Appendix A

Initial Study of the Long-Term Operations of the State Water Project

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State Clearinghouse No. 2019049121

State of California
Department of Water Resources

November 22, 2019

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ACRONYMS AND OTHER ABBREVIATIONS

°C	Celsius
°F	Fahrenheit
2008 USFWS Biological Opinion	2008 U.S. Fish and Wildlife Service Biological Opinion
2009 NMFS Biological Opinion	2009 National Marine Fisheries Service Biological Opinion
AB	Assembly Bill
AF	acre-feet
AMP	Adaptive Management Plan
AMT	Adaptive Management Team
ANSI	American National Standards Institute
B.P.	Before Present
Banks Pumping Plant	Harvey O. Banks Pumping Plant
basin plans	water quality control plans
BiOp	Biological Opinion
BLM	Bureau of Land Management
BSPP	Barker Slough Pumping Plant
CAL FIRE	California Department of Forestry and Fire Protection
CAL/OSHA	California Occupational Safety and Health Administration
CalEPA	California Environmental Protection Agency
California AB 32	California Global Warming Solutions Act of 2006
CalRecycle	California Department of Resources Recycling and Recovery
Caltrans	California Department of Transportation
CAP	Climate Action Plan
CARB	California Air Resources Board
CCF	Clifton Court Forebay
CCR	California Code of Regulations
CCSB	Cache Creek Settling Basin
CDE	California Department of Education
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act

cfs	cubic feet per second
CGS	California Geological Survey
CH4	methane
CHP	California Highway Patrol
CMIP5	Coupled Model Intercomparison Project
CNPS	California Native Plant Society
CO	carbon monoxide
CO2	carbon dioxide
CO2e	carbon dioxide equivalents
COA	Coordinated Operation Agreement
CRPR	California Rare Plant Ranks
CSAMP	Collaborative Science and Adaptive Management Program
CTC	California Transportation Commission
CTR	California Toxics Rule
CVP	Central Valley Project
CWA	Clean Water Act
D-1485	State Water Resources Control Board Water Rights Decision 1485
D-1641	State Water Resources Control Board Water Rights Decision 1641
dB	decibel(s)
dBA	A-weighted decibels
DCC	Delta Cross Channel
DDT	dichlorodiphenyltrichloroethane
DEIR	Draft Environmental Impact Report
Delta	Sacramento–San Joaquin Delta
Delta Methylmercury TMDL	Sacramento–San Joaquin Delta Estuary Methylmercury Total Maximum Daily Load
DMC	Delta–Mendota Canal
DPC	Delta Protection Commission
DPS	Distinct Population Segment
DSC	Delta Stewardship Council.
DSP	Delta Science Program
DTSC	California Department of Toxic Substances Control
DWR	Department of Water Resources

E/I	export/import
EC	electrical conductivity
EFH	Essential Fish Habitat
EIR	Environmental Impact Report
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	federal Endangered Species Act
ESU	Evolutionary Significant Unit
FBD	Fish Barrier Dam
FCCL	Fish Conservation and Culture Laboratory
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FMMP	Farmland Mapping and Monitoring Program
FMWT	Fall Midwater Trawl
FR	Federal Register
ft/sec	foot per second
GHG	greenhouse gas
GWh	gigawatt hour(s)
GWP	Global warming potential
GYSO	Goodyear Slough Outfall
HFC	hydrofluorocarbon
HORB	Head of Old River Barrier
Hz	hertz
I	Interstate
IEP	Interagency Ecological Program
IPCC	Intergovernmental Panel on Climate Change
IRP	Independent Review Panel
IS	Initial Study
ITP	Incidental Take Permit
ITS	incidental take statements
JPE	juvenile production estimate
JPOD	Joint Point of Diversion
K–12	kindergarten through 12th grade

km	kilometer
LADWP	Los Angeles Department of Water and Power
Ldn	day-night noise level
Leq	equivalent sound level
LFC	Low Flow Channel
Lmax	maximum sound level
LTO	long-term operation
M&I	municipal and industrial
MAF	million acre-feet
MERP	Mercury Exposure Reduction Program
mg/L	milligrams per liter
MIDS	Morrow Island Distribution System
mm	millimeter
MRZ	Mineral Resource Zone
mtCO2e	metric ton of carbon dioxide equivalent
NBA	North Bay Aqueduct
NEPDG	National Energy Policy Development Group
NFH	National Fish Hatchery
NMFS	National Marine Fisheries Service
NO2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOD	Notice of Determination
NPDES	National Pollutant Discharge Elimination System
NSF	National Sanitation Foundation International
NTU	Nephelometric Turbidity Unit
OBI	Old River at Bacon Island
OCO	Operations Control Office
OMR	Old and Middle river
OMRI	Organic Materials Reviews Institute
PBT	Parentage Based Tagging
PCB	polychlorinated biphenyl
PFC	perfluorinated chemicals
PFMC	Pacific Fishery Management Council

PG&E	Pacific Gas and Electric Company
PM	particulate matter
PM10	PM equal to or less than 10 micrometers in diameter
PM2.5	PM equal to or less than 2.5 micrometers in diameter
POD	Pelagic Organism Decline
ppm	parts per million
ppt	part per thousand
PRC	Public Resources Code
Proposed Project	Long-Term Operation of the State Water Project
PSL	pre-screen loss
PTM	Particle Tracking Model
PWAs	Public Water Agencies
QUEST	Net flow on the San-Joaquin River at Jersey Point
RBDD	Red Bluff Diversion Dam
RCRA	Resource Conservation and Recovery Act
Reclamation	U.S. Bureau of Reclamation
RPA	Reasonable and Prudent Alternative
RPS	Renewables Portfolio Standard
RRDS	Roaring River Distribution System
RWQCB	Regional Water Quality Control Board
Delta	Sacramento–San Joaquin Delta
SB	Senate Bill
SCWA	Solano County Water Agency
SF6	sulfur hexafluoride
SFB	San Francisco Bay
SFEI	San Francisco Estuary Institute
Skinner Fish Facility	John E. Skinner Delta Fish Protective Facility
SJRRP	San Joaquin River Restoration Program
SLCP	short-lived climate pollutant
SLS	Smelt Larva Survey
SMARA	Surface Mining and Reclamation Act
SMGB	State Mining and Geology Board
SMPA	Suisun Marsh Preservation Agreement

SMSCG	Suisun Marsh Salinity Control Gates
SO2	sulfur dioxide
SR	State Route
SRA	State Responsibility Area
SRCD	Suisun Resource Conservation District
SRWTP	Sacramento Regional Wastewater Treatment Plant
State	State of California
State Implementation Policy	Policy for Implementing Toxic Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California
SVP	Society of Vertebrate Paleontology
SWC	State Water Contractors
SWP	State Water Project
SWPAO	State Water Project Analysis Office
SWRCB	State Water Resources Control Board
TAF	thousand acre-feet
TBP	DWR South Delta Temporary Barrier Project
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TOC	total organic carbon
UC Davis	University of California, Davis
UCMP	University of California, Berkeley Museum of Paleontology
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WCRP	World Climate Research Programme
WGCM	Working Group on Coupled Modelling
Williamson Act	California Land Conservation Act
WOMT	Water Operations Management Team
WSPP	Western Systems Power Pool
WWR	Wetlands and Water Resources
YOY	young-of-the-year

1 INTRODUCTION

1.1 BACKGROUND

The Long-Term Operation of the State Water Project (Proposed Project) would continue the California Department of Water Resources' (DWR's) ongoing long-term State Water Project (SWP) operations consistent with applicable laws, contractual obligations, and agreements. DWR proposes long-term operation (LTO) of the SWP that will allow DWR to continue to store, divert, and convey water in accordance with its existing water rights to deliver water pursuant to water contracts and agreements up to full contract quantities. DWR is seeking to optimize water supply and improve operational flexibility while protecting fish and wildlife.

DWR operates the SWP in coordination with the Central Valley Project (CVP), under the Coordinated Operation Agreement (COA) between the federal government and the State of California (authorized by Public Law 99–546). The CVP and SWP operate pursuant to water rights permits and licenses that are issued by the State Water Resources Control Board (SWRCB). The CVP and SWP water rights allow appropriation of water by directly using and/or diverting water to storage for later withdrawal and use, or use and rediversion to storage further downstream for later consumptive use. Among the conditions of those water rights are requirements for projects either to bypass or withdraw water from storage and to help satisfy specific water quality, quantity, and operations criteria in source rivers and within the Sacramento–San Joaquin Delta (Delta).

DWR also operates the SWP in compliance with the California Endangered Species Act (CESA). DWR has obtained consistency determinations from the California Department of Fish and Wildlife (CDFW), pursuant to Section 2080.1 of the California Fish and Game Code. The 2008 U.S. Fish and Wildlife Service (USFWS) and 2009 National Marine Fisheries Service (NMFS) Biological Opinions are consistent with the requirements of CESA. CDFW's determinations signify that no further authorizations are necessary under CESA with respect to species that are listed under both the CESA and federal Endangered Species Act (ESA), including Delta Smelt, Winter-run Chinook Salmon, and Spring-run Chinook Salmon. DWR also holds an Incidental Take Permit (ITP) from CDFW, pursuant to Section 2081 of the California Fish and Game Code, covering Longfin Smelt, listed only under the CESA. The Incidental Take Permit for Longfin Smelt expires on December 31, 2019.

DWR intends to seek a new ITP from CDFW, pursuant to Section 2081 of the California Fish and Game Code. The new ITP will cover species that are listed under the CESA and are subject to incidental take from long-term operation of the SWP (i.e., Delta Smelt, Longfin Smelt, Winter-run Chinook Salmon, and Spring-run Chinook Salmon). CDFW is expected to rely on this document when issuing a decision on the DWR ITP application.

DWR is the lead agency for compliance with the California Environmental Quality Act (CEQA) and has prepared this Initial Study (IS). The IS has been prepared pursuant to CEQA, California Public Resources Code Section 21000, et seq., and the State CEQA Guidelines, Title 14 of the California Code of Regulations Section 15000, et seq.

DWR is seeking an ITP covering four CESA-designated species for the continued LTO of the SWP. ITPs are necessary for:

- Winter-run Chinook Salmon (*Oncorhynchus tshawytscha*) Sacramento River Evolutionary Significant Unit (ESU)
- Spring-run Chinook Salmon (*Oncorhynchus tshawytscha*) Central Valley ESU
- Delta Smelt (*Hypomesus transpacificus*)
- Longfin Smelt (*Spirinchus thaleichthys*) Bay–Delta Distinct Population Segment (DPS)

DWR has prepared this IS to identify potential significant environmental issues, and to narrow the scope of the Environmental Impact Report (EIR) being prepared to address the environmental consequences of the Proposed Project. In accordance with Section 15063 (3) of the State CEQA Guidelines, this IS presents an analysis addressing a full range of environmental topics and determines whether potential significant environmental effects may occur from the LTO of the SWP. This Initial Study is neither intended nor required to include the level of detail that must be included in an EIR.

The environmental topics that are determined to have no impact or a less-than-significant impact in this IS will be eliminated from further consideration in the EIR. Only the environmental topics that are determined to have a potentially significant impact from implementation of the Proposed Project will be further discussed in the EIR.

1.2 PROJECT OBJECTIVES

The objectives of the Proposed Project are to continue the coordinated long-term operation of the SWP for water supply and power generation, consistent with applicable laws, contractual obligations, and agreements, and to increase operational flexibility by focusing on non-operational measures to avoid significant adverse effects. DWR proposes to store, divert, and convey water in accordance with existing water contracts and agreements up to full contract amounts, including water service and repayment contracts, settlement contracts, exchange contracts, and other deliveries, consistent with water rights and applicable laws and regulations.

1.2.1 REQUIRED PERMITS AND APPROVALS

DWR operates the SWP in accordance with applicable statutes and regulations, including applicable water rights permits issued by the SWRCB, the Coordinated Operations Agreement with Reclamation, and biological opinions issued by the USFWS and NMFS, among other requirements. In accordance with Section 2081(b) of the California Fish and Game Code, CDFW may issue an ITP to authorize take that is otherwise prohibited by Section 2080 of the Fish and Game Code as long as the project meets the conditions set forth in Sections 2081(b) and 2081(c).

1.2.2 DOCUMENT ORGANIZATION

This Initial Study is organized as follows:

- **Chapter 1, "Introduction,"** describes the background of the Proposed Project, project objectives, and the organization of this document, and summarizes the findings of the environmental impact analysis.
- **Chapter 2, "Project Description,"** refers the reader to Chapter 3, "Project Description," presented in the Draft Environmental Impact Report (DEIR).
- **Chapter 3, "Environmental Checklist,"** identifies the environmental resource topics evaluated under CEQA and describes the environmental setting, significance criteria, and results of the analysis of potential environmental impacts of the Proposed Project. This chapter also identifies and summarizes the overall significance of any potential impacts on natural and cultural resources, cumulative impacts, and impacts on humans.
- **Chapter 4, "References,"** lists the sources of information cited in this IS, including literature citations and personal communications.
- **Chapter 5, "Document Preparation,"** lists the individuals who prepared this document.

1.3 SUMMARY OF FINDINGS

Chapter 3 of this IS contains the CEQA Environmental Checklist, which presents a brief discussion of each resource topic potentially affected and identifies the potential environmental impacts that would occur with implementation of the Proposed Project. The analysis focuses on potential effects on waterways of northern California, the Sacramento–San Joaquin Delta, and Suisun Marsh from the continued operation of the SWP facilities and issuance of the ITP.

In accordance with Section 15063(c)(3) of the State CEQA Guidelines, the purpose of preparing an initial study is to assist preparation of an EIR by focusing the EIR on the effects determined to be potentially significant, identifying resources that would be affected but determined not to be significant, and explaining the reasons for determining that potentially significant effects would not be significant.

Based on the information and analyses presented, this IS identifies and discusses those environmental resources that would not be affected by the long-term operation of the SWP under a new ITP. The Proposed Project would result in no impacts on the following resource topics:

- Aesthetics
- Agriculture and Forestry Resources
- Air Quality
- Biological Resources (Terrestrial)
- Cultural Resources
- Energy
- Geology and Soils
- Greenhouse Gas Emissions
- Hazards and Hazardous Materials
- Land Use and Planning
- Mineral Resources
- Noise
- Population and Housing
- Public Services
- Recreation
- Transportation/Traffic
- Tribal Cultural Resources
- Utilities and Service Systems
- Wildfire

However, implementation of the Proposed Project would have the potential to adversely affect the environment. The proposed long-term operation of the SWP would have the potential for adverse effects on the following resource topics:

- **Biological Resources (Fisheries and Aquatic Resources):** The proposed long-term operation of SWP may result in a significant adverse effect on fisheries and aquatic biological resources located in the Sacramento–San Joaquin Delta (Delta). These biological resources would include Delta Smelt; Winter-run Chinook Salmon, Spring-run Chinook Salmon, and Longfin Smelt, along with their associated habitat, population abundance, and viability.
- **Hydrology and Water Quality:** The proposed long-term operation of SWP may result in a significant adverse effect on water quality in the Delta. Because of the direct relationship between surface water hydrology and water quality in the Delta, both topics are discussed in the EIR.

The analysis presented in this IS finds that the Proposed Project would not affect a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and therefore no impact on Tribal cultural resources would occur. However, because the Tribal consultation process undertaken by DWR was not complete at the time of the Initial Study's preparation, the DEIR does address this topic further to document the extent of the consultation process and outcome, and the conclusion of no impact on Tribal cultural resources.

2 PROJECT DESCRIPTION

2.1 INTRODUCTION

The SWP includes water, power, and conveyance systems, conveying an annual average of 2.9 million acre-feet (AF) of water. The principal facilities of the SWP are the Oroville Reservoir and related facilities, the San Luis Dam and related facilities, facilities in the Delta, the Suisun Marsh Salinity Control Gates, the California Aqueduct including its terminal reservoirs, and the North Aqueduct and South Bay Aqueduct. DWR holds contracts with 29 public agencies in Northern, Central, and Southern California for water supplies from the SWP. Water stored in the Oroville facilities and water available in the Delta (consistent with applicable regulations) are captured in the Delta and conveyed through several facilities to SWP contractors. The SWP is operated to provide flood control and water for agricultural, municipal, industrial, recreational, and environmental purposes.

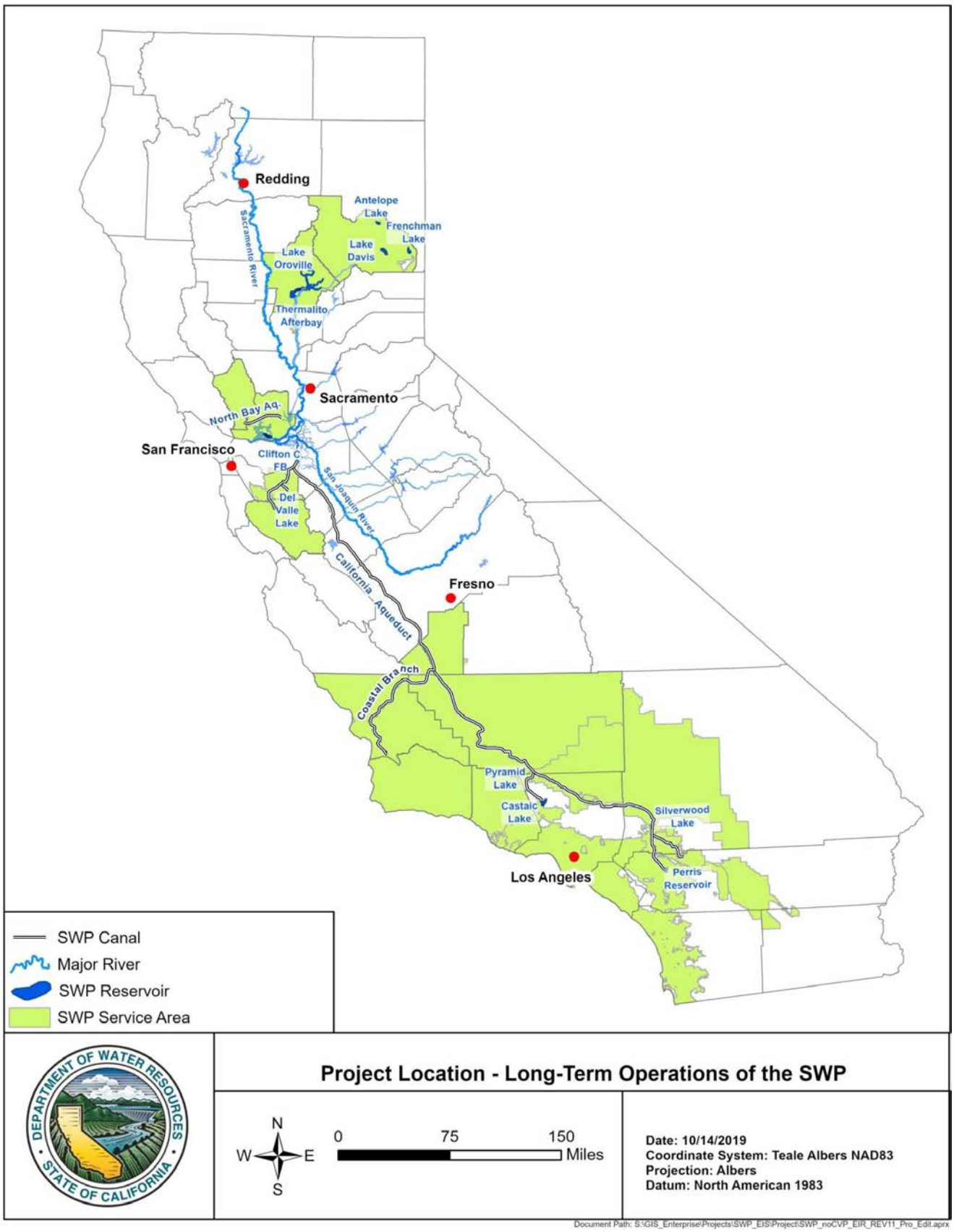
2.1.1 PROJECT OBJECTIVES

The objective of the Proposed Project is to continue the long-term operation of the SWP consistent with applicable laws, contractual obligations, and agreements. DWR proposes to store, divert, and convey water in accordance with DWR's existing water rights to deliver water pursuant to water contracts and agreements up to full contract quantities. DWR seeks to optimize water supply and improve operational flexibility while protecting fish and wildlife based on the best available scientific information.

2.1.2 PROJECT LOCATION

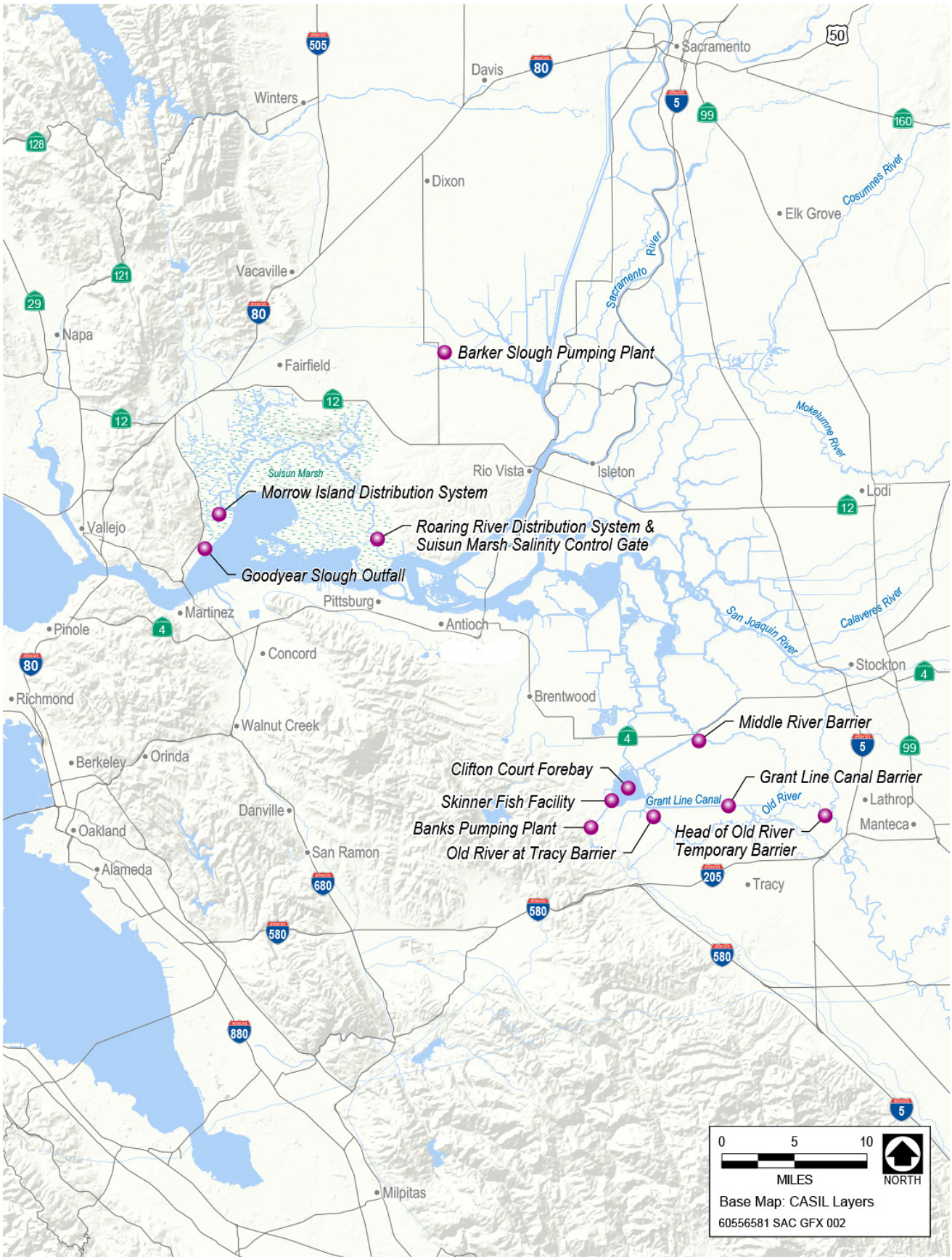
The project area includes the SWP Service Areas and existing SWP storage and export facilities located within the Delta and vicinity. Figure 2-1 shows the entire project area, including the SWP Service Areas, while Figure 2-2 shows those SWP facilities located in the Delta and vicinity.

The DWR operates the SWP in coordination with the CVP, under the Coordinated Operation Agreement (COA) between the federal government and the State of California (authorized by Pub. L. 99 546). The CVP and SWP operate pursuant to water rights permits and licenses issued by the State Water Resources Control Board. The CVP and SWP water rights allow appropriation of water by directly using and/or diverting water to storage for later withdrawal and use, or use and rediversion to storage further downstream for later consumptive use. Among the conditions of their water rights, are requirements of the SWP and CVP to either bypass or withdraw water from storage and to help satisfy specific water quality, quantity and operations criteria in source rivers and within the Delta.



Source: Data compiled by DWR in 2019

Figure 2-1. Long-Term SWP Operations Project Area



Source: Data compiled by AECOM in 2017

Figure 2-2. Locations of State Water Project Facilities in the Delta, Suisun Marsh, and Suisun Bay

2.1.3 DESCRIPTION OF EXISTING SWP FACILITIES

The SWP facilities in the Delta provide for delivery of water supply to areas within and immediately adjacent to the Delta, and to regions south of the Delta. The main SWP Delta features are Suisun Marsh and Bay facilities, the Harvey O. Banks Pumping Plant (Banks Pumping Plant), the Clifton Court Forebay (CCF), the John E. Skinner Delta Fish Protective Facility (Skinner Fish Facility), and the Barker Slough Pumping Plant (BSPP).

2.1.3.1 Harvey O. Banks Pumping Plant

The Banks Pumping Plant, located about 8 miles northwest of Tracy, marks the upstream end of the California Aqueduct. The plant discharges into five pipelines that convey water into a roughly 1-mile-long canal, which in turn conveys water to Bethany Reservoir (DWR and Reclamation 2015). The Banks Pumping Plant consists of 11 pumps—two rated at 375 cubic feet per second (cfs) capacity, five at 1,130 cfs capacity, and four at 1,067 cfs capacity—that provide the initial lift of water 244 feet from the CCF into the California Aqueduct. The rated capacity of the Banks Pumping Plant is 10,300 cfs. The plant maximum daily pumping rate is controlled by a combination of the SWRCB's D-1641 and permits issued by the U.S. Army Corps of Engineers (USACE) that regulate the rate of diversion of water into the CCF. The diversion rate is normally restricted to 6,680 cfs as a 3-day average inflow and 6,993 cfs as a 1-day average inflow to the CCF in accordance with the existing USACE Section 10 permit issued pursuant to the Rivers and Harbors Act (SWRCB 2017). The diversions may be greater in the winter and spring, depending on San Joaquin River flows at Vernalis (DWR and Reclamation 2015). As part of the adaptive management process, the SWP is permitted to pump an additional 500 cfs between July 1 and September 30 to offset water costs associated with fisheries actions, making the summer limit effectively 7,180 cfs (Reclamation 2008).

2.1.3.2 John E. Skinner Delta Fish Protective Facility

The Skinner Fish Facility is west of the CCF, about 2 miles upstream from the Banks Pumping Plant. The Skinner Fish Facility guides fish away from entering the pumps that convey water into the California Aqueduct. Large fish and debris are directed away from the facility by a 388-foot-long trash boom. Smaller fish are diverted from the intake channel into bypasses by a series of metal louvers. These smaller fish pass through a secondary system of screens, louvers, and pipes into seven holding tanks, where a subsample is counted and recorded. The salvaged fish are then returned to the Delta in oxygenated tank trucks.

2.1.3.3 Clifton Court Forebay

The CCF is located near the city of Byron in the South Delta. The Banks Pumping Plant pumps water diverted from the CCF via the intake channel past the Skinner Fish Facility A set of five radial gates are located at the CCF inlet near the confluence of the Grant Line and West Canal. They are operated so that they can be closed during critical periods of the ebb/flood tidal cycle to protect water levels experienced by local agricultural water users in the South Delta. The gates are operated on the tidal cycle to reduce approach velocities, prevent scour in adjacent channels, and minimize fluctuations in

water elevation in the South Delta by taking water in through the gates at times other than low tide. Banks Pumping Plant pumping rates are constrained operationally by limits on CCF diversions from the Delta. The maximum daily diversion limit from the Delta into the CCF is 13,870 AF per day (6,990 cfs/day), and the maximum averaged diversion limit over any 3 days is 13,250 AF per day (6,680 cfs/day). In addition to these requirements, DWR may increase diversions from the Delta into the CCF by one-third of the San Joaquin River flow at Vernalis from mid-December through mid-March when flows at Vernalis exceed 1,000 cfs. These limits are listed in USACE Public Notice 5820A Amended (Oct. 13, 1981).

From July through September, the maximum daily diversion limit from the Delta into the CCF is increased from 13,870 AF per day (6,990 cfs/day) to 14,860 AF per day (7,490 cfs/day), and the maximum averaged diversion limit over any 3 days is increased from 13,250 AF per day (6,680 cfs/day) to 14,240 AF per day (7,180 cfs/day). These increases are for the purpose of recovering water supply losses incurred earlier in the same year to protect fish species listed under the federal Endangered Species Act (ESA). Those increases are a separate action permitted for short-term time periods.

2.1.3.4 Barker Slough Pumping Plant

The Barker Slough Pumping Plant diverts water from Barker Slough into the North Bay Aqueduct (NBA) for delivery to Napa and Solano counties. The NBA intake is located approximately 10 miles from the mainstem Sacramento River at the end of Barker Slough. In accordance with salmon screening criteria, each of the aqueduct's 10 pump bays are individually screened with a positive barrier fish screen consisting of a series of flat, stainless-steel, wedge-wire panels with a slot width of 3/32 inch. This configuration is designed to exclude and prevent the entrainment of fish measuring approximately 1 inch or larger. The bays tied to the two smaller units have an approach velocity of about 0.2 foot per second (ft/sec). The larger units were designed for a 0.5 ft/sec approach velocity, but actual approach velocity is about 0.44 ft/sec. The screens are routinely cleaned to prevent excessive head loss, thereby minimizing increases in localized approach velocities.

2.1.3.5 Suisun Marsh Operations

The Suisun Marsh Preservation Agreement (SMPA) among DWR, Reclamation, CDFW, and Suisun Resource Conservation District (SRCD) contains provisions for DWR and Reclamation to mitigate the impacts on Suisun Marsh channel water salinity from SWP and CVP operations and other upstream diversions. The SMPA requires DWR and Reclamation to meet salinity standards in accordance with D-1641, sets a timeline for implementing the Plan of Protection, and delineates monitoring and mitigation requirements.

There are two primary physical mechanisms for meeting salinity standards set forth in D-1641 and the SMPA: (1) the implementation and operation of physical facilities in the Marsh and (2) management of Delta outflow (i.e., facility operations are driven largely by salinity levels upstream of Montezuma Slough and salinity levels are highly sensitive to Delta outflow). Physical facilities (described below) have been operating since the 1980s and have proven to be a highly reliable method for meeting standards.

Physical facilities in the Suisun Marsh and Bay include the Suisun Marsh Salinity Control Gates (SMSCG), the Roaring River Distribution System (RRDS), the Morrow Island Distribution System (MIDS) and the Goodyear Slough Outfall (GYSO). The location and operation of these facilities is described below.

The SMSCG are located on Montezuma Slough about 2 miles downstream from the confluence of the Sacramento and San Joaquin rivers, near Collinsville. The objective of Suisun Marsh Salinity Control Gate operation is to decrease the salinity of the water in Montezuma Slough. The gates control salinity by restricting the flow of higher salinity water from Grizzly Bay into Montezuma Slough during incoming tides and retaining lower salinity Sacramento River water from the previous ebb tide. Operation of the gates in this fashion lowers salinity in Suisun Marsh channels and results in a net movement of water from east to west through Suisun Marsh.

The SMSCG are operated during the salinity control season, which spans from October to May. Operational frequency is affected by salinity at D-1641 compliance stations, hydrologic conditions, weather, Delta outflow, tide, fishery considerations, and other factors. The boat lock portion of the gate is now held partially open during SMSCG operation to allow an opportunity for continuous salmon passage opportunity. After an engineering solution is implemented to prevent boaters from entering the boat lock prior to the operator closing it, the gate will be held open at all times. However, the boat lock gates may be closed temporarily to stabilize flows to facilitate safe passage of watercraft through the facility.

Assuming no significant long-term changes in the drivers mentioned above, it is expected that gate operations will remain at current levels, or as needed to implement the summer action to benefit Delta Smelt.

The RRDS was constructed to provide lower salinity water to 5,000 acres of private and 3,000 acres of CDFW managed wetlands on Simmons, Hammond, Van Sickle, Wheeler, and Grizzly islands. The RRDS includes a 40-acre intake pond that supplies water to Roaring River Slough. Water is diverted through a bank of eight 60-inch-diameter culverts equipped with fish screens into the Roaring River intake pond on high tides to raise the water surface elevation in the RRDS above the adjacent managed wetlands. The intake to the RRDS is screened to prevent entrainment of fish larger than approximately 25 mm. After the listing of Delta Smelt, RRDS diversion rates have been controlled to maintain a maximum average approach velocity of 0.2 ft/sec at the intake fish screen except during the period from September 14 through October 20, when RRDS diversion rates are controlled to maintain a maximum average approach velocity of 0.7 ft/sec for fall flood up operations.

The MIDS allows Reclamation and DWR to provide water to the landowners so that lands may be managed according to approved local management plans. The system was constructed primarily to channel drainage water from the adjacent managed wetlands for discharge into Suisun Slough and Grizzly Bay. This approach increases circulation and reduces salinity in Goodyear Slough. The MIDS is used year-round, but most intensively from September through June. When managed wetlands are filling and circulating, water is tidally diverted from Goodyear Slough just south of Pierce Harbor.

The GYSO connects the south end of Goodyear Slough to Suisun Bay. Prior to construction of the outfall, Goodyear Slough was a dead-end slough. The GYSO was designed to increase circulation and reduce salinity in Goodyear Slough to provide higher water quality to the wetland managers who flood their ponds with Goodyear Slough water. GYSO has a series of four passive intakes that drain to Suisun Bay. The outfall is equipped with slide gates on the interior of the outfall structure to allow DWR to close the system as needed for maintenance or repairs. The intakes and outfall of GYSO are unscreened but are equipped with trash racks to prevent damage. Any fish that entered the system would be able to leave via the intake or the outfall, as GYSO is an open system.

2.1.3.6 South Delta Temporary Barrier Project

DWR's South Delta Temporary Barrier Project (TBP) was initiated in 1991. The objectives of the TBP are to increase water levels, circulation patterns, and water quality in the southern Delta area for local agricultural diversions. The existing SWP consists of installation and removal of temporary rock barriers at the following locations:

- Middle River near the Victoria Canal, about 0.5 mile south of the confluence of Middle River, Trapper Slough, and the North Canal
- Old River near Tracy, approximately 0.5 mile east of the Delta-Mendota Canal intake
- Grant Line Canal, approximately 400 feet east of the Tracy Boulevard Bridge

These rock barriers are designed to act as flow control structures, trapping tidal waters behind them after a high tide. These barriers improve water levels and circulation for local South Delta farmers and are collectively referred to as agricultural barriers.

Rock barriers at Old River near Tracy, Middle River, and the Grant Line Canal are in place from April 15 to September 30 each year. The Old River barrier near Tracy has been installed since 1991 and the Middle River barrier has been installed since 1987. A rock barrier was first installed in the Grant Line Canal in spring 1996, and since then the barrier has been installed in every year except 1998.

This document is focused on the operation of the barriers within the South Delta and does not analyze or address the construction or removal of the barriers, which is covered by a separate Biological Opinion (BiOp) and associated permits.

2.1.3.7 Head of Old River Barrier

The Head of Old River Barrier (HORB) is a temporary structure at the divergence from the San Joaquin River. The fall HORB is intended to keep water in the San Joaquin River, which may improve downstream dissolved-oxygen conditions. The spring barrier is intended to prevent downstream-migrating salmonid smolts in the San Joaquin River from entering Old River.

The HORB has been installed seasonally, between September 15 and November 30, in most years since 1963. Since 1992, the rock barrier has also been installed frequently in the spring, between April 15 and May 30. High flows in the San Joaquin River prevented installation of the HORB in 1993, 1995, 1998, 1999, 2005, 2006, and 2011. The spring installation of the HORB is currently required as part of

the 2009 National Marine Fisheries Service Biological Opinion (2009 NMFS Biological Opinion). The construction and removal of the HORB is covered by a separate BiOp and associated permits.

2.1.3.8 San Luis Reservoir

San Luis Reservoir is an off-stream storage facility located along the California Aqueduct downstream of the Jones and Banks pumping plants. The CVP and SWP share San Luis Reservoir storage roughly 50/50 (CVP has 966 thousand acre-feet [TAF] of storage, and SWP has 1062 TAF of storage). San Luis Reservoir is used by both the SWP and CVP to meet deliveries to their contractors during periods when Delta pumping is insufficient to meet demands. San Luis Reservoir is also operated to supply water to the CVP San Felipe Division in San Benito and Santa Clara Counties.

San Luis Reservoir operates as a regulator on the CVP/SWP system, accepting any water pumped from the Banks and Jones pumping plants that exceeds contractor demands, then releasing that water back to the aqueduct system when the pumping at the Jones and Banks pumping plants is insufficient to meet demands. The reservoir allows the CVP/SWP to meet peak-season demands that are seldom balanced by Jones and Banks pumping.

As San Luis Reservoir is drawn down to meet contractor demands, it usually reaches its low point in late August or early September. From September through early October, demand for deliveries declines until it is less than the rate of diversions from the Delta at the Jones and Banks pumping plants. At this point, the additional diverted water is added to San Luis Reservoir, reversing its spring and summer decline and eventually filling the San Luis Reservoir—typically before April of the following year.

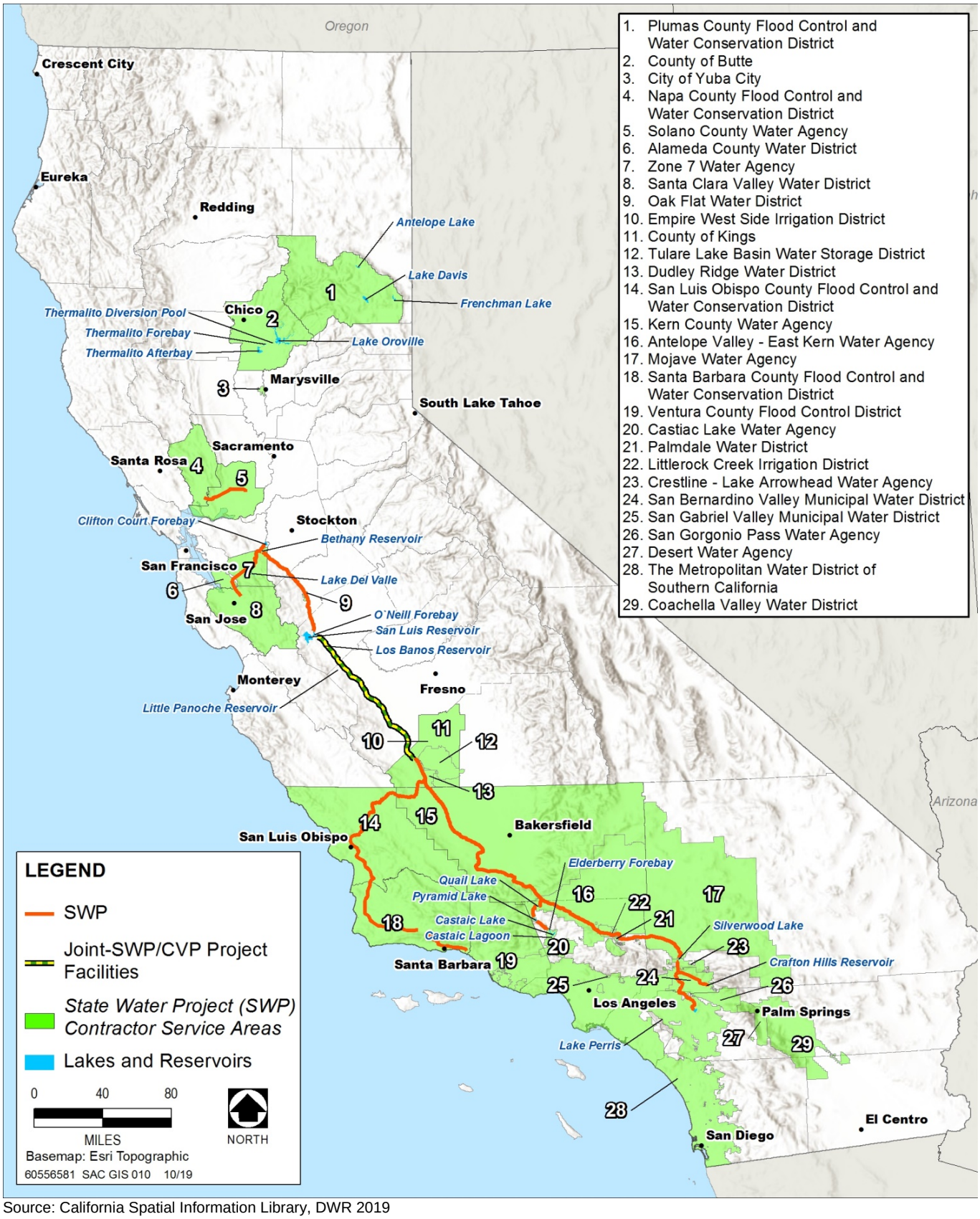
Operations of the San Luis Reservoir are not discussed further in this document, as there will be no changes to the operations of this reservoir and it is an off-stream facility.

2.1.4 DESCRIPTION OF EXISTING SWP WATER SERVICE CONTRACTS

DWR has signed long-term contracts with 29 water agencies statewide to deliver water supplies developed from the SWP system (Figure 2-3). These contracts are with both municipal and industrial (M&I) water users and agricultural water users. The contracts specify the charges that will be made by the water agency for both: (1) water conservation, and (2) conveyance of water. The foundation allocation of water to each contractor is based on their respective “Table A” entitlement, which is the maximum amount of water delivered to them by the SWP, on an annual basis.

DWR proposes to operate the SWP in accordance with contracts with senior water right holders in the Feather River Service Area (approximately 983 TAF). Furthermore, under statewide contracts, DWR allocates Table A water as an annual supply made available for scheduled delivery throughout the year. Table A contracts total 4,173 TAF with more than 3 million acre-feet (MAF) for San Joaquin Valley and southern California water users.

Article 21 of the long-term SWP water supply contracts provides an interruptible water supply made available only when certain conditions exist: (1) The SWP share of San Luis Reservoir is physically full, or projected to be physically full; (2) other SWP reservoirs south of the Delta are at their storage



Source: California Spatial Information Library, DWR 2019

Figure 2-3. The 29 Water Purveyors Under Contract to Receive SWP Water Deliveries

targets or the conveyance capacity to fill these reservoirs is maximized; (3) the Delta is in excess conditions; (4) current Table A demand is being fully met; and (5) the Banks Pumping Plant has export capacity beyond that which is needed to meet current Table A and other SWP operational demands.

Table 2-1 shows the maximum contracted annual water supply per water purveyor per DWR's most recent water supply reliability report.

Table 2-1. State Water Contractors

State Water Contractors	Table A Contracted Water Supply (acre-feet)	Purpose of Use
Butte County	27,500	M&I
Plumas County	2,700	M&I
Yuba City	9,600	M&I
Napa County Flood Control and Water Conservation District	29,025	M&I
Solano County Water Agency	47,756	M&I
Alameda County—Zone 7	80,619	M&I
Alameda County Water District	42,000	M&I
Santa Clara Valley Water District	100,000	M&I
Oak Flat Water District	5,700	Agriculture
Kings County	9,305	Agriculture
Dudley Ridge Water District	45,350	Agriculture
Empire West Side Irrigation District	3,000	Agriculture
Kern County Water Agency	982,730	Agriculture/M&I[1]
Tulare Lake Water Storage District	87,471	Agriculture
San Luis Obispo County	25,000	M&I
Santa Barbara County	45,486	M&I
Antelope Valley-East Kern Water Agency	144,844	Agriculture/M&I[2]
Santa Clarita Valley Water Agency	95,200	M&I
Coachella Valley Water District	138,350	M&I
Crestline-Lake Arrowhead Water Agency	5,800	M&I
Desert Water Agency	55,750	M&I
Littlerock Creek Irrigation District	2,300	M&I
Metropolitan Water District of Southern California	1,911,500	M&I
Mojave Water Agency	85,800	M&I
Palmdale Water District	21,300	M&I
San Bernardino Valley Municipal Water District	102,600	M&I
San Gabriel Valley Municipal Water District	28,800	M&I
San Gorgonio Pass Water Agency	17,300	M&I
Ventura County Watershed Protection District	20,000	M&I

Notes:

[1] Approximately 15% of the Kern County Water Agency Table A Amount is classified as municipal and industrial (M&I) supply.

[2] Approximately 25% of the Antelope Valley-East Kern Water Agency Table A amount is used for agricultural purposes.

Source: DWR 2016

M&I = municipal and industrial

2.1.5 SWP Allocation and Forecasting

At the beginning of each new water year, there is significant uncertainty as to the hydrologic conditions that will exist in the future several months, and hence, the water supplies that will be allocated by the SWP to its water contractors. In recognition of this, DWR uses a forecasting water supply allocation process that is updated monthly, incorporates known conditions in the Central Valley watershed to date, and forecasts future hydrologic conditions in a conservative manner to provide an accurate estimate of SWP water supplies that can be delivered to SWP contractors as the water year progresses.

There are many factors considered in the forecast-supply process. Some of these factors are the following:

- Water storage in Lake Oroville (both updated and end-of-water-year (September 30)
- Water storage in San Luis Reservoir (both updated and end-of-calendar-year)
- Flood operations constraints at Lake Oroville
- Snowpack surveys (updated monthly from February through May)
- Forecasted runoff in the Central Valley (reflects both snowpack and precipitation)
- Feather River settlement agreement obligations
- Feather River fishery flows and temperature obligations
- Anticipated depletions in the Sacramento and Delta basins
- Anticipated Delta standards and conditions
- Anticipated CVP operations for joint responsibilities
- Contractor supply requests and delivery patterns

Staff from both the Operations Control Office (OCO) and the State Water Project Analysis Office (SWPAO) coordinate their efforts to determine the current water supply allocations. OCO primarily focuses on runoff/operations models to determine allocations. SWPAO requests updated information from the contractors on supply requests and delivery patterns to determine allocations. Both OCO and SWPAO staff meet at least once a month with the Director of DWR to make final decisions on staff's proposed allocations.

The Initial Allocation for SWP Deliveries is made by December 1 of each year with a conservative assumption of future precipitation to avoid overallocating water before the hydrologic conditions are well defined for the year. As the water year unfolds, Central Valley hydrology and water supply delivery estimates are updated using measured and known information and conservative forecasts of future hydrology. Monthly briefings are held with the Director of DWR to determine formal approvals of delivery commitments announced by DWR.

Another water supply consideration is the contractual ability of SWP contractors to "carry over" allocated (but undelivered) Table A supplies from the previous year to the next if space is available in San Luis Reservoir. The carryover storage is often used to supplement an individual contractor's current year Table A allocations if conditions are dry. Carryover supplies left in San Luis Reservoir by

SWP contractors can result in higher storage levels in San Luis Reservoir. As SWP pumping fills San Luis Reservoir, the contractors are notified to take, or lose, their carryover supplies. Carryover water not taken, after notice is given to remove it, then becomes water available for reallocation to all contractors in a given year.

Article 21 (surplus to Table A) water which is delivered early in the calendar year may be reclassified as Table A water later in the year, depending on final allocations, hydrology, and contractor requests.

Reclassification does not affect the amount of water carried over in San Luis Reservoir, nor does it alter pumping volumes or schedules.

2.1.6 SWP Settlement Agreements

DWR has water rights settlement agreements to provide water supplies with entities north of Oroville, along the Feather River and Bear River and in the Delta. These agreements provide users with water supplies that they were entitled to prior to the construction of the SWP's Oroville Complex. Collectively, these agreements with more than 60 riparian diverters along the Feather and Bear rivers provide water for diversion. Table 2-2 summarizes the volume under the water right settlement agreements.

Table 2-2. SWP Settlement Agreements

Location	Entity	Amount (Acre-Feet)
North of Oroville	Andrew Valberde	135
North of Oroville	Jane Ramelli	800
North of Oroville	Last Chance Creek WD	12,000
Feather River	Garden Highway Mutual Water	18,000
Feather River	Joint Water Districts Board	620,000
Feather River	South Feather Water & Power	17,555
Feather River	Oswald WD	3,000
Feather River	Plumas Mutual Water	14,000
Feather River	Thermalito Irrigation District	8,200
Feather River	Tudor Mutual Water	5,000
Feather River	Western Canal/PG&E	295,000
Bear River	South Sutter/Camp Far West	4,400
Delta	Byron-Bethany ID	50,000
Delta	East Contra Costa ID	50,000
Delta	Solano Co./Fairfield, Vacaville and Benicia	31,620

Notes:
ID = Irrigation District
PG&E = Pacific Gas and Electric Company
WD = water district

2.1.7 Daily Operations

After the allocations and forecasting process, Reclamation and DWR coordinate their operations on a daily basis. Some factors Reclamation and DWR consider when coordinating their joint operations include required in-Delta flows, Delta outflow, water quality, schedules for the joint use facilities, pumping and wheeling arrangements, and any facility limitations. Both the SWP and CVP must meet

the flood obligations of individual reservoirs. CVP operations must also consider flows at Wilkins Slough and associated pump intake elevations.

During balanced water conditions, Reclamation and DWR maintain a daily water accounting of CVP and SWP obligations. This accounting allows for flexible operations and avoids the need to change reservoir releases made several days in advance (due to travel time from the Delta). Therefore, adjustments can be made "after the fact," using actual observed data rather than by prediction for the variables of reservoir inflow, storage withdrawals, and in-basin uses. This iterative process of observation and adjustment results in a continuous trueing up of the running COA account. If either the SWP or CVP is "owed" water (i.e., the project that provided more or exported less than its COA-defined share), each may request the other to adjust its operations to reduce or eliminate the accumulated account within a reasonable time.

The COA provides the mechanism for determining SWP and CVP responsibility for meeting in-basin use, but real-time conditions dictate real-time actions. Conditions in the Delta can change rapidly. For example, weather conditions combined with tidal action can quickly affect Delta salinity conditions and therefore the Delta outflow required to maintain joint salinity standards under D-1641.

Increasing or decreasing SWP or CVP exports can achieve changes to Delta outflow immediately. Imbalances in meeting each other's initial shared obligations are captured by the COA accounting and balanced out later.

When more reaction time is available, reservoir release changes are used to adjust to changing in-basin conditions. If Reclamation decides the reasonable course of action is to increase upstream reservoir releases, the response may be to increase Folsom Reservoir releases first because the released water will reach the Delta before flows released from other CVP and SWP reservoirs. DWR's Lake Oroville water releases require about 3 days to reach the Delta, while water released from Reclamation's Shasta Reservoir requires 5 days to travel from Keswick Reservoir to the Delta. As water from another reservoir arrives in the Delta, Reclamation can adjust Folsom Reservoir releases downward. Alternatively, if sufficient time exists for water to reach the Delta, Reclamation may choose to make initial releases from Shasta Reservoir. Each occurrence is evaluated on an individual basis, and appropriate action is taken based on multiple factors. Again, the COA accounting captures imbalances in meeting each other's initial shared obligation.

The duration of balanced water conditions varies from year to year. Balanced conditions never occur in some very wet years, while very dry years may have long continuous periods of balanced conditions, and still other years may have had several periods of balanced conditions interspersed with excess water conditions. Account balances continue from one balanced water condition through the excess water condition and into the next balanced water condition. When either the SWP or CVP enters into flood control operations, the accounting is zeroed out for that project.

Reclamation and DWR staff meet daily to discuss and coordinate CVP and SWP system operations. Several items are discussed at this daily meeting, including:

- Current reservoir conditions
- Pumping status and current outages (for both the CVP and the SWP and how they are affecting combined operations)
- Upcoming planned outages (CVP and SWP) and what that means for future operations
- Current reservoir releases and what changes may be planned
- Current regulatory requirements and compliance status
- Delta conditions to determine if CVP and SWP pumping make use of all available water

Reclamation and DWR also coordinate with Hydrosystem Controllers and Area Offices to ensure that, if necessary, personnel are available to make the desired changes. Once Reclamation and DWR each decide on a plan for that day and complete all coordination, the respective agencies issue change orders to implement the decisions, if necessary.

Reclamation and DWR are co-located in the Joint Operations Center. In addition, the California Data Exchange Center, California-Nevada River Forecast Center, and the DWR Flood Management Group are also co-located in the Joint Operations Center. This enables efficient and timely communication, particularly during flood events.

2.2 EXISTING REGULATIONS

2.2.1 U.S. ARMY CORPS OF ENGINEERS PERMITS

In Public Notice 5820A (October 1981), USACE limited the volume of daily SWP diversions from the Delta into Clifton Court Forebay, stating that such diversions may not exceed 13,870 AF and 3-day average diversions into the CCF may not exceed 13,250 AF. In addition, the SWP can increase diversions into the CCF by one-third of the San Joaquin River flow at Vernalis from mid-December to mid-March when the river's flow at Vernalis exceeds 1,000 cfs (USACE 1981).

In August 2013, the USACE issued Permit SPK-1999-0715 and raised the daily diversion from 13,870 AF to 14,860 AF and the 3-day average diversion from 13,250 AF to 14,240 for calendar years 2013 through 2016 (USACE 2013). These increased diversions also required compliance with applicable terms and conditions in the existing BiOps and installation of the South Delta temporary barriers.

In 2017, USACE issued a revised Permit SPK-1999-0715 and raised the daily diversion from 13,870 AF to 14,860 AF and the 3-day average diversion from 13,250 AF to 14,240 AF. The conditions in this permit apply to SWP operations from 2017 through 2020 (USACE 2016). The permit also required compliance with applicable terms and conditions in the existing BiOps and installation of the South Delta temporary barriers.

2.2.2 State Water Resources Control Board Water Rights and D-1641

Reclamation and DWR operate the CVP and the SWP in accordance with obligations under D-1641, which provides protection for fish and wildlife, M&I water quality, agricultural water quality, and Suisun Marsh salinity. D-1641 granted Reclamation and DWR the ability to use or exchange either SWP or CVP diversion capacity capabilities to maximize the beneficial uses of the CVP and SWP. The SWRCB conditioned the use of Joint Point of Diversion capabilities based on staged implementation and conditional requirements for each stage of implementation.

2.2.3 Federal Endangered Species Act

The SWP and CVP are currently operated in accordance with the 2008 USFWS Biological Opinion and the 2009 NMFS Biological Opinion, issued pursuant to Section 7 of the ESA. Both BiOps included Reasonable and Prudent Alternatives (RPAs) designed to allow the SWP and CVP to continue operating without causing jeopardy to listed species or adverse modification to designated critical habitat provided the RPAs were implemented.

On August 2, 2016, Reclamation and DWR jointly requested the Reinitiation of Consultation on the Coordinated Long-Term Operation of the CVP and SWP. The USFWS accepted the reinitiation request on August 3, 2016, and NMFS accepted the reinitiation request on August 17, 2016. Reclamation completed a biological assessment to support consultation under ESA Section 7, which documents the potential impacts of the proposed action on federally listed endangered and threatened species that have the potential to occur in the study area and on critical habitat for these species. The biological assessment also fulfills consultation requirements for the Magnuson-Stevens Fishery Conservation and Management Act of 1976 for Essential Fish Habitat.

When the new USFWS and NMFS Biological Opinions are issued, they will include incidental take statements (ITS) for Delta Smelt, Winter-run Chinook Salmon, Spring-run Chinook Salmon, Green Sturgeon, and steelhead. DWR will comply with the ITS in accordance with federal law in addition to state requirements. As a result of the difference in species listed under the CESA and ESA and the coordinated operation of the SWP and CVP, California's Proposed Project includes operations for the protection of federally listed steelhead and Green Sturgeon. These operations and the ITSs result in reductions in SWP pumping in addition to the reductions that would be necessary to comply with state law.

2.2.4 California Endangered Species Act

In 2009, the California Department of Fish and Wildlife (CDFW) issued an ITP for the ongoing and long-term operation of the SWP's existing facilities in the Delta for the protection of LFS. CDFW also issued consistency determinations to DWR for the NMFS and USFWS BiOps for continued operation of the SWP and other actions related to water diversion, storage, and transport that are described in the BiOps. CDFW determined that the BiOps, including the RPA requirements and related ITS, were consistent with CESA because the mitigation measures meet the conditions in Section 2081 of the Fish and Wildlife Code for CDFW to authorize incidental take of CESA species.

The 2009 Incidental Take Permit from CDFW for Longfin Smelt expires on December 31, 2019. DWR is seeking a new ITP from CDFW pursuant to Section 2081 of the California Fish and Game Code. The new ITP will cover aquatic species listed under CESA that are subject to incidental take from long-term operation of the SWP (Delta Smelt, Longfin Smelt, Winter-run Chinook Salmon, and Spring-run Chinook Salmon).

DWR has prepared this DEIR to address the continued operation of the SWP as described in the project description. CDFW will rely on this DEIR when issuing a decision on DWR's ITP application.

2.3 DESCRIPTION OF THE PROPOSED PROJECT

The Proposed Project, which is the preferred alternative in this DEIR, consists of multiple elements that characterize future operations of SWP facilities, modify ongoing programs being implemented as part of SWP operations, improve specific activities that would enhance protection of special-status fish species, or support ongoing studies and research on these special-status species to improve the basis of knowledge and management of these species. Implementation of these elements is intended to continue operation of the SWP and deliver up to the full contracted water amounts while minimizing and fully mitigating the take of listed species consistent with CESA requirements.

For discussion purposes in this DEIR, these elements are divided into four categories and consist of the following: (1) proposed operation of the SWP that can be described in detail and assessed on a project-level basis; (2) proposed operation of the SWP that can only be described generally and assessed on a program-level basis; (3) proposed environmental protective measures that would offset, reduce, or otherwise mitigate potential environmental impacts on special-status species; and (4) adaptive management actions that include establishing a governance framework, a compliance and reporting program, specific drought- and dry-year actions, and independent review panels, and conducting Four-Year Reviews of management measures.

Table 2-3 identifies the actions and facilities associated with the long-term operation of the SWP that are included in the Proposed Project.

Table 2-3. Proposed Project Elements – Table 2-3 a – Table 2-3 d

Table 2-3 a. Proposed Project Elements – Proposed Project-Level SWP Operations and Facilities

Facility or Action	Proposed Project Actions	Action Goal or Objective
Existing Regulatory Requirements	Comply with D-1641 and USACE Permit 2100.	Continue to comply with existing limits and permit requirements to protect water quality for the beneficial uses of fish and wildlife, agriculture and urban uses.
Minimum Export Rate	The combined CVP and SWP export rates at Jones Pumping Plant and Banks Pumping Plant will not be required to drop below 1,500 cfs.	Establish minimum export rate to protect human health and safety.
Old and Middle River Requirements	Manage OMR reverse flows based on species distribution, modeling, and risk analysis, with provisions for capturing storm flows.	Implement real-time OMR management to minimize entrainment and aquatic species loss during water operations at Bank Pumping Plant.

Facility or Action	Proposed Project Actions	Action Goal or Objective
Barker Slough Pumping Plant (BSPP)	Continue operating BSPP to minimize effects on Delta Smelt and Longfin Smelt, and continue implementing sediment removal and aquatic weed management actions as part of normal operations at Barker Slough Pumping Plant.	Implement actions as components of facility maintenance for continued water supply deliveries.
South Delta Temporary Barriers	Continue operation of three South Delta Temporary Barriers according to existing terms and conditions.	Maintain ongoing annual installation of three South Delta Temporary Barriers with goal of maintaining surface water levels and circulation) in the South Delta.
Suisun Marsh Operations	Operate the Suisun Marsh Salinity Control Gates, Roaring River Distribution System, Morrow Island Distribution System, and Goodyear Slough Outfall in compliance with D-1641.	Operate the Suisun Marsh Salinity Control Gates to improve habitat conditions for the benefit of Delta Smelt.
Delta Smelt Summer-Fall Habitat Action	Operate the Suisun Marsh Salinity Control Gate for up to 60 days (not necessarily consecutive) in June through October of below-normal, above-normal, and wet years. Project operations would maintain a monthly average 2 ppt isohaline at 80 kilometers (km) from the Golden Gate Bridge in above-normal and wet water years in September and October. Food enhancement actions would be similar to the North Delta Food Subsidies and Colusa Basin Drain Project, and Suisun Marsh Food Subsidies (Roaring River distribution system reoperation).	Operate the Suisun Marsh Salinity Control Gate to improve Delta Smelt food supply and habitat.
North Delta Food Subsidies and Colusa Basin Drain Project	Facilitate downstream transport of phytoplankton and zooplankton to areas inhabited by Delta Smelt.	Implement actions to transport productivity downstream to where it can be utilized by Delta Smelt.

Table 2-3 b. Proposed Project Elements – Proposed Program-Level Changes to SWP Operations and Facilities

Facility or Action	Proposed Project Actions	Action Goal or Objective
Water Transfers	Water transfers would occur during an expanded water transfer window, between July through November, with volumes up to 600 TAF.	Increase SWP operational flexibility.

Table 2-3 c. Proposed Project Elements – Proposed Environmental Protective Measures

Facility or Action	Proposed Project Actions	Action Goal or Objective
Clifton Court Forebay	Continue implementing actions to reduce mortality of listed fish species at the Clifton Court Forebay; these measures would include (a) continued evaluation of predator relocation methods and (b) controlling aquatic weeds.	Increase species survival and control weeds to reduce impacts on the SWP's physical facilities (clogging screens) and predation reduction.
Skinner Fish Facility	Continue implementing studies to better understand and continuously improve the performance of the Skinner Fish Facility, including (a) changes to release site scheduling and rotation of release site locations to reduce post-salvage predation and (b) continued refinement and improvement of the fish sampling and hauling procedures and infrastructure to improve the accuracy and reliability of data and fish survival.	Continue ongoing salvage fish at the Skinner Fish Facility and implement actions to reduce post-salvage predation and improve the accuracy and reliability of data and fish survival.

Facility or Action	Proposed Project Actions	Action Goal or Objective
Longfin Smelt Science Program	DWR proposes to continue implementing studies to better understand LFS population distribution and abundance in San Francisco Bay and the Delta.	Study of environmental factors affecting LFS distribution and reproduction.
Studies to Support Establishment of a Delta Fish Hatchery	Conduct further studies to locate, design, construct, and operate a hatchery facility that would be capable of producing a substantial number of Delta Smelt and other Delta fish species for reintroduction to the Delta and recovery of the species populations.	Protect the species and provide resiliency.
Conduct Further Studies to Prepare for Delta Smelt Reintroduction from Stock Raised at the U.C. Davis Fish Conservation and Culture Laboratory (FCCL)	Continue to support facilities and research to establish a Delta Smelt conservation population that is as genetically close as possible to the wild population and to provide a safeguard against extinction.	Protect the species and provide resiliency.
Additional elements related to real-time operation of the SWP	DWR proposes a governance structure for real-time operation of the SWP that includes compliance and performance reporting, monitoring, convening of independent panels, drought and dry year actions, and Four-Year Reviews.	Advancements in science and minimization of effects of project operations.

Table 2-3 d. Proposed Project Elements – Adaptive Management Actions

Facility or Action	Proposed Project Actions	Action Goal or Objective
Adaptive Management Plan	The Adaptive Management Plan (AMP) will be carried out to evaluate the efficacy of the operations and activities stated below. An Adaptive Management Team (AMT) will be established to carry out this AMP. The AMT will oversee efforts to monitor and evaluate the operations and related activities. In addition, the AMT will use structured decision-making to assess the relative costs and benefits of those operations and activities. The AMT will also identify proposed adaptive management changes to those operations and activities. The AMP will be developed before issuance of, and could be incorporated into, the Incidental Take Permit DWR is seeking for CESA coverage for the Proposed Project.	The objectives of the AMP are (1) to continue the long-term operation of the SWP consistent with applicable laws, contractual obligations, and agreements and (2) to ensure that the long-term operation of the SWP is consistent with the CESA.

Notes:
AMP = Adaptive Management Plan
AMT = Adaptive Management Team
CESA = California Endangered Species Act
cfs = cubic feet per second
D-1641 = State Water Resources Control Board's Water Rights Decision 1641
DWR = California Department of Water Resources
FCCL = Fish Conservation and Culture Laboratory
km = kilometers
LFS = Longfin Smelt
OMR = Old and Middle River
ppt = parts per thousand
Skinner Fish Facility = John E. Skinner Delta Fish Protective Facility
SWP = State Water Project
TAF = thousand acre-feet
USACE = U.S. Army Corps of Engineers

DWR is requesting an ITP for the exercise of discretion in operational decision-making, including how to comply with the terms of its existing water supply and settlement contracts (which include maximum deliveries under the terms of these contracts), and other legal obligations. DWR is not requesting an ITP from CDFW for the following actions:

- Flood control
- Oroville Dam and Feather River operations
- Prior execution of existing SWP contracts
- Coordinated Operation Agreement
- Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project
- Suisun Marsh Habitat Management Preservation and Restoration
- Suisun Marsh Preservation Agreement
- CVP facilities, operations and agreements

These facilities and operations activities are already covered under existing permits or addressed by other legal authorities. The actions included as elements of the Proposed Project are described in the following discussion.

2.3.1 OMR MANAGEMENT

DWR, in coordination with Reclamation, proposes to operate the SWP in a manner that maximizes exports while minimizing direct and indirect impacts on state and federally listed fish species. Old and Middle river (OMR) flow is a surrogate indicator of the influence of export pumping at the Banks Pumping Plant on hydrodynamics in the South Delta. The management of OMR flow, in combination with other environmental variables, can minimize or avoid entrainment of fish in the South Delta and at the SWP salvage facilities. DWR proposes to manage OMR flow by incorporating all available information into decision support for the management of OMR flow. The available information includes real-time monitoring of fish distribution, turbidity, temperature, hydrodynamic models, and entrainment models. The objective of the OMR management will be to provide focused protection for fish when necessary and to provide flexibility where possible. DWR, in coordination with existing multi-agency Delta focused technical teams, will use estimates of species distribution and other environmental variables based on ongoing monitoring.

From the onset of OMR management to the end, DWR, in coordination with Reclamation, will operate to an OMR flow index that is no more negative than a 14-day moving average of -5,000 cfs unless a storm event occurs (described below). Grimaldo et al. (2017) indicated that -5,000 cfs OMR flow is an inflection point for fish entrainment. OMR flow could be more positive than -5,000 cfs if additional real-time OMR restrictions are triggered (described below) or constraints other than OMR flow control exports. The OMR flow index would be computed using an equation presented in Hutton (2008). An OMR flow index allows for shorter-term operational planning and real-time adjustments. DWR, in coordination with Reclamation, will make a change to exports within 3 days of the trigger when monitoring, modeling, and the operational criteria indicate protection for fish is necessary. The 3-day

period is consistent with the 2008 and 2009 Biological Opinions and allows for efficient power scheduling.

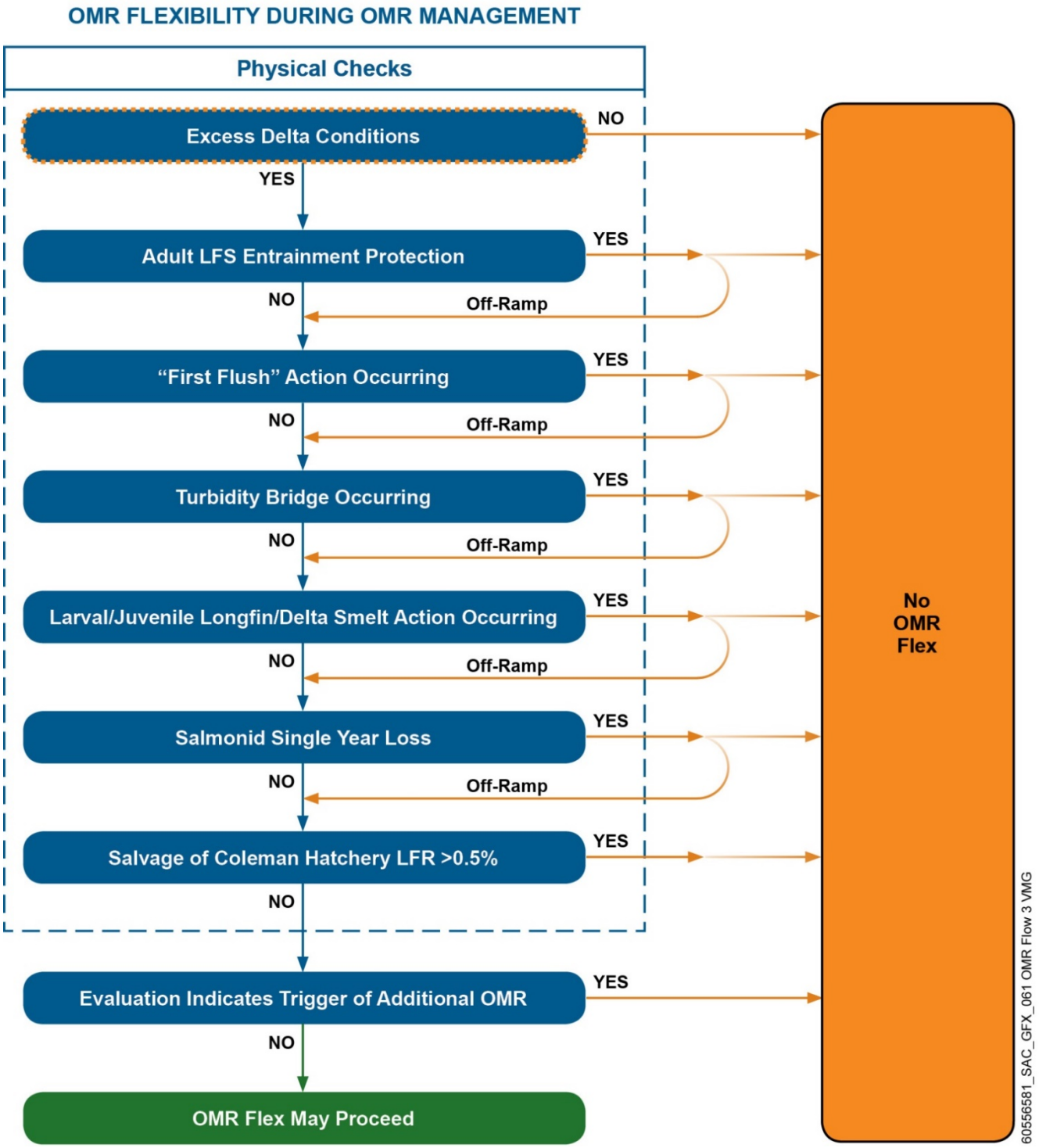


Figure 2-4. OMR Flexibility During OMR Management

2.3.1.1 Onset of OMR Management

DWR, in coordination with Reclamation, would start OMR management when one or more of the following conditions have occurred, as shown in Figure 2-4.

- Integrated Early Winter Pulse Protection (First Flush Turbidity Event): To minimize project influence on migration (or dispersal) of Delta Smelt, DWR and Reclamation would reduce exports for 14 consecutive days so that the 14-day averaged OMR index for the period would not be more negative than −2,000 cfs, in response to "First Flush" conditions in the Delta. The population-scale migration of Delta Smelt is believed to occur quickly in response to inflowing freshwater and turbidity (Grimaldo et al. 2009; Sommer et al. 2011). Thereafter, best available scientific information suggests that fish make local movements, but there is no evidence for further population-scale migration (Polansky et al. 2018). The "First Flush" action may be triggered between December 1 and January 31. The triggers include a running 3-day average of the daily flows at Freeport that is greater than 25,000 cfs and a running 3-day average of the daily turbidity at Freeport that is 50 Nephelometric Turbidity Unit (NTU) or greater; or real-time monitoring indicates a high risk of migration and dispersal into areas at high risk of future entrainment.
    - This "First Flush" action may only be initiated once during the December through January period.
- Salmonids Presence: After January 1, if more than 5% of any one or more salmonid species (wild young-of-the-year (YOY) Winter-run, wild YOY Spring-run, or wild California Central Valley Steelhead) are estimated to be present in the Delta as determined by their appropriate monitoring working group based on available real-time data, historical information, and modeling (e.g., SAC PAS).
- Longfin Smelt protection: After December 1, trigger adult LFS entrainment protection, if:
    - the cumulative salvage index (defined as the total estimated LFS salvage at the CVP and SWP in the December through February period divided by the immediately previous Fall Midwater Trawl (FMWT) LFS annual abundance[1] exceeds five,[2] or
    - real-time monitoring indicates a risk of movement into areas that may be subject to high entrainment.
- Adult LFS Entrainment Protection: From December 1 through February 28, DWR, in coordination with Reclamation will ensure that the OMR flow 14-day running average is no more negative than -5,000 cfs, unless:

[1] The Fall Midwater Trawl (FMWT) Survey annual abundance index for Longfin Smelt is calculated as the sum of September through December monthly abundance indices and is typically reported at about the same date as adult salvage begins in December. Early December salvage can be compared to September through November abundance as an approximation of the salvage index.

[2] Cumulative salvage index criteria may be modified as part of the adaptive management program in coordination with CDFW.

1. During any time OMR flow restrictions for Delta Smelt are being implemented, this measure will not result in additional OMR flow requirements for protection of adult LFS, or

2. When LFS spawning has been detected in the system, adult LFS migration and spawning action will terminate and Larval LFS Entrainment Protection will be implemented, or

3. Adult LFS migration and spawning action, including the OMR flow requirement, is not required or would cease if previously required when river flows are (a) greater than 55,000 cfs in the Sacramento River at Rio Vista or (b) greater than 8,000 cfs in the San Joaquin River at Vernalis, or

4. If subsequent to the high flows identified in number 3 above, flows go below 40,000 cfs in the Sacramento River at Rio Vista or below 5,000 cfs in the San Joaquin River at Vernalis, the OMR flow in the adult LFS migration and spawning action may resume if triggered previously and not precluded by another adult LFS migration and spawning action off ramp. In the implementation of this resumption, in addition to river flows, DWR personnel will review survey data and other pertinent biological factors that influence the entrainment risk of adult LFS. If the technical analysis supports relaxation or ceasing of this OMR flow requirement, DWR will share its technical analysis and supporting documentation with CDFW, seek their technical assistance, and discuss the risk assessment and future operations. If CDFW does not agree with DWR's technical analysis, the Director of CDFW will immediately notify the Director of DWR in writing of the disagreement. The Directors will then confer and attempt to reach a resolution within 3 days. If within 3 days (1) the Directors do not reach a resolution, and (2) CDFW provides an explanation and supporting documentation on how relaxing or ceasing of this OMR flow requirement would result in take that would not be minimized or fully mitigated, then DWR will not relax or cease OMR flow requirements. DWR will ensure that its proportional share of the OMR flow requirements described herein is satisfied. If either or both the conditions stated above are not met, DWR will continue with the operational change.

2.3.1.2 Real-Time OMR Limits and Performance Objectives

DWR, in coordination with Reclamation, would operate to an OMR flow requirement that is more positive than a -5,000 cfs OMR flow based on conditions that would protect the following fish species and groups of species from entrainment:

- Longfin Smelt
- Delta Smelt
- Salmonids

The conditions for each of these species and species groups (salmonids) are described below.

Longfin Smelt Entrainment Protections

Additional Real-time Consideration for Adult Longfin Smelt

From December 1 through February 28, DWR personnel will review survey data, salvage data and other pertinent biological factors that influence the entrainment risk of adult LFS. DWR will share its technical analysis and supporting documentation with CDFW on an as-needed basis and seek their technical assistance. If the technical analysis supports a more restrictive OMR flow requirement than -5,000 cfs, DWR will discuss the risk assessment and future operations with Water Operations Management Team (WOMT) at its next meeting. If CDFW does not agree with DWR's technical analysis, the Director of CDFW will immediately notify the Director of DWR in writing of the disagreement. The Directors will then confer and attempt to reach a resolution within 3 days. If within 3 days (1) the Directors do not reach a resolution, and (2) CDFW provides an explanation and supporting documentation on how the change in the OMR flow requirement would result in take that would not be minimized or fully mitigated, then DWR will not change the OMR flow requirement. DWR will ensure that its proportional share of the OMR flow requirement described herein is satisfied. If either or both the conditions stated above are not met, then DWR will continue with the operational change.

Larval and Juvenile Longfin Smelt

From January 1 through June 30, when a single Smelt Larva Survey (SLS) or 20 mm Survey (20 mm) sampling period results in one of the following triggers, DWR in coordination with Reclamation will ensure the OMR flow 14-day running average is no more negative than -5,000 cfs:

- LFS larvae or juveniles found in 8 or more of the 12 SLS or 20 mm stations in the Central Delta and South Delta (Stations 809, 812, 815, 901, 902, 906, 910, 912, 914, 915, 918, 919), or
- LFS catch per tow exceeds 15 LFS larvae or juveniles in four or more of the 12 stations in the Central Delta and South Delta (Stations 809, 812, 815, 901, 902, 906, 910, 912, 914, 915, 918, 919).

If QWEST is negative, and larval or monitoring detects juvenile LFS within the corridors of the Old and Middle rivers, DWR will assess potential entrainment impacts of fish in the corridors of the Old and Middle rivers relative to their estuarine-wide distribution from monitoring data (e.g., SLS and Enhanced Delta Smelt Monitoring Program [EDSM] for larvae; 20 mm Survey and EDSM for juveniles) using Particle Tracking Model (PTM) runs weighted by the distribution in the surveys. In addition to PTM outputs, DWR will use real-time hydrological conditions, salvage data, forecast models (e.g., statistical-based models of historical data), other potential hydrodynamic models, and water quality to assess entrainment risk and to determine appropriate OMR flow targets to minimize entrainment or entrainment risk, or both. In coordination with CDFW, DWR will determine the best available models, the model inputs, and the assessment methods for determining larval and juvenile Longfin Smelt entrainment risk.

DWR will determine if an OMR flow protection target is warranted and determine the timing (e.g., days or week) and magnitude of the action. Implemented OMR flow management actions will continue until it is determined the risk is abated based on changes in real-time conditions or until the off-ramp has

been met as described in the "End of OMR Management" section below. DWR will share its technical analysis and supporting documentation for the modified OMR requirement or determination of the abatement of risk with CDFW on an as-needed basis and seek their technical assistance. If CDFW does not agree with DWR's technical analysis, the Director of CDFW will immediately notify the Director of DWR in writing of the disagreement. The Directors will then confer and attempt to reach a resolution within 3 days. If within 3 days (1) the Directors do not reach a resolution and (2) CDFW provides an explanation and supporting documentation on how the change in the OMR flow requirement or determination of the abatement of risk would result in take that would not be minimized or fully mitigated, then DWR will not change the OMR flow requirement. DWR will ensure that its proportional share of the OMR flow requirement described herein is satisfied. If either or both of the conditions stated above are not met, DWR will continue with the operational change.

Off-Ramps for Larval and Juvenile LFS Entrainment Protection

DWR will continue to manage OMR flows for the protection of Longfin Smelt until the offramp criteria have been met as described in the "End of OMR Management" section below or until one of the following offramp criteria are met.

1. During periods when OMR flow restrictions for larval and juvenile Delta Smelt are being implemented, this measure shall not result in additional OMR flow requirements for protection of larval and juvenile LFS, or
2. When river flows meet one of the following requirements, larval and juvenile LFS protections would not trigger, or would be relaxed if triggered previously:
    - Greater than 55,000 cfs in the Sacramento River at Rio Vista
    - Greater than 8,000 cfs in the San Joaquin River at Vernalis
3. If subsequent to the high flows identified in (2), flows drop below 40,000 cfs in the Sacramento River at Rio Vista or below 5,000 cfs in the San Joaquin River at Vernalis, larval and juvenile LFS protection will resume if triggered previously. In implementing this resumption, in addition to river flows, the DWR personnel will review all abundance and distribution survey data and other pertinent biological factors that influence the entrainment risk of larval and juvenile LFS. If the technical analysis supports relaxation or cessation of this OMR flow requirement, DWR will share its technical analysis and supporting documentation with CDFW, seek their technical assistance, and discuss the risk assessment and future operations.

As Longfin Smelt are not a federally listed species and because DWR has limited control over OMR flows, DWR can take actions to make OMR flows more positive, but there are circumstances when the actual OMR flow may not respond to DWR's actions, particularly if the CVP is operating differently. DWR will make efforts to coordinate with Reclamation, but Reclamation is not legally required to comply with the Longfin Smelt operations. DWR will ensure that its proportional share of the OMR flow requirements described for Longfin Smelt are satisfied.

Delta Smelt Entrainment Protections

Turbidity Bridge Avoidance (South Delta Turbidity)

After the Integrated Early Winter Pulse Protection (above) or February 1 (whichever comes first), until when a spent female is detected or April 1 (whichever is first), DWR, in coordination with Reclamation, would manage exports in order to maintain daily average turbidity in Old River at Bacon Island (OBI) at a level of less than 12 NTU. The purpose of this action is to minimize the risk to adult Delta Smelt in the corridors of the Old and Middle rivers, where they are subject to high entrainment risk. This action seeks to avoid the formation of a turbidity bridge from the San Joaquin River shipping channel to the South Delta fish facilities, which historically has been associated with elevated salvage of pre-spawning adult Delta Smelt. If the daily average turbidity at Bacon Island could not be maintained at less than 12 NTU, DWR, in coordination with Reclamation, would manage exports to achieve an OMR flow that is no more negative than -2,000 cfs until the daily average turbidity at Bacon Island drops below 12 NTU. However, if 5 consecutive days of OMR flow that is less negative than -2,000 cfs does not reduce daily average turbidity at Bacon Island below 12 NTU in a given month, DWR, in coordination with Reclamation, may determine that OMR restrictions to manage turbidity are infeasible and will instead implement an OMR flow target that is deemed protective based on turbidity and adult Delta Smelt distribution and salvage, but will not implement a more negative OMR than -5,000 cfs.

DWR and Reclamation recognize that readings at individual sensors or localized groups of sensors can generate spurious results in real time. Such changes could be incorrectly interpreted as a full turbidity bridge, when in fact the cause a result of local conditions or sensor error. To avoid excessive OMR restrictions during a sensor error or a localized turbidity spike, DWR, in coordination with Reclamation, will consider and review data from other locations and sources. Additional information that will be reviewed include regional visualizations of turbidity, alternative sensors, and boat-based turbidity mapping, particularly if there was evidence of a local sensor error.

DWR will share its technical analysis and supporting documentation with CDFW on an as-needed basis and seek CDFW's technical assistance if it determines the OMR requirement could be off-ramped after 5 days of implementation of the Turbidity Bridge Avoidance action or if it determines that this action is not warranted. If CDFW does not agree with DWR's technical analysis, the Director of CDFW will immediately notify the Director of DWR in writing of the disagreement. The Directors will then confer and attempt to reach a resolution within 3 days. If within 3 days (1) the Directors do not reach a resolution and (2) CDFW provides an explanation and supporting documentation on how off-ramping the Turbidity Bridge Avoidance action or not implementing this action would result in take that would not be minimized or fully mitigated, then DWR will implement (or continue to implement) this action. DWR will ensure that its proportional share of the OMR flow requirement described herein is satisfied. If either or both the conditions stated above are not met, DWR will continue with the operational change.

Larval and Juvenile Delta Smelt Protection

DWR, in coordination with Reclamation, will use results produced by life cycle models approved by CDFW and USFWS to manage the annual entrainment levels of larval and juvenile Delta Smelt. The

USFWS models will be publicly vetted and peer reviewed prior to March 15, 2020. CDFW and USFWS will coordinate with the Delta Fish Monitoring Working Group to identify a Delta Smelt recruitment level that Reclamation and DWR can use in OMR flow management. The life cycle models statistically link environmental conditions to recruitment, including factors related to loss as a result of entrainment such as OMR flows. In this context, recruitment is defined as the estimated number of post-larval Delta Smelt in June per number of spawning adults in the prior February-March period.

DWR, in coordination with Reclamation, CDFW and USFWS will operationalize the life cycle model results through the use of real-time monitoring for the spatial distribution of Delta Smelt. On or after March 15 of each year, if QWEST is negative and larval or juvenile Delta Smelt are detected within the corridors of the Old and Middle rivers based on real-time sampling of spawning adults or YOY life stages, Reclamation or DWR, or both, will run hydrodynamic models and forecasts of entrainment, informed by the EDSM or other relevant survey data to estimate the percentage of larval and juvenile Delta Smelt that could be entrained. If necessary, DWR and Reclamation will manage exports to limit entrainment to be protective based on the modeled recruitment levels. DWR, in coordination with Reclamation, will re-run hydrodynamic models when operational changes or new sampling data indicate a potential change in entrainment risk. This process will continue until the off-ramp criteria have been met as described in the "End of OMR Management" section below. In the event the life cycle models cannot be operationalized in a manner that can be used to inform real-time operations then Reclamation, DWR, CDFW, and USFWS will coordinate to develop an alternative plan to provide operational actions protective of this life stage.

If CDFW does not agree with the operational actions determined above, the Director of CDFW will immediately notify the Director of DWR in writing of the disagreement. The Directors will then confer and attempt to reach a resolution within 3 days. If within 3 days (1) the Directors do not reach a resolution and (2) CDFW provides an explanation and supporting documentation on how the operational actions determined above would result in take that would not be minimized or fully mitigated, DWR will then implement the operational action agreeable to CDFW. DWR will ensure that its proportional share of the OMR flow requirement described herein is satisfied. If either or both the conditions stated above are not met, then DWR will continue with the operational actions determined above.

Salmonid Entrainment Loss Protections

Cumulative Loss Thresholds

DWR, in coordination with Reclamation, would target exceedance of cumulative loss thresholds over the duration of the 2019 BiOps for natural Winter-run Chinook Salmon, hatchery Winter-run Chinook Salmon, natural Central Valley Steelhead from December through March, and natural Central Valley Steelhead from April 1 through June 15.

DWR, in coordination with Reclamation, proposes to avoid exceeding cumulative loss thresholds by 2030 as follows:

- Natural Winter-run Chinook Salmon (cumulative loss = 8,738)

- Hatchery Winter-run Chinook Salmon (cumulative loss = 5,356)
- Natural Central Valley Steelhead from December through March (cumulative loss = 6,038)
- Natural Central Valley Steelhead from April 1 through June 15 (cumulative loss = 5,826).

Natural Central Valley Steelhead would be separated into two time periods to protect San Joaquin-origin fish that historically appear in the Mossdale trawls later than Sacramento-origin fish. The loss threshold and loss tracking for hatchery Winter-run Chinook Salmon do not include releases into Battle Creek. Loss (for development of thresholds and ongoing tracking) for Chinook Salmon is based on length-at-date criteria.

The cumulative loss thresholds would be based on the cumulative historical loss from 2010 through 2018. DWR and Reclamation's performance objectives are intended to avoid loss such that the cumulative loss threshold (measured as the 2010-2018 average cumulative loss multiplied by 10 years) will not be exceeded by 2030.

If at any time prior to 2024, DWR, in coordination with Reclamation, were to exceed 50% of the cumulative loss threshold, DWR, in coordination with Reclamation, would convene an independent panel to review the actions contributing to this loss trajectory and make recommendations on modifications or additional actions to stay within the cumulative loss threshold, if any.

In the year 2024, DWR, in coordination with Reclamation, would convene an independent panel to review the first 5 years of actions and determine whether continuing these actions is likely to reliably maintain the trajectory associated with this performance objective for the duration of the period.

If during real-time operations, DWR, in coordination with Reclamation, were to exceed the cumulative loss threshold, DWR, in coordination with Reclamation, would immediately seek technical assistance from CDFW and NMFS, as appropriate, on the coordinated operation of the SWP and CVP, respectively for the remainder of the OMR management period. In addition, prior to the next OMR management season, DWR, in coordination with Reclamation would convene an independent review panel to review the actions contributing to this loss trajectory and make recommendations for modifications or additional actions to stay within the permitted take.

Single-Year Loss Thresholds

In each year, DWR, in coordination with Reclamation, would avoid exceeding an annual loss threshold equal to 90% of the greatest salvage loss that occurred in the historical record from 2010 through 2018 for each of the following:

- Natural Winter-run Chinook Salmon (loss = 1.17% of juvenile production estimate [JPE])
- Hatchery Winter-run Chinook Salmon (loss = 0.12% of JPE)
- Natural Central Valley Steelhead from December through March (loss =1,414)
- Natural Central Valley Steelhead from April through June 15 (loss = 1,552)

Natural Central Valley Steelhead would be separated into two time periods to protect San Joaquin-origin fish that historically appear in the Mossdale trawls later than Sacramento-origin fish.

The loss threshold and loss tracking for hatchery Winter-run Chinook Salmon does not include releases into Battle Creek. Loss (for development of thresholds and ongoing tracking) for Chinook Salmon are based on length-at-date criteria.

During the year, if SWP and CVP operations were to exceed the average annual loss threshold, DWR in coordination with Reclamation would review recent fish distribution information and operations with the fisheries agencies at the WOMT and seek technical assistance on future planned operations. DWR, Reclamation, USFWS, NMFS, and CDFW could elevate an issue from WOMT to a Directors' discussion, as appropriate.

During the year, if SWP and CVP operations exceed 50% of the annual loss threshold, DWR, in coordination with Reclamation, would restrict OMR flow to a 14-day moving average OMR flow index that is no more negative than −3,500 cfs, unless DWR, in coordination with Reclamation, determines that further OMR flow restrictions are not required to benefit fish movement because a risk assessment shows that the risk is no longer present based on real-time information.

The -3,500 OMR flow operational criteria adjusted and informed by this risk assessment will remain in effect for the rest of the season. DWR and Reclamation would seek CDFW and NMFS technical assistance on the risk assessment and real-time operations.

During the year, if Reclamation and DWR exceed 75% of the annual loss threshold, Reclamation and DWR will restrict OMR flow to a 14-day moving average OMR flow index that is no more negative than -2,500 cfs unless DWR and Reclamation determine that further OMR flow restrictions are not required to benefit fish movement because a risk assessment shows that the risk is no longer present based on real-time information.

The -2,500 OMR flow operational criteria adjusted and informed by this risk assessment will remain in effect for the rest of the season. DWR and Reclamation will seek CDFW and NMFS technical assistance on the risk assessment and real-time operations.

Regarding the risk assessments (identified above), DWR and Reclamation will evaluate and adjust OMR flow restrictions under this section by preparing a risk assessment that considers several factors, including, but not limited to, real-time monitoring, historical trends of salmonids exiting the Delta and entering the South Delta, fish detected in salvage, and relevant environmental conditions. Risks will be measured against the potential to exceed the next single year loss threshold. DWR and Reclamation will share its risk assessment and supporting documentation with CDFW, USFWS and NMFS, seek their technical assistance, discuss the risk assessment and future operations with WOMT at its next meeting and elevate issues to the Directors as appropriate.

DWR will share its risk assessment and supporting documentation with CDFW on an as-needed basis and seek their technical assistance if it determines the OMR requirement could be off-ramped. If CDFW does not agree with DWR's technical analysis, the Director of CDFW will immediately notify the Director of DWR in writing of the disagreement. The Directors will then confer and attempt to reach a resolution within 3 days. If within 3 days (1) the Directors do not reach a resolution and (2) CDFW provides an explanation and supporting documentation on how off-ramping the OMR flow requirement would result in take that would not be minimized or fully mitigated, then DWR will not

off-ramp the OMR flow requirement. DWR will ensure that its proportional share of the OMR flow requirement described herein is satisfied. If either or both the conditions stated above are not met, DWR will continue with the operational change.

If during real-time operations, Reclamation and DWR were to exceed the single-year loss threshold, Reclamation and DWR would immediately seek technical assistance from CDFW, USFWS, and NMFS, as appropriate, on the coordinated operation of the CVP and SWP for the remainder of the OMR management period. In addition, Reclamation and DWR would, prior to the next OMR management season, convene an independent panel to review the OMR Management Action. The purpose of the independent review would be to review the actions contributing to this loss trajectory and make recommendations on modifications or additional actions to stay within the annual loss threshold, if any.

DWR, in coordination with Reclamation, would continue monitoring and reporting salvage at the Jones and Tracy fish facilities. DWR and Reclamation would continue the release and monitoring of yearling Coleman National Fish Hatchery (NFH) Late Fall-run and yearling Spring-run Chinook Salmon surrogates.

OMR Flexibility During Delta Excess Flow Conditions

DWR, in coordination with Reclamation, may operate to a more negative OMR flow up to a maximum (otherwise permitted) export rate (which could result in a range of OMR flow values) at the Banks and Jones pumping plants to capture excess flows in the Delta. Excess flows occur typically from storm-related events and are defined as flows in excess of that required to meet water quality control plan flow and salinity requirements and other applicable regulations. DWR, in coordination with Reclamation, would continue to monitor fish in real time and will operate in accordance with the "Additional Real-time OMR Restrictions," previously described.

Figure 2-4 shows the physical checks that would preclude implementation of an OMR flexibility action. As shown, if any other OMR flow limit is active, an OMR flexibility action would be precluded.

Unless the following species protections occur, DWR has the discretion to capture excess flows if:

1. Integrated Early Winter Pulse Protection or additional real-time OMR restrictions are triggered and the required OMR is more positive or less negative than -5,000 cfs. Under such conditions, DWR and Reclamation have already determined that more restrictive OMR is required.
2. An evaluation of environmental and biological conditions by DWR, in coordination with Reclamation, indicates a more negative OMR flow would likely trigger an additional real-time OMR flow restriction.
3. Salvage of yearling Coleman National Fish Hatchery Late Fall-run (as yearling Spring-run Chinook Salmon surrogates) exceeds 0.5% within any of the release groups.
4. DWR, in coordination with Reclamation, identifies changes in spawning, rearing, foraging, sheltering, or migration behavior beyond those anticipated to occur under OMR management.

DWR, in coordination with Reclamation, would continue to monitor conditions and could resume management of OMR flow to levels no more negative than −5,000 cfs if conditions indicate the defined off-ramps are necessary to avoid additional adverse impacts. If OMR flow flexibility causes the conditions in Real-Time OMR Limits and Performance Measures, DWR, in coordination with Reclamation, would implement additional real-time OMR flow restrictions.

DWR will share its technical analysis and supporting documentation with CDFW on an as-needed basis and seek their technical assistance if it determines the OMR flow flexibility is warranted. If CDFW does not agree with DWR's technical analysis, the Director of CDFW will immediately notify the Director of DWR in writing of the disagreement. The Directors will then confer and attempt to reach a resolution within 3 days. If within 3 days (1) the Directors do not reach a resolution and (2) CDFW provides an explanation and supporting documentation on how OMR flow flexibility would result in take that would not be minimized or fully mitigated, then DWR will not implement OMR flexibility. DWR will ensure that its proportional share of the OMR flow requirement described herein is satisfied. If either or both the conditions stated above are not met, DWR will continue with the operational change.

End of OMR Management

OMR flow criteria may control operations until June 30 or when the following species-specific off-ramps have occurred, whichever is earlier.

- Longfin Smelt and Delta Smelt: When the daily mean water temperature at the CCF reaches 77 degrees Fahrenheit (°F) (25 degrees Celsius [°C]) for 3 consecutive days.
- Salmonids: When more than 95% of Winter-run Chinook Salmon and Spring-run Chinook Salmon have migrated past Chipps Island, as determined by DWR and Reclamation's monitoring working group, or after daily average water temperatures at Mossdale exceed 72°F (22.2 °C) for 7 days during June (the 7 days do not have to be consecutive).

Real-Time Decision-Making and Loss Thresholds

When real-time monitoring demonstrates that criteria in "Additional Real-Time OMR Restrictions and Performance Objectives" are not supported, then Reclamation and DWR may confer with the Directors of NMFS, USFWS, and CDFW if they desire to operate to a more negative OMR flow than what is specified in "Additional Real-Time OMR Limits and Performance Objectives." Upon mutual agreement, the Directors of NMFS and USFWS may authorize DWR and Reclamation to operate to a more negative OMR flow than the "Additional Real-Time OMR Restrictions," but no more negative than -5,000 cfs. The Director of CDFW may authorize DWR to operate to a more negative OMR flow than the "Additional Real-Time OMR Restrictions," but no more negative than -5,000 cfs. This process would be separate from the risk analysis process described above.

If CDFW does not agree, the Director of CDFW will immediately notify the Director of DWR in writing of the disagreement. The Directors will then confer and attempt to reach a resolution within 3 days. If within 3 days (1) the Directors do not reach a resolution and (2) CDFW provides an explanation and supporting documentation on how the action would result in take that would not be minimized or fully mitigated, then DWR will not implement this action. DWR will ensure that its proportional share of the

OMR flow requirement described herein is satisfied. If either or both the conditions stated above are not met, DWR will continue with the operational change.

2.3.2 MINIMUM EXPORT RATE

Water rights, contracts, and agreements specific to the Delta include D-1641, COA and other related agreements pertaining to CVP and SWP operations and Delta watershed users. In order to meet health and safety needs, critical refuge supplies, and obligations to senior water rights holders, the combined CVP and SWP export rates at the Jones Pumping Plant and the Banks Pumping Plant will not be required to drop below 1,500 cfs. Reclamation and DWR propose to use the Sacramento River, San Joaquin River, and Delta channels to transport water to export pumping plants located in the South Delta.

2.3.3 DELTA SMELT SUMMER-FALL HABITAT ACTION

The Delta Smelt Summer-Fall Habitat Action is intended to improve Delta Smelt food supply and habitat, thereby contributing to the recruitment, growth, and survival of Delta Smelt. The current conceptual model states that Delta Smelt habitat should include low salinity conditions of 0 to 6 parts per thousand (ppt), turbidity of approximately 12 NTU, temperatures below 25^{o}C, food availability, and littoral or open water physical habitats (FLaSH Synthesis, pp. 15-25). The Delta Smelt Summer-Fall Habitat Action is being undertaken recognizing that the highest-quality habitat in this large geographical region includes areas with complex bathymetry, in deep channels close to shoals and shallows, and in proximity to extensive tidal or freshwater marshlands and other wetlands. The Delta Smelt Summer-Fall Habitat Action is to provide the aforementioned habitat components in the same geographic area through a range of actions to improve water quality and food supplies.

DWR and Reclamation propose to use structured decision-making to implement Delta Smelt habitat actions. In the summer and fall (June through October) of below-normal, above-normal and wet years, based on the Sacramento Valley Index, the environmental and biological goals are, to the extent practicable, the following:

- Maintain low-salinity habitat in Suisun Marsh and Grizzly Bay when water temperatures are suitable;
- Manage the low salinity zone to overlap with turbid water and available food supplies.
- Establish contiguous low-salinity habitat from Cache Slough Complex to Suisun Marsh.

The action will initially include modifying project operations to maintain a monthly average 2 ppt isohaline at 80 km (X2) from the Golden Gate in above-normal and wet water years in September and October. DWR and Reclamation will also implement additional measures that are expected to achieve additional benefits. These measures include, but are not limited to:

- SMSCG operations for up to 60 days (not necessarily consecutive) in June through October of below-normal and above-normal years. This action may also be implemented in wet years, if preliminary analysis shows expected benefits.

- Food enhancement action (for example, those included in the Delta Smelt Resiliency Plan to enhance food supply). These projects include the North Delta Food Subsidies and Colusa Basin Drain project, and Suisun Marsh Food Subsidies (Roaring River distribution system reoperation). DWR and Reclamation will monitor dissolved oxygen at Roaring River distribution system drain location(s) during Delta Smelt food distribution actions.

These considerations (listed above) and implementation of other actions will be more fully defined and developed through the structured decision-making or other review process. The review will include selection of appropriate models, sampling programs, and other information to be used. The process will be completed prior to implementation and may be improved in subsequent years as additional information is synthesized and reviewed, as described below.

Reclamation and DWR will develop a Delta Smelt Summer-Fall Habitat Action Plan to meet the environmental and biological goals in years when summer-fall habitat actions are triggered. In above-normal and wet years, operating to a monthly average X2 of 80 km in September and October is the initial operation. In every action year, Reclamation and DWR will propose, based on discussions with the USFWS and CDFW, a suite of actions that would meet the action's environmental and biological goals. This action would be coordinated with Reclamation and categorized as an in-basin use for COA purposes. In the event that Reclamation does not meet its share of the Delta outflow to meet 80 km X2, DWR will implement its share of this action.

2.3.3.1 Food Enhancement Summer-Fall Actions

North Delta Food Subsidies and Colusa Basin Drain Project: DWR proposes to implement actions to improve flow conditions in the North Delta in summer and fall, thereby facilitating downstream transport of phytoplankton and zooplankton. While the Cache Slough Complex and the lower Yolo Bypass are known to have relatively high levels of food resources, local water diversions create net negative flows during summer and fall that may inhibit downstream food transport. By enhancing summer and fall flows through the Yolo Bypass, downstream transport of food could be improved.

DWR and partners would test two different ways to improve flow conditions in the North Delta. For the first approach, water would be provided by Sacramento River water districts, such as Reclamation District 108 and Glenn Colusa Irrigation District. The water districts would use their facilities to move freshwater into Colusa Drain. By adjusting the operations of Knights Landing Outfall Gates and Wallace Weir, much of this water would be routed into the Yolo Bypass.

The second approach would use agricultural drain water in fall, which is available in fall when valley rice fields discharge irrigation water at the end of the growing season. Agricultural drain water would be routed into the Yolo Bypass via Knights Landing Ridge Cut.

DWR proposes flow pulses would include summer actions using fresh Sacramento River water and fall actions using agricultural drain water from Colusa Drain. Initial results suggest that a target pulse of 27 TAF over a 4-week period would improve downstream transport of phytoplankton. This flow volume is not sufficient to inundate floodplain in Yolo Bypass, nor would it constitute a consumptive use of water

because the water used for this action would be allowed to move through the North Delta and contribute to Delta outflow.

This food subsidy action is an adaptive management action that relies on monitoring and evaluation in order to optimize its efficacy. Similarly, the action depends on partnerships with local water users including Reclamation District 108, Glenn Colusa Irrigation District, Conaway Ranch, and Swanston Ranch. All actions should be developed in consultation with the needs of local water users and landowners. Food enhancement action design and implementation would be determined through the Summer-Fall Adaptive Management process.

Roaring River Distribution System Reoperations: Infrastructure in the Roaring River Distribution System may help drain food-rich water from the canal into Grizzly Bay to augment Delta Smelt food supplies in that area.

2.3.3.2 Delta Smelt Summer-Fall Habitat Action Adaptive Management Planning

Conceptual Model

The Delta Smelt Summer-Fall Habitat Action is intended to improve Delta Smelt food supply and habitat, thereby contributing to improved Delta Smelt habitat conditions. The current conceptual model is that Delta Smelt habitat should include low salinity conditions of 0 to 6 ppt, turbidity of approximately 12 NTU, temperatures below 25°C (77 °F), food availability, and littoral or open water physical habitats (FLaSH Synthesis, pp. 15-25). The Delta Smelt Summer-Fall Habitat Action is being undertaken recognizing that the highest quality habitat in this large geographical region includes areas with complex bathymetry, in deep channels close to shoals and shallows, and in proximity to extensive tidal or freshwater marshlands and other wetlands. The Delta Smelt Summer-Fall Habitat Action is to provide these habitat components in the same geographic area through a range of actions to improve water quality and food supplies.

Planning Process

The adaptive management process would be investigating the way in which SWP-CVP operations interact with the full range of components of Delta Smelt habitat. The process would be investigating the extent that providing flow and/or low salinity conditions of various volumes and locations improves the quality and quantity of Delta Smelt habitat in the summer and fall, and whether Delta Smelt survival, viability and/or abundance improves in relation to the Delta Smelt Summer-Fall Habitat Action.

An adaptive management plan will be developed following issuance of the Notice of Determination (NOD). The framework for the adaptive management plan is as follows:

- DWR and Reclamation shall form a Delta Coordination Group (Reclamation, DWR, USFWS, NMFS, CDFW, and representatives from federal and state water contractors).
- The Delta Coordination Group would use one of the existing structured decision-making models or adopt a new model to analyze proposed summer-fall habitat actions, making predictions regarding

the potential outcomes for various implementation scenarios. This structured decision-making process would inform each year's Habitat Action Plan.

- Within 6 months of signing the NOD, the Delta Coordination Group would meet to select a structured decision-making model; and complete initial model runs (and annual model runs thereafter) testing various approaches to satisfying the environmental and biological goals, utilizing the available tool box of approaches.
- Each year, the Delta Coordination Group would develop a Habitat Action Plan accounting for forecasted hydrology and temperatures over the summer and fall. The Habitat Action Plan would describe how the proposed action would meet the environmental and biological goals of the action. The Habitat Action Plan would include the hypotheses to be tested, the suite of actions and operations to test the hypotheses, and the expected outcomes. The Habitat Action Plan would be informed by the annual results of the structured decision-making process. In recognition of the time required for annual planning, the Habitat Action Plan process would occur every year so the Plan would be prepared in time for review by the USFWS and CDFW, in the event the action is triggered.
- CDFW and USFWS would review the Habitat Action Plan in each year in which an action is triggered and confirm that the impacts of the action are within what was analyzed in the BiOp and the California Fish and Game Code Section 2081 permit and that the action is consistent with the project description.
- After the completion of each Summer-Fall Habitat Action, DWR and Reclamation will share preliminary monitoring results through the Delta Coordination Group. At the beginning of the next water year, DWR and Reclamation would provide a synthesis of the monitoring results to the Delta Coordination Group. The Delta Coordination Group would review the synthesis of results and use the results of the monitoring to inform a subsequent structured decision-making modeling exercise using the tool box of available approaches.
- The Delta Smelt Summer-Fall Habitat Action would be included in the Four-Year Reviews under the Governance section of this Proposed Action. The structured decision-making model and the multi-year science and monitoring plan would be part of this Peer Review.

2.3.4 Real-time Water Operations Process

DWR, in coordination with Reclamation, would implement activities, monitor performance, and report on compliance with the commitments in the Proposed Project. Implementing the proposed action would require coordination between CDFW, DWR, USFWS, NMFS, Reclamation, and the SWP-CVP water contractors. The federal government is proposing a Real-Time Operations Charter to facilitate federal coordination with the State.

Investments in science, monitoring, and decision support tools since the 2008 and 2009 federal Biological Opinions, state Consistency Determinations, and the Fish and Game Code Section 2081 permit for Longfin Smelt provide the ability to reduce reliance on professional opinion and increase the use of qualitative and quantitative models to assess risk in real time based on the real-time monitoring of species and relevant other physical and biological factors. While DWR and Reclamation hold the

responsibility for operating the SWP and CVP in a coordinated manner, many agencies and organizations assist in monitoring field conditions to provide information that assists in real-time decisions. Communication on real-time conditions and the implementation of water operations provides assurance that DWR, in coordination with Reclamation, is meeting the commitments within the Proposed Project.

Portions of the Proposed Project rely on real-time monitoring to inform DWR and Reclamation on how to minimize and/or avoid stressors on listed species. The Proposed Project seeks to take advantage of the expertise within the state and federal fish agencies in the real-time monitoring of species distribution and life stage. DWR, in coordination with Reclamation, would then use qualitative and quantitative tools to perform risk analyses that inform operations. Actions to address stressors in real-time include Old and Middle River Flow Management.

Some elements of the Proposed Project include seasonal input by the state and federal regulatory agencies on scheduling actions to benefit the fishery. Actions requiring seasonal input from CDFW include the Delta Smelt Summer-Fall Habitat Action.

DWR, in coordination with Reclamation, would demonstrate compliance with the commitments of the Proposed Project and provide sufficient information for evaluation of federal initiation triggers through regular monitoring and reporting. New information and changing conditions may exceed a federal reinitiation trigger and could require subsequent federal ESA Section 7 consultation. As the SWP and CVP must coordinate operations, a federal reinitiation of Section 7 consultation would require discussions with CDFW and possible need for a permit amendment.

- Real-Time Operation participants
- Action Agencies: DWR and Reclamation
- Regulatory Agencies: USFWS, NMFS, CDFW, SWRCB, USACE
- Stakeholders: state and federal water contractors
- Decision-Making for Real-Time Operations

Nothing in this project description modifies the rights and responsibilities of the agencies. Decisions shall be made consistent with the authorizing legislation and the regulations and policies under the federal and state Endangered Species Acts, as appropriate.

DWR and Reclamation shall retain sole discretion for:

- Water Operations of the SWP and CVP, including allocations, under Reclamation Law and the State Water Project, as appropriate
- Agency appropriations (budget requests, fund alignment, contracting, etc.)
- Section 7 Action Agency and Applicant (consultation)
- Coordination and cooperation with Public Water Agencies (PWAs) as required by contracts and agreements

CDFW, USFWS, and NMFS shall retain sole discretion for:

- Consultation under Section 7 of the federal ESA and California Fish and Game Code, as appropriate and the associated Incidental Take Statements/Permits
- Agency Appropriations

State Water Resources Control Board shall retain the sole discretion for:

- Enforcement as allowable under federal and state law (e.g., Clean Water Act and Porter-Cologne Water Quality Control Act)

State and federal water contractors shall retain all existing authority and discretion, and are participating in a technical and policy advisory capacity.

DWR would continue to coordinate with USACE, as appropriate, under existing permits as wells as in venues such as the Interagency Ecological Program (IEP). Other agencies (e.g., the U.S. Geological Survey [USGS]) may also be involved in monitoring physical conditions in the Delta.

2.3.4.1 Annual Process

Reclamation and DWR will continue to provide standard reporting on real-time operations, environmental conditions, and biological parameters, such as species distribution, life stage, and dynamics. These data are available daily through Reclamation and DWR websites and additional tools such as CDEC, NWIS, RWIS, SacPAS, Bay-Delta Live, and SHOWR.

Monitoring for the proposed real-time management includes:

- Delta flow, temperature, and salinity stations
- Chinook Salmon biological information:
  - Juvenile abundance and timing: Implementation of OMR management (Sacramento Trawl and Chipps Island Trawl)
  - Delta distribution: Informs OMR actions and is currently supported through beach seines, acoustic tagging, and EDSM
  - Salvage count: Informs the direct impacts on listed fish
  - Genetic identification: Informs the salvage of listed Chinook Salmon species versus non-listed Chinook Salmon species.
- Delta Smelt biological information:
  - Turbidity stations: Informs the potential for a “turbidity bridge” that would inform OMR actions.
  - Temperature stations: Informs the transition between life stages and the need for protective measures.
  - Water quality stations: Tracks the movement of the low salinity zone and parameters associated with the food web (e.g., chlorophyll)
  - Delta distribution: Informs the entrainment risk due to OMR actions and would be supported by EDSM.

- Fish condition: Informs when adults have spawned and the need for larval protections.

- Longfin Smelt biological information:
  - Water quality stations: Tracks the movement of the low salinity zone and parameters associated with the food web (e.g., chlorophyll)
  - Delta distribution: Informs the entrainment risk due to OMR actions.
  - Fish condition: Informs when adults have spawned and the need for larval protections

Status and Trend Monitoring

Status and trend monitoring characterizes the population of species and their environments over time including the impacts of stressors from sources other than the CVP and SWP. Recovery plans characterize the status and trends differently depending upon the species in the general categories of abundance, production, life history diversity, and geographic diversity. In addition to the Core Monitoring, a number of additional programs are anticipated to continue, the majority of which are supported by Reclamation and DWR for CVP, SWP, and Delta watersheds:

- Hatchery Proportion (Constant Fractional Marking)
- Genetic Analyses of California Salmonid Populations: Parentage Based Tagging (PBT) of salmonids in California Hatcheries
- Fall Midwater Trawl
- 20-mm Survey monitoring to determine distribution and relative abundance of Delta Smelt and Longfin Smelt
- Spring Kodiak Trawl
- Estuarine and Marine Fish Abundance and Distribution Survey
- Smelt Larva Survey (SLS)
- Summer Townet Survey
- Environmental Monitoring Program (EMP)

The coordinated operation of the SWP requires the following deliverables throughout the year. In addition to those identified herein, Reclamation would have additional deliverables that would be provided to USFWS and NMFS related to the operation of the CVP.

DWR and Reclamation will provide products on the schedule identified below:

1. Monitoring Program for Core Water Operations, Ongoing
2. December through June, Weekly and Biweekly, Real-Time Species Distribution and Life Stage
3. Monthly (and as needed), Water Operation Status
4. Monthly (and/or as needed), Specific operations for:
5. Old and Middle River Reverse Flow Storm Events (December through June)
6. Delta Smelt Fall Habitat and Suisun Marsh Salinity Control Gates (May)

7. Seasonal and Annual Compliance Reporting September, Annual Summary of Water Supply and Fish Operations

2.3.5 MONITORING WORKGROUPS

DWR and Reclamation would continue to convene Monitoring Workgroups as needed. Reclamation would be solely responsible for convening Watershed Workgroups for each of the Upper Sacramento, American, and Stanislaus watersheds. Each of Reclamation's Watershed Workgroups would be responsible for real-time synthesis of fisheries monitoring information and providing recommendations on scheduling specific volumes of water for restorations actions described in the federal proposed action. DWR, in coordination with Reclamation, would convene the Delta Monitoring Workgroup, which would be responsible for integrating species information across watersheds, including Delta Smelt, Winter-run Chinook Salmon and other salmonids, and sturgeon. In addition to the Delta Monitoring Workgroup, the program may include smelt monitoring and salmonid monitoring teams. The Delta Monitoring Workgroup will include technical representatives from federal and state agencies and stakeholders and will provide information to DWR and Reclamation on species abundance, species distribution, life-stage transitions, and relevant physical parameters.

A WOMT comprised of agency managers will coordinate on overall water operations to oversee the implementation of various real-time provisions. The WOMT shall be responsible for overseeing the Watershed Monitoring Workgroups and elevating disagreements to the Directors of CDFW, DWR, Reclamation, USFWS, and NMFS, where necessary. The coordinated state and federal monitoring group structure is as follows:

- Directors
- WOMT
- Delta Monitoring Workgroup
    - Smelt Monitoring Team
    - Salmon Monitoring Team
    - Program Teams

The WOMT shall coordinate the preparation of seasonal and annual reporting in coordination with the Watershed Monitoring Teams.

DWR would continue to coordinate with the IEP for permitting and coordination for physical and biological monitoring. It would also continue to coordinate with the Collaborative Science and Adaptive Management Program for synthesis of monitoring and studies. In the event that either of these groups is unwilling or unable to provide for the commitments in the Proposed Project, DWR (in coordination with Reclamation) would confer with CDFW, USFWS, and NMFS on alternative implementation plans.

2.3.6 FOUR-YEAR REVIEWS

In January of 2024 and January of 2028, DWR, in coordination with Reclamation, would convene an independent panel to review OMR flow management and measures to improve survival through the South Delta and the Delta Smelt Summer-Fall Habitat Action.

Establishment of independent review panels composed of subject matter experts is a key component of DWR's proposed adaptive management approach to operation of the SWP. CDFW, NMFS, and USFWS may provide technical assistance and input regarding the panel and its panel charge. The panel would evaluate the efficacy of these and other project actions and make recommendations.

The independent panels would review actions for consistency with applicable guidance and will provide information and recommendations to DWR. DWR, in consultation with Reclamation, will provide the results of the independent review to CDFW, NMFS, and USFWS. DWR will coordinate with Reclamation to document a response to the independent review.

2.3.7 DROUGHT AND DRY YEAR ACTIONS

DWR shall coordinate with Reclamation to develop a voluntary toolkit of drought actions that could be implemented at the discretion of DWR and/or Reclamation. On October 1, if the prior water year was dry or critical, DWR, in coordination with Reclamation, shall meet and confer with USFWS, NMFS, CDFW, and Public Water Agencies on voluntary measures to be considered if drought conditions continue into the following year. If dry conditions continue, DWR, in coordination with Reclamation, will regularly meet with this group (and potentially other agencies and organizations) to evaluate hydrologic conditions and the potential for continued dry conditions that may necessitate the need for development of a drought contingency plan (that may include actions from the toolkit) for the water year.

By February of each year following a critical hydrologic year type, DWR, in coordination with Reclamation, shall report on the measures employed and assess their effectiveness. The toolkit will be revisited at a frequency of not more than 5-year intervals.

2.3.8 CONTINUED INSTALLATION OF SOUTH DELTA TEMPORARY BARRIERS

DWR proposes to continue operating three temporary barriers at the Old River at Tracy, Middle River, and Grant Line Canal each year, when necessary to maintain operations of agricultural water users. These three rock barriers are designed to act as flow control structures, trapping tidal waters behind them after a high tide. These barriers improve water levels and circulation for local South Delta farmers and collectively are referred to as agricultural barriers.

The objectives of operating the three temporary barriers are to increase water levels, circulation patterns, and water quality in the South Delta area for local agricultural diversions. DWR installs and removes the temporary rock barriers at the following locations:

- Middle River near the Victoria Canal, about 0.5 mile south of the confluence of the Middle River, Trapper Slough, and the North Canal

- Old River near Tracy, approximately 0.5 mile east of the Delta-Mendota Canal intake
- Grant Line Canal, approximately 400 feet east of the Tracy Boulevard Bridge

The agricultural barriers will continue to be installed under existing permits starting in May, provided San Joaquin River flow at Vernalis is low enough to enable installation, typically less than 5,000 cfs. All three agricultural barriers operate until the fall and must be completed removed by November 30 of each year. Full closure of the Grant Line Canal Barrier requires NMFS, USFWS, and CDFW approval and a demonstrated need for the full closure based on actual conditions and modeling. Barriers would include at least one open culvert, to allow fish passage when water temperatures are less than 22°C (77 °F).

2.3.9 BARKER SLOUGH PUMPING PLANT OPERATIONS

The BSPP diverts water from Barker Slough into the NBA for delivery in Napa County and to the Solano County Water Agency (SCWA). The NBA intake is approximately 10 miles from the Sacramento River at the northwest end of Barker Slough. The maximum pumping capacity of this facility is 175 cfs. The annual maximum diversion is 125 TAF.

DWR will work with the USFWS to develop Delta Smelt minimization measures by the end of the 2019 calendar year. These minimization measures will aim to protect larval Delta Smelt from entrainment through the BSPP and will consider reduction in diversion through the NBA at the appropriate spring period and appropriate water year types by using effective detection measures or an appropriate proxy.

BSPP will be operated to protect larval Longfin Smelt from January 15 through March 31 of dry and critically dry years. The Water Year type is as defined in D-1641 for the Sacramento River Basin. If the Water Year type changes after January 1 to below normal, above normal, or wet, this action will be suspended. If the Water Year type changes after January to dry or critical, this action will occur.

DWR personnel in coordination with CDFW staff will review weekly the abundance and distribution survey data and other pertinent biological factors that influence the entrainment risk and detection of larval Longfin Smelt at Station 716. When conditions warrant, BSPP's maximum 7-day average will not exceed 50 cfs from January 15 through March 31 within 5 days. During the 5-day period, the rate of diversion at BSPP will not increase. This restriction will be removed when larval Longfin Smelt are no longer detected at Station 716.

Operation of the BSPP also includes ongoing maintenance of the facility. Maintenance activities included in the Proposed Project include fish screen cleaning, sediment removal, and aquatic weed removal. Each of these activities is described below.

2.3.9.1 Fish Screen Cleaning

The 10 pump bays are individually screened with a positive-barrier fish screen consisting of a series of flat, stainless-steel, wedge-wire panels with a slot width of 3/32 inch. The screens are routinely cleaned to prevent excessive head loss and minimize increases in localized approach velocities (CDFG 2009).

2.3.9.2 Sediment Removal

Sediment accumulated on the concrete apron in front of the fish screen and in the pump wells behind the fish screen would be removed by suction dredge. Removal of sediment from within the pump wells would occur as needed, year-round.

Removal of sediment from the front apron would occur during summer and early fall months and during the annual NBA shutdown in March. The NBA is annually taken off-line for one to two-weeks for routine maintenance and repairs, and the BSPP is non-operational during this period.

Sediment would be tested and disposed at a suitable location or existing landfill.

2.3.9.3 Aquatic Weed Removal

The aquatic weed removal system consists of grappling hooks attached by chains to an aluminum frame. A boom truck, staged on the platform in front of the BSPP pumps, will lower the grappling system into the water to retrieve the accumulated aquatic vegetation. The removed aquatic weeds will be transported to two aggregate base spoil sites located near the pumping plant.

Removal of aquatic weeds from the BSPP fish screens would typically occur during summer and fall months when aquatic weed production is highest. Floating aquatic vegetation, i.e., water hyacinth, may need to be removed during spring months if water hyacinth becomes entrained into Barker Slough and accumulates in front of BSPP fish screens.

2.3.10 CLIFTON COURT FOREBAY OPERATIONS

Clifton Court Forebay operations included in the Proposed Project include predator management and aquatic weed removal and disposal. Each of these operations is described below.

2.3.10.1 Predator Management

Fish entering the CCF must travel approximately 2.1 miles across the CCF to reach the Skinner Fish Facility. The loss of fish between the CCF Radial Gates and the Skinner Fish Facility is termed pre-screen loss (PSL). PSL includes, but is not limited to, predation by fish, birds, and other predatory species. Studies conducted by DWR and CDFW indicate that PSL of juvenile Chinook Salmon varies from 63% to 99% (Gingras 1997) and PSL of juvenile steelhead was 82 ± 3% (Clark et al. 2009). Predation by Striped Bass is thought to be the primary cause of high PSL in the CCF (Brown et al. 1996, Gingras 1997, Clark et al. 2009).

DWR proposes to continue the development of predator control methods including, but not limited to:

- Continued evaluation of the performance of various predator relocation methods
- Controlling aquatic weeds

Clifton Court Forebay Predator Studies

The Predator Reduction Interim Measure is a combination of the most effective predator removal elements of previous predator reduction efforts; the Clifton Court Forebay Predation Study, the

Predator Reduction Electrofishing Study, and the Predator Fish Relocation Study. The intent of this interim measure is to maximize the removal of predators from Clifton Court Forebay and relocate them to Bethany Reservoir, thereby reducing pre-screen losses.

2.3.10.2 Aquatic Weed Removal and Disposal

DWR will apply herbicides or will use mechanical harvesters on an as-needed basis to control aquatic weeds and algal blooms in the CCF (Table 2-4). Herbicides may include Aquathol K or copper-based herbicides. Algaecides may include peroxygen-based algaecides (e.g., PAK 27). These products are used to control algal blooms that can degrade drinking water quality through production of taste and odor compounds or algal toxins. Dense growth of submerged aquatic weeds can cause severe head loss and pump cavitation at the Banks Pumping Plant when the stems of the rooted plant break free and drift into the trash racks. This mass of uprooted and broken vegetation essentially forms a watertight plug at the trash racks and vertical louver array. The resulting blockage necessitates a reduction in the pumping rate of water to prevent potential equipment damage through cavitation at the pumps and excessive weight on the louver array causing collapse of the structure. Cavitation creates excessive wear and deterioration of the pump impeller blades. Excessive floating weed mats also reduce the efficiency of fish salvage at the Skinner Fish Facility. Ultimately, this all results in a reduction in the volume of water diverted by the SWP. In addition, dense stands of aquatic weeds provide cover for unwanted predators that prey on listed species within the CCF. Aquatic weed control is included as a conservation measure to reduce mortality of ESA-listed fish species within the CCF (see subsection 3.11.3, “Skinner Fish Facility Improvements”).

Mechanical Removal

Mechanical methods are used to manually remove aquatic weeds. A debris boom and an automated weed rake system continuously remove weeds entrained on the trash racks. During high weed load periods such as late summer and fall when the plants senesce and fragment or during periods of hyacinth entrainment, boat-mounted harvesters are operated on an as-needed basis to remove aquatic weeds in the Forebay and the intake channel upstream of the trash racks and louvers. The objective is to decrease the weed load on the trash racks and to improve flows in the channel. Effectiveness is limited due to the sheer volume of aquatic weeds and the limited capacity and speed of the harvesters. Harvesting rate for a typical weed harvester ranges from 0.5 to 1.5 acres per hour or 4 to 12 acres per day. Actual harvest rates may be lower due to travel time to off-loading sites, unsafe field conditions such as high winds, and equipment maintenance.

Table 2-4. Methods to Control Aquatic Weeds and Algal Blooms in Clifton Court Forebay

Algae and Weed Treatments	Control Target	Period of Use	Limits to Application	Other Conditions of Use
Aquathol K, an endothall-based aquatic herbicide and copper-based compounds, including copper sulfate pentahydrate and chelated copper herbicides	Pondweeds, *Egeria densa*, cyanobacteria, and green algae	As needed, from June 28 to August 31, when the average daily water temperature in the CCF is at or above 25°C	The herbicide application would not begin until after the radial gates have been closed. Applications of Aquathol K for pondweed control will be applied at a concentration of 2 to 3 ppm. Applications of copper herbicides for aquatic weed control will be applied at a concentration of 1 ppm with an expected dilution of 0.75 ppm dispersal in the water column. Application for algal control will be applied at a concentration of 0.2 to 1 ppm with expected dilution within the water column. The radial gates would remain closed for 12 to 24 hours after completion of the application.	The radial intake gates at the entrance to the CCF would be closed before application of pesticides to allow fish to move out of the targeted treatment areas and toward the salvage facility, and to prevent any possibility of aquatic pesticides diffusing into the Delta. The radial gates would remain closed for a minimum of 12 and up to 24 hours after treatment, to allow the recommended contact time between the aquatic pesticide and the treated vegetation or cyanobacteria in the CCF, and to reduce residual endothall concentrations for drinking water compliance. The radial gates would be re-opened after a minimum of 36 hours (24 hours pre-treatment closure plus 12 hours post-treatment closure). No more than 50% of the surface area of the CCF will be treated at one time. Water quality samples to monitor copper and endothall concentrations within or adjacent to the treatment area, per NPDES permit requirements, will be collected before, during, and after application.
Peroxygen-based algaecides (e.g., PAK 27)	Cyanobacteria	As needed, year-round	The radial gates would be closed before the application of the algaecide to prevent any possibility of the algaecide diffusing into the Delta. The radial gates may be re-opened immediately after the treatment, as the required contact time would be less than 1 minute and no residual by-product of concern would exist. Applied concentrations will be in the range of 0.3 to 10.2 ppm hydrogen peroxide.	No more than 50% of the surface area of the CCF will be treated at one time. Dissolved oxygen concentration will be measured prior to and immediately following application within and adjacent to the treatment zone.

Notes:
°C = degrees Celsius
CCF = Clifton Court Forebay
CDFW = California Department of Fish and Wildlife
DWR = California Department of Water Resources
ESA = federal Endangered Species Act
NMFS = National Marine Fisheries Service
NPDES = National Pollutant Discharge Elimination System
ppm = parts per million
USFWS = U.S. Fish and Wildlife Service

Aquatic Herbicide Application

Aquatic weed and algae treatments would occur on an as-needed basis depending upon the level of vegetation biomass, the cyanotoxin concentration from the harmful algal blooms (HABs), or the concentration of taste and odor compounds. The frequency of aquatic herbicide applications to control aquatic weeds is not expected to occur more than twice per year, as demonstrated by the history of past applications. Aquatic herbicides are ideally applied early in the growing season when plants are susceptible to them during rapid growth and formation of plant tissues; or later in the season, when plants are mobilizing energy stores from their leaves towards their roots for overwintering senescence. The frequency of algaecide applications to control HABs is not expected to occur more than once every few years, as indicated by monitoring data and demonstrated by the history of past applications. Treatment areas are typically about 900 acres, and no more than 50% of the 2,180 total surface acres.

Aquatic weed assemblages change from year to year in the CCF from predominantly *Egeria densa* to one dominated by curly-leaf pondweed, sago pondweed, and southern naiad. To effectively treat a dynamic aquatic weed assemblage and HABs, multiple aquatic pesticide compounds are required to control aquatic weeds and algal blooms in the CCF. The preferred products are the following:

- Aquathol K, an endothall-based aquatic herbicide that is effective on pondweeds
- Copper-based compounds that are effective on *E. densa*, cyanobacteria, and green algae; copper-based aquatic herbicides, including copper sulfate pentahydrate and chelated copper herbicides
- Peroxygen-based algaecides (e.g., PAK 27) that are effective on cyanobacteria

Aquathol K

The dipotassium salt of endothall is used for control of aquatic weeds and is the active ingredient in Aquathol® K (liquid formulation). Aquathol K is a widely used herbicide to control submerged weeds in lakes and ponds, and the short residual contact time (12 to 48 hours) makes it effective in both still and slow-moving water. Aquathol K is effective on many weeds, including hydrilla, milfoil, and curly-leaf pondweed, and begins working on contact to break down cell structure and inhibit protein synthesis. Without the ability to grow, the weed dies. Full kill takes place in 1 to 2 weeks. As weeds die, they sink to the bottom and decompose. Aquathol K is not effective at controlling *E. densa*.

Aquathol K is registered for use in California and has effectively controlled pondweeds and southern naiad in the CCF and in other lakes. Endothall has low acute and chronic toxicity effects on fish. The LC50 for salmonids is 20 to 40 times greater than the maximum concentration allowed to treat aquatic weeds. The U.S. Environmental Protection Agency (EPA) maximum concentration allowed for Aquathol K is 5 parts per million (ppm). A recent study (Courter et al. 2012) of the effect of Cascade® (same endothall formulation as Aquathol K) on salmon and steelhead smolts showed no sublethal effects until exposed to 9 to 12 ppm, that is, two to three times greater than the 5 ppm maximum concentration allowed by the EPA and about four to six times greater than the 2 to 3 ppm applied in past CCF treatments. In the study, steelhead and salmon smolts showed no statistical difference in mean survival between the control group and treatment groups, however, steelhead showed slightly lower survival after 9 days at 9 to 12 ppm. Based on the studies with salmonids, Aquathol K applied at

or below the EPA maximum allowable concentration of 5 ppm poses a low to no toxicity risk to salmon, steelhead and other fish. No studies have assessed the exposure risk to Green Sturgeon.

When aquatic plant survey results indicate that pondweeds are the dominant species in the CCF, Aquathol K will be selected due to its effectiveness in controlling these species. Aquathol K will be applied according to the label instructions, with a target concentration dependent upon plant biomass, water volume, and forebay depth. The target concentration of treatments is 2 to 3 ppm, which is well below the concentration of 9 to 12 ppm where sublethal effects have been observed (Courter et al. 2012). DWR monitors herbicide concentration levels during and after treatment to ensure levels do not exceed the Aquathol K application limit of 5 ppm. Additional water quality testing may occur following treatment for drinking water intake purposes. Samples are submitted to a laboratory for analysis. There is no "real time" field test for endothall. No more than 50% of the surface area of the CCF will be treated at one time. A minimum contact time of 12 hours is needed for biological uptake and treatment effectiveness, but the contact time may be extended up to 24 hours to reduce the residual endothall concentration for National Pollutant Discharge Elimination System (NPDES) compliance purposes.

Copper-Based Aquatic Herbicides and Algaecides

Copper herbicides and algaecides include chelated copper products and copper sulfate pentahydrate crystals. When aquatic plant survey results indicate that *E. densa* is the dominant species, copper-based compounds will be selected due to their effectiveness in controlling this species. Application of Aquathol K does not affect *E. densa*. Copper-based algaecides are effective at controlling algal blooms (cyanobacteria) that produce cyanotoxins or taste and odor compounds.

Copper herbicides and algaecides will be applied in a manner consistent with the label instructions, with a target concentration dependent upon target species and biomass, water volume and the depth of the forebay. Applications of copper herbicides for aquatic weed control will be applied at a concentration of 1 ppm with an expected dilution to 0.75 ppm upon dispersal in the water column. Applications for algal control will be applied at a concentration of 0.2 to 1 ppm with expected dilution within the water column. DWR will monitor dissolved copper concentration levels during and after treatment to ensure levels do not exceed the application limit of 1 ppm, per NPDES permit required procedures. Treatment contact time will be up to 24 hours. If the dissolved copper concentration falls below 0.25 ppm during an aquatic weed treatment, DWR may opt to open the radial gates after 12 hours but before 24 hours to resume operations. Opening the radial gates prior to 24 hours would enable the rapid dilution of residual copper and thereby shorten the exposure duration of ESA-listed fish to the treatment. No more than 50% of the surface area of the CCF will be treated at one time.

Peroxygen-based Algaecides

The PAK 27 algaecide active ingredient is sodium carbonate peroxyhydrate. An oxidation reaction occurs immediately upon contact with the water destroying algal cell membranes and chlorophyll. There is no contact or holding time requirement, as the oxidation reaction occurs immediately and the byproducts are hydrogen peroxide and oxygen. There are no fishing, drinking, swimming, or irrigation restrictions following the use of this product. PAK 27 has National Sanitation Foundation International

(NSF)/American National Standards Institute (ANSI) Standard 60 Certification for use in drinking water supplies at maximum-labeled rates and is certified for organic use by the Organic Materials Reviews Institute (OMRI).

PAK 27, or an equivalent product, will be applied in a manner consistent with the label instructions, with permissible concentrations in the range of 0.3 to 10.2 ppm hydrogen peroxide. No more than 50% of the surface area of the CCF will be treated at one time.

Herbicide Application Procedure

The following are operational procedures to minimize impacts on listed species during aquatic herbicide treatment for application of Aquathol K and copper-based products and algaecide treatment for application of peroxide-based algaecides in the CCF:

- Apply Aquathol K and copper-based aquatic pesticides, as needed, from June 28 to August 31.
- Apply Aquathol K and copper-based aquatic pesticides, as needed, prior to June 28 or after August 31 if the average daily water temperatures within the CCF is at or above 77°F (25°C) and if Delta Smelt, salmonids, and Green Sturgeon are not at additional risk from the treatment as confirmed by NMFS and USFWS.
    - Prior to treatment outside of the June 28 to August 31 time frame, DWR will notify and confer with NMFS and USFWS on whether ESA-listed fish species are present and at risk from the proposed treatment.
- Apply Aquathol K and copper-based aquatic pesticides, as needed, during periods of activated Delta Smelt and salmonid protective measures and when the average daily water temperature in the CCF is below 77°F (25°C) if the following conditions are met:
    - Prior to treatment outside of the June 28 to August 31 time frame, DWR will notify and confer with NMFS and USFWS on whether ESA-listed fish species are present and at risk from the proposed treatment.
    - The herbicide application does not begin until after the radial gates have been closed for 24 hours or after the period of predicted Delta Smelt and salmonid survival within the CCF (e.g., after predicted mortality has occurred due to predation or other factors) has been exceeded.
    - The radial gates remain closed for 24 hours after the completion of the application, unless DWR confers with NMFS and USFWS and it is agreed that rapid dilution of the herbicide would be beneficial to reduce the exposure duration to listed fishes present within the CCF.
- Apply peroxygen-based aquatic algaecides, as needed, year-round.
- There are no anticipated impacts on fish with the use of peroxygen-based aquatic algaecides in the CCF during or following treatment.
- Monitor the salvage of listed fish at the Skinner Fish Facility prior to the application of the aquatic herbicides and algaecides in the CCF.
- For Aquathol K and copper compounds, the radial intake gates will be closed at the entrance to the CCF prior to the application of pesticides to allow fish to move out of the targeted treatment areas

and toward the salvage facility and to prevent any possibility of aquatic pesticide diffusing into the Delta.

- For Aquathol K and copper compounds, the radial gates will remain closed for a minimum of 12 and up to 24 hours after treatment to allow for the recommended duration of contact time between the aquatic pesticide and the treated vegetation or cyanobacteria in the forebay, and to reduce residual endothall concentration for drinking water compliance purposes. (Contact time is dependent upon pesticide type, applied concentration, and weed or algae assemblage.) Radial gates would be reopened after a minimum of 36 hours (24 hours pre-treatment closure plus 12 hours post-treatment closure).
- For peroxide-based algaecides, the radial gates will be closed prior to the application of the algaecide to prevent any possibility of the algaecide diffusing into the Delta. The radial gates may reopen immediately after the treatment, as the required contact time is less than 1 minute and there is no residual by-product of concern.
- Application will be made by a licensed applicator under the supervision of a California Certified Pest Control Advisor.
- Aquatic herbicides and algaecides will be applied by boat or by aircraft.
    - Boat applications will be by subsurface injection system for liquid formulations and by a boat-mounted hopper dispensing system for granular formulations. Applications would start at the shoreline and move systematically farther offshore, enabling fish to move out of the treatment area.
    - Aerial applications of granular and liquid formulations will be by helicopter or aircraft. No aerial spray applications will occur during wind speeds above 15 mph to prevent spray drift.
- Application would be to the smallest area possible that provides relief to SWP operations or water quality. No more than 50% of the CCF will be treated at one time.
- Water quality samples to monitor copper and endothall concentrations within or adjacent to the treatment area, per the NPDES permit requirements, will be collected before, during and after application. Additional water quality samples may be collected during the following treatment for drinking water compliance purposes. No monitoring of copper or endothall concentrations in the sediment or detritus is proposed.
- No monitoring of peroxide concentration in the water column will occur during and after application, as the reaction is immediate and there is no residual by-product of concern. Dissolved oxygen concentration will be measured prior to and immediately following application within and adjacent to the treatment zone.
- A spill prevention plan will be implemented in the event of an accidental spill.

Aquatic weed and algae treatments would occur on an as-needed basis. The timing of application is an avoidance measure and is based on the life history of Chinook Salmon and steelhead in the Central Valley's Delta region and of Delta Smelt. Green Sturgeon are present in the area year-round. Migrations of juvenile Winter-run Chinook Salmon and Spring-run Chinook Salmon primarily occur outside of the summer period in the Delta. Central Valley Steelhead have a low probability of being in

the South Delta during late June, when temperatures exceed 77°F (25°C) through the first rainfall flush event, which can occur as late as December in some years (Grimaldo 2009). Delta Smelt are not expected to be in the CCF during this time period. Delta Smelt are not likely to survive when water temperatures reach a daily average of 77°F (25°C), and they are not expected to occur in the Delta prior to the first flush event. Therefore, the likelihood of herbicide exposure to Chinook Salmon, Central Valley Steelhead, and Delta Smelt during the proposed herbicide treatment time frame in the CCF is negligible.

Additional protective measures will be implemented to prevent or minimize adverse impacts from herbicide applications. As described above, applications of aquatic herbicides and algaecides will be contained within the CCF. The radial intake gates to the CCF will be closed prior to, during, and following the application. The radial gates will remain closed during the recommended minimum contact time based on herbicide type, application rate, and aquatic weed or algae assemblage. In addition, following the gate closure and prior to the applications of Aquathol K and copper-based pesticides, the water is drawn down in the CCF via the Banks Pumping Plant. This drawdown helps facilitate the movement of fish in the CCF toward the fish diversion screens and into the fish protection facility, lowers the water level in the CCF to decrease the total amount of herbicide needed to be applied per volume of water, and aids in the dilution of any residual pesticide post-treatment. Following reopening of the gates and refilling of the CCF, the rapid dilution of any residual pesticide and the downstream dispersal of the treated water into the California Aqueduct via the Banks Pumping Plant will reduce the exposure time of any ESA-listed fish species present in the CCF.

Avoidance and Minimization Practices

DWR implements the following best management practices during aquatic weed harvesting at Clifton Court Forebay to avoid and minimize potential impacts on sensitive resources:

- A pre-construction survey for nesting birds and Burrowing Owls is conducted by a qualified biologist within 2 weeks prior to the start of work. If Burrowing Owls are observed within 500 feet of the Proposed Project, non-disturbance buffers are established and/or a qualified biological monitor is present during disposal activities.
- On the first day of work, and as needed once work has begun, a qualified biologist surveys for floating grebe nests within the CCF and identifies avoidance areas to prevent take of nests.
- All on-site personnel participate in environmental awareness training for special-status species with the potential to occur in the project area.
- If any wildlife is observed within the aquatic weed removal and disposal areas, work is halted immediately and the wildlife are allowed to move out of the area on their own.
- Work does not take place during rain events or within 24 hours of significant precipitation when special-status species could potentially be traveling to breeding ponds.
- Aquatic weed disposal and vehicle travel are contained within the established roadways and identified work area.

2.3.11 SKINNER FISH FACILITY IMPROVEMENTS

The Skinner Fish Facility has behavioral barriers to keep fish away from the pumps that lift water into the California Aqueduct. Large fish and debris are directed away from the facility by a 388-foot-long trash rack. Smaller fish are diverted from the intake channel into bypasses by a series of behavioral barriers (metal louvers), while the main flow of water continues through the louvers and toward the pumps. These fish pass through a secondary system of louvers or screens and pipes into seven holding tanks, where a subsample is counted and recorded. The salvaged fish then are returned to the Delta in oxygenated tank trucks. The sampling frequency at Skinner Fish Facility is generally 30 minutes of every 2 hours, but may be reduced based upon the presence of excessive numbers of fish or debris based upon procedures developed by CDFW. See Appendix G of the 2019 Biological Assessment for a summary of study results (Reclamation 2019).

DWR proposes to continue to salvage fish with the Skinner Fish Facility which is located about 2 miles upstream from the Banks Pumping Plant. In addition, DWR proposes the following:

- Operational changes to salvage release scheduling and location to reduce post-salvage predation
- Continued refinement and improvement of the fish sampling and hauling procedures and infrastructure to improve the accuracy and reliability of data and fish survival

2.3.12 LONGFIN SMELT SCIENCE PROGRAM

CDFW, DWR and the State Water Contractors (SWC) entered into an agreement in 2014 to implement a multiyear Longfin Smelt Science Program. The Longfin Science Program was described in a Study Plan that identified the Napa River, Coyote Creek, and other areas that required further study of environmental factors affecting the species distribution and reproduction. In addition, the Study Plan focused studies on sampling efficiency, including time of day, water transparency, and tidal conditions. The Study Plan was intended to address eight research questions, six of which will be examined over the course of an initial 5-year period of field study and data analysis. The Longfin Smelt Science Program would be continued. An updated Study Plan would be developed jointly with DWR, CDFW and the SWC and would address issues that include external issues influencing population abundance, distribution, and catchability, including vertical migration behavior and water transparency.

2.3.13 CONDUCT FURTHER STUDIES TO PREPARE FOR DELTA SMELT REINTRODUCTION FROM STOCK RAISED AT THE UC DAVIS FISH CONSERVATION AND CULTURE LABORATORY

DWR is proposing to continue supporting the operation and research being conducted by the University of California, Davis (UC Davis), Fish Conservation and Culture Laboratory (FCCL).

The two main goals of the FCCL are to maintain a refuge Delta Smelt population in captivity that is as genetically close as possible to the wild population and provide a safeguard against extinction. The culture technique has been improved continuously over the years and the survival rate of cultured Delta Smelt at the FCCL is high (UC Davis 2019).

The FCCL is undertaking multiple research projects that will continue to add to the understanding of Delta Smelt and other species. The laboratory works collaboratively with other researchers from different agencies and institutions, assisting them with research projects and providing them with experimental fish populations of all life stages. The FCCL currently is expanding and renovating existing facilities, increasing the capacity for culture and research. Ongoing and future studies include the following:

- The FCCL currently is conducting studies to characterize and better understand Delta Smelt spawning behavior. Because spawning behavior has never been observed in the wild and has not been formally described yet, it is unclear how and where Delta Smelt naturally spawn. In ongoing experiments, the laboratory is conducting studies that characterize Delta Smelt spawning behavior under natural conditions and examining spawning substrate preferences. The findings from these studies will be critical to continued recovery and conservation efforts.
- The FCCL is investigating the optimum conditions for hatching Delta Smelt eggs in the wild. The current laboratory practice has been optimized to hatch good-quality eggs within 10 days of spawning, although it is important to consider the conditions in which the eggs are spawned in the wild. The laboratory is studying the effects of salinity and flow rate on the survival and condition of Delta Smelt eggs. This information will inform the proposed egg frame trials as well as the conservation of suitable breeding grounds.
- The FCCL is testing the possibilities of using an egg frame, created by the Lake Suwa Fishing Collective in Hokkaido, Japan, for future restoration of Delta Smelt in the Delta. The frame was designed for hatching Wakasagi (*Hypomesus nipponensis*) into a body of water with constant flow. The water flow condition around the eggs in the frame will be studied using computational flow dynamics, and the results will be used to suggest a suitable environment for applying the egg frame in the Delta.
- The FCCL is taking steps toward promoting survival of individual families by conducting trials using small culture containers that can rear single families at a time. This method could reduce competition between families and increase the survival of each individual family. The FCCL is carrying out trials to assess this factor by individually incubating an equal number of eggs from one, four, or eight family groups; parentage analysis will assess the survival of each family in these groups.
- The FCCL was able to increase survival rates to a level sufficient for the successful culturing of Delta Smelt from the egg through adult stage; the first complete life cycle in captivity was established in 2000–2001. Currently, the FCCL focuses on improving existing rearing techniques, with the goals of increasing the system's efficacy and rearing success. Some of the laboratory's current areas of emphasis are as follows:
    - Tank size and system parameters As fish develop from newly hatched larvae to adults, they are transferred multiple times between fish-rearing systems to fulfill the needs of each life stage. Black interior tanks are used for all fish, as clear and acrylic tanks have been found to stress fish. Light is administered to the tanks, with varying intensities corresponding to what has been deemed optimal for each life stage. Each recirculating system provides ultraviolet (UV)

sterilization, both particle and biological filtration, and heat pumps for temperature control. Currently, the FCCL is testing stocking densities and feeding rates for each tank and also is developing smaller culturing systems for research purposes.

- Turbidity effect early-larval and late-larval stages require different turbidity environments to promote feeding. Although it is not completely understood why larval stages require turbidity, it is thought that the suspended particles provide a visual contrast that enables larval stages to better find their prey. Turbidity is introduced via the addition of concentrated algae. As fish mature into the adult stage, algal addition gradually is decreased to gently transition the fish into clearer water environments.
- Weaning strategies As the smelt develop, they are transitioned from a live prey diet to a dry feed diet. The FCCL currently is researching this topic to determine the best time for weaning.
- Salinity In their natural environment, Delta Smelt inhabit estuary areas of relatively low salinity. The precise environmental salinity values vary seasonally, in accordance with each year's freshwater availability. In collaboration with researchers at UC Davis, the FCCL is conducting experiments that analyze the physiological effects of salinity on Delta Smelt.

2.3.14 CONTINUE STUDIES TO ESTABLISH A DELTA FISH SPECIES CONSERVATION HATCHERY

The Delta Smelt (*Hypomesus transpacificus*) is currently in severe decline within its native range in the Sacramento-San Joaquin Delta. Delta Smelt have declined to such low numbers that it is difficult to detect them in traditional surveys, and it is possible that the species cannot sustain itself without additional recovery actions. In an effort to conserve the species, a refuge population has been maintained at the UC Davis FCCL in Byron, California, since 2006 (a smaller population exists as a backup to the FCCL at Livingston Stone Hatchery in Shasta Lake, CA). The refuge population provides fish for research purposes, but more importantly, is a reservoir of Delta Smelt genetic diversity that has been specifically managed for potential wild population supplementation or reintroduction.

Currently, FCCL fish have not been released into the Delta, except as part of a predation study in a South Delta fish facility (Castillo et al. 2012). Yet under the present circumstances, there is a need to at least have an emergency plan to guide possible release of refuge fish into the wild. Logic suggests that the easiest and most effective course of action at present may be to supplement the wild population before it goes extinct. Unfortunately, little is known about the most effective way to release Delta Smelt into the Delta for the purpose of recovering the species.

In recognition of this issue, since 2017 DWR has facilitated studies with the overarching goal of determining the best methods to manage Delta Smelt releases from the refuge population to benefit the wild with maximum survival, retention of genetic diversity, and minimal risk to the wild population. A first step was the organization of a public workshop that identified some of the major scientific uncertainties and to guide future studies (Lessard et al. 2018). This workshop has led to DWR's collaborative work with UC Davis, USFWS, CDFW, and Reclamation to conduct initial investigations. The current work plan includes work on genetics, pathology, behavior, a Hatchery and Genetic Management Plan, and test use of hatchery fish in experimental enclosures placed in the wild. Ultimately, the goal of this work is to develop an adaptive population supplementation plan that will

assemble current knowledge about Delta Smelt, describe successful supplementation/reintroduction approaches for other fish species, identify research priorities, recommend monitoring approaches for evaluating supplementation strategies, and detail facility upgrade requirements for the refuge population.

DWR is proposing to continue collaborative laboratory and field work to develop a strategy for successful reintroduction of Delta Smelt to their natural environment in the wild and prevention of extinction. Since previous field work on hatchery smelt required the project team to secure CESA coverage for this project, we propose to include this work in our Project Description to allow continued laboratory and field research to support possible future supplementation. As in previous years, the work would be led by a hatchery advisory team, which could be the existing multi-agency group (CDFW, USFWS, Reclamation, DWR, UC Davis, USGS) or a potential new group organized by CDFW and USFWS.

For 2020 it is anticipated that the primary research activities will be deployment of custom smelt cages in multiple habitats (channel, tidal wetlands) and geographic areas (Suisun, Sacramento River, North Delta), genetic analysis of the wild and hatchery population, pathology, and behavioral studies. The specific details of the work will be subject to input and review by the agency hatchery advisory group.

No construction will occur as part of this proposal. Similarly, none of these studies are intended to directly augment the smelt population. Depending on study results, future decisions to proceed with supplementation would be subject to separate reviews under CESA, ESA, and CEQA.

2.3.15 WATER TRANSFERS

DWR and Reclamation propose to continue facilitating transfers of SWP water and other water supplies through CVP and SWP facilities, including north-to-south transfers and north-to-north transfers. The quantity and timing of Keswick releases would be similar to those that would occur absent the transfer. Water transfers would occur through various methods, including, but not limited to, groundwater substitution, release from storage, and cropland idling, and would include individual and multi-year transfers. The effects of developing supplies for water transfers in any individual year or a multi-year transfer is evaluated outside of this proposed action. North-to-South water transfers would occur from July through November in total annual volumes up to those described in Table 2-5.

Table 2-5. Proposed Annual North-to-South Water Transfer Volume

Water Year Type	Maximum Transfer Amount (TAF)
Critical	Up to 600
Dry (following Critical)	Up to 600
Dry (following Dry)	Up to 600
All other years	Up to 360

Note:
TAF = thousand acre-feet

As part of this proposed action, DWR and Reclamation will provide a transfer window from July 1 through November 30. Real-time operations may restrict transfers within the transfer window so that

Reclamation and DWR can meet other authorized project purposes, e.g., when pumping capacity is needed for CVP or SWP water.

2.3.16 ADAPTIVE MANAGEMENT PLAN

The Adaptive Management Plan (AMP) will be carried out to evaluate the efficacy of the operations and activities stated below. An Adaptive Management Team (AMT) will be established to carry out this AMP. The AMT will oversee efforts to monitor and evaluate the operations and related activities. In addition, the AMT will use structured decision-making to assess the relative costs and benefits of those operations and activities. The AMT will also identify proposed adaptive management changes to those operations and activities. The AMP will be developed before issuance of, and could be incorporated into, the ITP DWR is seeking for CESA coverage for the Proposed Project. Any proposed adaptive management changes should provide equivalent or superior conservation benefits to the listed species at equal or lesser societal costs. The objectives of the AMP are to: (i) continue the long-term operation of the SWP in a manner that improves water supply reliability and water quality consistent with applicable laws, contractual obligations, and agreements and (ii) use the knowledge gained from the scientific study and analysis described in the AMP to avoid, minimize and fully mitigate the adverse effects of SWP operations on CESA-listed aquatic species.

More specifically, the intent of this AMP is to:

- Create an adaptive management plan for ongoing operation of the SWP, as it operates in coordination with the CVP that will assist DWR in complying with applicable California law, including CESA.
- Develop and implement a monitoring protocol necessary to implement the AMP, working in coordination with the Collaborative Science and Adaptive Management Program (CSAMP) and the Delta Science Program (DSP) as appropriate.
- Identify the scope of the AMP, that is, the operations and activities that will be subject to adaptive management.
- Describe the decision-making and governance structure that will be used to implement the AMP including adaptive management changes.
- Describe the mechanisms that will be used to communicate among the Implementing Entities and with the broader stakeholder community regarding implementation of the AMP.
- Describe funding for the AMP.
- Describe the relationship between the AMP and real-time operations.

Each existing operation and activity and each adaptive management change must be accompanied by (1) a set of criteria that the Implementing Entities can use to determine whether the action is having the anticipated impacts (e.g., take limits derived from salvage data) and (2) monitoring that will provide the data necessary in order to determine whether the performance measures are being met. It may be necessary to undertake additional monitoring and research that build on existing efforts in order to carry out this adaptive management program. The AMP would draw upon the CSAMP and the

DSP, where appropriate, to assist with these monitoring and research efforts as well as program evaluation.

The AMP extends to specified operation of the SWP and activities undertaken by DWR concomitant to those operations. They include the following:

- Operation of the Banks Pumping Plant to comply with OMR flow requirements
- Delta Smelt Summer-Fall Habitat Action, including food enhancement actions
- Installation of the South Delta temporary barriers
- Spring outflow actions
- Clifton Court Forebay predator management
- Monitoring associated with all of the foregoing

While the AMP described in this document pertains only to specified operation of the SWP and activities undertaken by DWR concomitant to those operations and will be used to support the 2081 permit issued for operation of the SWP, upon unanimous agreement among the Implementing Entities, it may be (1) expanded in the future to include other operations and activities, or (2) implemented in a coordinated manner with other adaptive management programs covering such operations and activities. These may include ongoing operations of the CVP and implementation of voluntary agreements or other activities undertaken under the oversight of the State Water Resources Control Board.

3 INITIAL STUDY CHECKLIST

3.1 AESTHETICS

Table 3.1-1. Potential Impacts on Aesthetics

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
I. Aesthetics. Except as provided in Public Resources Code Section 21099, would the project:	-
Have a substantial adverse effect on a scenic vista?	No Impact
a) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	No Impact
b) Substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from a publicly accessible vantage point.) If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?	No Impact
c) Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?	No Impact

Note:
"-" indicates blank cell

3.1.1 ENVIRONMENTAL SETTING

The visual appearance of the landscape is dependent on the underlying landform and its land cover. Natural landscape elements include topography, geology, hydrology, vegetation, and wildlife. Engineered landscape elements include buildings, roads, infrastructure, and settlement patterns. The visual character of a particular landscape is established by the interaction of these physical elements. The visual quality of the landscape considers the vividness, intactness, and unity of the viewshed, along with considerations related to viewer sensitivity (i.e., the number and type of viewers and the frequency and duration of views). (Federal Highway Administration 1988; U.S. Forest Service 1995).

3.1.1.1 Visual Character

Delta and Suisun Marsh

The Delta and Suisun Marsh, which extend west to the San Francisco Bay, mark the confluence of the Sacramento and San Joaquin rivers. Major waterways and sloughs provide connections between the Sacramento, San Joaquin, Mokelumne, Cosumnes, and Calaveras rivers to the southeast. The smaller waterways traverse a landscape that includes more than 50 named islands and tracts, with hundreds of smaller islands, which vary in size from a few acres to several thousand acres. The larger islands are protected by flood control levees. Most of these levees are armored with large boulders to prevent erosion and scour. Viewed from the water, the armoring on the levees appears in sharp contrast to the water and surrounding vegetation, decreasing the visual quality. The height of the levees restricts views of the interior of the islands from most locations on the water.

The Delta region is nearly flat, with only a few scattered stands of trees. Most of the Delta is used for agricultural purposes. Visible flood management and irrigation facilities include levees and other impoundments, pumping plants, and control gate structures. Transportation infrastructure is limited, with only a few scattered roads and bridges that access the larger islands.

Suisun Marsh is characterized by tidal and freshwater wetlands and riparian woodlands. Upland areas, such as the Montezuma Hills, provide a backdrop with rolling hills and occasional oak woodlands. Much of Suisun Marsh is managed wetland that provides habitat for fish and resident and migrating birds and waterfowl.

San Francisco Bay

The physical and natural environment of the San Francisco Bay is diverse, with a wide range of visual resources. The Bay itself ranges from approximately 3 to 12 miles wide and is approximately 60 miles long. Typical views and landscapes include heavy urban development, natural and altered open-space areas, major ridgelines, and scenic waterways. The terrain ranges from alluvial plains to gently sloping hills and wooded ravines. Striking scenic vistas of iconic scenes are available throughout the area: the San Francisco Bay, the San Francisco skyline, Angel Island, Alcatraz Island, Mount Tamalpais, the Peninsula foothills, and the East Bay hills. Views to the east are dominated by Mount Diablo and the adjacent Diablo Ridge and associated valleys. Views to the west are dominated by the Coast Ranges.

San Luis Reservoir

The SWP and CVP San Luis Reservoir complex is in the western foothills of the Coast Ranges, on the western side of the northern San Joaquin Valley. The CVP and SWP water conveyance facilities are at the base of the San Luis Reservoir. This area is sparsely populated and is characterized by mountainous to hilly terrain, with grasslands and scattered oak woodlands along narrow streams.

The predominant visual feature in the San Joaquin Valley is agricultural land. Where visible along the western and eastern margins of the valley, predominant visual features also include views of the Coast Ranges and Sierra Nevada, respectively.

The San Luis and Los Banos Creek reservoirs are part of the visual resources for the San Luis Reservoir State Recreation Area and Cottonwood Creek Wildlife Area. The shorelines of the reservoirs are undeveloped, except for recreational facilities. Views include annual grassland, coastal sage, and riparian woodland. When the reservoir waters are drawn down, broad bands of bare soil are exposed, detracting from the visual quality. Open water viewing opportunities also occur south of the San Luis Reservoir complex at the Little Panoche Reservoir, west of Interstate (I) 5.

SWP Service Areas

Areas along the Pacific Coast in San Luis Obispo, Santa Barbara, Ventura, portions of Los Angeles, portions of Orange, and San Diego counties are characterized by steep, craggy coastal mountains and coastal plains. The visual resources include beaches, sand dunes, coastal bluffs, headlands, wetlands, estuaries, islands, hillsides, and canyons. The foothills extend from the Pacific Ocean to more than 800

feet above mean sea level and generally are covered with mature trees (including native oaks, deciduous trees, and eucalyptus) and grasslands.

Inland from the Pacific Ocean, urban areas extend throughout large portions of the foothills and valleys of Los Angeles, Orange, San Diego, Riverside, and San Bernardino counties. Reduced abundance of natural features and scenic vistas and the dominating presence of non-urban land uses diminish the visual quality. However, in the Coachella Valley portion of Riverside County, the visual character is dominated by dramatic vistas of the Santa Rosa, San Jacinto, San Bernardino, Cottonwood, and Chocolate mountains, with high desert craggy rock outcroppings and sparse vegetation. The Salton Sea in the southern Coachella Valley provides dramatic vistas from the shoreline and highways that extend around the open water.

The inland areas also include major surface water resources that provide open water vistas associated with recreational activities, including the Twitchell Reservoir, Silverwood Lake, Diamond Valley Lake, Lake Perris, Lake Skinner, Vail Lake, and Lake Mathews, along with smaller water supply reservoirs. Many of these reservoirs store SWP water and are human-built reservoirs, located in the foothills or at the edge of the foothills.

3.1.1.2 Wild and Scenic Rivers

The National Wild and Scenic Rivers System was created by the U.S. Congress in 1968 (Public Law 90-542; 16 U.S. Code 1271 et seq.) to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition and to protect the rivers and their immediate environments.

The California Wild and Scenic Rivers Act (California Public Resources Code Section 5093.50 et seq.) was enacted in 1972 to preserve designated rivers or river segments that are free-flowing and possess extraordinary wildlife, fishery, scenic, or recreational values. The act designates rivers or segments of rivers in the state as wild, scenic, or recreational for preserving the highest and most beneficial uses of those rivers.

After a river is designated as wild and scenic, existing recreation, agricultural practices, residential development, and other permitted uses (such as power generation and diversion under existing, permitted water rights) may continue. New uses that would substantially degrade the visual character are prohibited. Protection of the river is provided through regulation and programs of federal, State, local, or tribal governments, and through voluntary stewardship by landowners and river users. Six designated wild and scenic rivers are in the Central Coast and Southern California SWP service area: one in the mountains north of Santa Barbara, two in the Angeles National Forest, and three in the Santa Rosa–San Jacinto Mountains west of Palm Springs (National Wild and Scenic River System 2019).

3.1.1.3 State Scenic Highways

The California Scenic Highway Program is intended to protect and enhance California's natural beauty, and to protect the social and economic values provided by the State's scenic resources. The program is administered by the California Department of Transportation. A variety of roadways throughout the state have been officially designated as "scenic corridors." Other roadways have been classified as

"eligible" but have not been granted "scenic" status. A State-designed scenic corridor requires, at a minimum, the following actions that are designed to protect the existing visual quality (Caltrans 2018):

- regulation of land use and density of development;
- detailed land and site planning;
- control of outdoor advertising, including a ban on billboards;
- careful attention to and control of earthmoving and landscaping; and
- careful attention to design and appearance of structures and equipment.

Portions of the scenic viewshed around one scenic highway in the Northern California project area were burned by wildfires in 2018:

- SR 70 from Red Hill south of Lake Oroville northeast to Grizzly Creek burned in the 2018 Camp Fire (CAL FIRE 2018)

The existing visual quality of this scenic highway in the burn areas now is considered to be low because of the dominant appearance of brown and blackened vegetation.

Table 3.1-2 shows designated and eligible scenic highway corridors in the vicinity of SWP or CVP facilities or water bodies.

Table 3.1-2. Scenic Highways

Project Region	Description	Type of Designation
Sacramento Valley Region	-	-
Sacramento County	SR 160 from Freeport south to the border with Contra Costa County (paralleling the Sacramento River and crossing the Delta)	State
Contra Costa County	SR 160 from the border with Sacramento County to the intersection with SR 4, and south on SR 4 to Sellers Avenue (crossing the Delta and the lower San Joaquin River)	Eligible
Delta Region	-	-
Sacramento County	SR 160 from Freeport south to the border with Contra Costa County (paralleling the Sacramento River and crossing the Delta)	State
Contra Costa County	SR 160 from the border with Sacramento County to the intersection with SR 4, and south on SR 4 to Sellers Avenue (crossing the Delta and the lower San Joaquin River)	Eligible
San Francisco Bay Region	-	-
Solano County	SR 37 from Vallejo to Sears Point (crossing a portion of the northern San Francisco Bay)	Eligible

Sources: Caltrans 2017a, 2017b

SR = State Route

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Several State-designated scenic corridors are in the Central Coast and Southern California SWP service area. Most of these roadways have been designated based on views of agricultural land; a few are in mountainous areas where scenic mountain vistas are present (Caltrans 2017a).

3.1.2 DISCUSSION

a) Have a substantial adverse effect on a scenic vista?

The Proposed Project would not involve any new construction of water facilities, infrastructure, or result in land disturbance. Furthermore, no changes in land use (i.e., conversion from agricultural land to non-agricultural land) are anticipated because of the Proposed Project. Therefore, **no impact** on an existing scenic vista would occur.

Section 3.10, "Hydrology and Water Quality," of this IS concludes that the proposed long-term operation of the SWP would remain within the historic range of past SWP operations and would not result in altering downstream surface water flows that would alter existing visual resources or scenic vistas. **No impact** on an existing scenic vista would occur.

b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

For the same reasons described in response to Item (a), the proposed long-term operation of the SWP would not substantially damage scenic resources within a designated state scenic highway. **No impact on** an existing scenic resource or views along a state scenic highway would occur.

c) Substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from a publicly accessible vantage point.) If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?

The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance. No changes in land use (i.e., conversion from agricultural land to non-agricultural land uses) are anticipated because of the proposed long-term operation of the SWP.

The proposed long-term operation and maintenance of existing SWP facilities would have no effect on the existing visual character of the SWP facilities or their surroundings. The proposed long-term operation of the SWP would not reduce the scenic attributes or degrade the visual quality of associated streams and rivers or the surrounding landscape that would conflict with applicable zoning and other regulations governing scenic quality. **No impact on** the visual character of the landscape or the quality of public views would occur.

d) Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?

The Proposed Project would not involve any new construction of water facilities, infrastructure, or land disturbance that could require new nighttime lighting or create new sources of glare. The proposed long-term operation of the SWP also would not require new nighttime lighting or create new sources of glare. **No impact** would occur.

3.2 AGRICULTURE AND FORESTRY RESOURCES

Table 3.2-1. Potential Impacts on Agriculture and Forestry Resources

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
II. Agriculture and Forestry Resources. In determining whether impacts on agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997, as updated) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts on forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board.	-
Would the project:	
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	No Impact
b) Conflict with existing zoning for agricultural use or a Williamson Act contract?	No Impact
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	No Impact
d) Result in the loss of forest land or conversion of forest land to non-forest use?	No Impact
e) Involve other changes in the existing environment that, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?	No Impact

Note:
"-" indicates blank cell

3.2.1 ENVIRONMENTAL SETTING

3.2.1.1 Agricultural Resources

California ranks as the leading agricultural state in the United States in terms of farm-level sales. In 2017, California's farm-level sales totaled nearly $50 billion and accounted for 13% of total U.S. agricultural sales. Tulare and Kern counties rank among the leading agricultural counties in the nation (CRS 2015).

According to the 2017 Census of Agriculture (the most recent census for which data were available at the time of writing), there is approximately 24.523 million acres of farmland in California, and these acres represent slightly less than a quarter of California's total land area (USDA 2019). The acreage of farmland includes approximately:

- 9.6 million acres of cropland
- 11.6 million acres of permanent pasture and rangeland
- 1.85 million acres of pastured or unpastured woodlands
- 1.47 million acres in farmsteads, buildings, livestock facilities, roads, ponds and wastelands, etc.

The acreage of farmland, including irrigated farmland, in California has decreased over the past 20 years, down from approximately 8.89 million acres of farmland in 1997 to approximately 7.84 million acres of land in 2017 (USDA 2019).

The existing SWP plays an important role in California's agriculture, as approximately 30% of SWP water is used to irrigate approximately 750,000 acres of farmland, located mostly within the San Joaquin Valley (Water Education Foundation 2019). Table 3.2-2 shows the State Water Contractors that supply water for agricultural purposes.

Table 3.2-2. State Water Contractors that Supply Water for Agricultural Use

State Water Contractors	Table A Contracted Water Supply (acre-feet)
Oak Flat Water District	5,700
Kings County	9,305
Dudley Ridge Water District	45,350
Empire West Side Irrigation District	3,000
Kern County Water Agency[1]	982,730
Tulare Lake Water Storage District	87,471
Antelope Valley-East Kern Water Agency[2]	144,844

Notes:

[1] Approximately 15% of the Kern County Water Agency Table A amount is classified as municipal and industrial supply.

[2] Approximately 75% of the Antelope Valley-East Kern Water Agency Table A amount is used for municipal and industrial supply.

Source: DWR 2016

Approximately 14.8 million acres of California farmland reported enrollment in California Land Conservation Act (Williamson Act) contracts in 2015 (CDOC 2016). The Department of Conservation's Farmland Mapping and Monitoring Program (FMMP) identifies the suitability of agricultural lands in the state of California. The classifications of Prime Farmlands, Farmlands of Statewide Importance, Unique Farmland, Farmland of Local Importance, and Grazing Land are based on both land use and soil. Approximately 5.1 million acres of irrigated farmland in the state was identified as prime farmland in 2012, the most recent year for which statewide data were available (CDOC 2015).

The following discussion summarizes agricultural land use and irrigation practices within the project area, itemized by county and leading commodities.

Sacramento-San Joaquin Delta

The Delta Region includes Sacramento, Yolo, Solano, San Joaquin, and Contra Costa counties. Of these five counties, San Joaquin County has the highest acreage of total agricultural land, irrigated land, prime farmland, and land under Williamson Act contracts (Table 3.2-3).

Table 3.2-3. Delta Region Agricultural Land Uses

Land Use	Sacramento County	Yolo County	Solano County	San Joaquin County	Contra Costa County
Total Agricultural Land (acres)#	260,212	459,662	342,593	772,762	155,572
Total Irrigated Land (acres) #	100,399	234,703	110,396	487,147	22,625
Prime Farmland (acres)*	90,691	250,345	130,843	381,634	26,332
Farmland of Statewide Importance (acres)*	43,342	19,529	6,674	82,618	7,733
Unique Farmland (acres)*	15,540	46,095	10,346	81,920	3,392
Farmland of Local Importance (acres)*	57,910	49,671	0	68,903	60,416
Williamson Act Contracts (acres)+	174,656	NR	271,041	499,654	42,137
Leading Commodities^	Grapes (Wine), Milk, Poultry, Pears (Bartlett)	Almonds, Tomatoes, Grapes (Wine), Field Crops	Walnuts, Nursery, Almonds, Tomatoes	Grapes (Wine), Milk, Almonds, Walnuts	Cattle & Calves, Tomatoes, Corn (Sweet), Grapes (Wine)

Notes:
Total agricultural land and irrigated land data are from the 2017 Census of Agriculture (USDA 2019).
* Important farmland data are from the 2016 FMMP Inventory (CDOC 2016a).
+ Williamson Act Contract data are from 2015 Reported Acreage (CDOC 2016b).
^ Commodity data are from the 2017-18 California Agriculture Statistics Review (CDFA 2018).
FMMP = Farmland Mapping and Monitoring Program
NR = not reported

San Joaquin Valley Region

The San Joaquin Valley Region includes Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Kern counties. Of the seven counties in this region, Kern County has the highest acreage of agricultural land and land under Williamson Act contracts, while Fresno County has the highest acreage of irrigated land and prime farmland (Table 3.2-4).

San Francisco Bay Area Region

The San Francisco Bay Area Region includes Alameda, Napa, Santa Clara, and San Benito counties. Of these four counties, San Benito has the highest acreage of total agricultural land and land enrolled in Williamson Act contracts, while Napa County has the highest acreage of irrigated land and prime farmland (Table 3.2-5).

Central Coast Region

The Central Coast Region includes San Luis Obispo and Santa Barbara counties. Of these, San Luis Obispo County has the highest acreage of total agricultural land and Williamson Act contracts, while Santa Barbara has the highest acreage of irrigated land and prime farmland (Table 3.2-6).

Table 3.2-4. San Joaquin Valley Region Agricultural Land Uses

Land Use	Stanislaus County	Merced County	Madera County	Fresno County	Kings County	Tulare County	Kern County
Total Agricultural Land (acres)#	722,546	946,385	645,358	1,646,540	615,958	1,250,121	2,295,497
Total Irrigated Land (acres)#	380,590	493,726	300,234	972,576	371,699	568,184	730,711
Prime Farmland (acres)*	249,967	269,243	98,500	675,722	110,915	366,136	579,295
Farmland of Statewide Importance (acres)*	33,172	154,209	85,206	397,134	339,020	322,355	209,484
Unique Farmland (acres)*	116,210	115,235	180,291	94,902	18,920	11,691	91,323
Farmland of Local Importance (acres)*	26,029	61,671	8,751	191,782	10,984	157,937	0
Williamson Act Contracts (acres)+	575,705	464,031	538,340	1,473,924	674,445	1,097,727	1,673,306
Leading Commodities^	Almonds, Milk, Chickens, Nursery (Fruit/Vine/ Nut, non-bearing)	Milk, Almonds, Chickens, Cattle and Calves	Almonds, Milk, Pistachios, Grapes (Wine)	Almonds, Poultry, Pistachios, Milk	Milk, Cotton (Pima), Cattle and Calves, Almonds	Milk, Grapes (Table), Cattle and Calves, Oranges	Grapes (Table), Almonds, Milk, Pistachios

Notes:
Total agricultural land and irrigated land data are from the 2017 Census of Agriculture (USDA 2019).
* Important Farmland data are from the 2016 FMMP Inventory (CDOC 2016a).
+ Williamson Act Contract data are from 2015 Reported Acreage (CDOC 2016b).
^ Commodity data are from the 2017-18 California Agriculture Statistics Review (CDFA 2018).
FMMP = Farmland Mapping and Monitoring Program

Table 3.2-5. San Francisco Bay Area Region Agricultural Land Uses

Land Use	Alameda County	Napa County	Santa Clara County	San Benito County
Total Agricultural Land (acres)#	183,282	255,778	288,084	520,127
Total Irrigated Land (acres)#	7,511	60,945	19,222	18,085
Prime Farmland (acres)*	3,392	30,619	14,909	26,833
Farmland of Statewide Importance (acres)*	1,127	9,593	3,273	7,107
Unique Farmland (acres)*	2,153	16,803	2,227	2,412
Farmland of Local Importance (acres)*	0	18,326	5,581	17,157
Williamson Act Contracts (acres)+	138,245	73,956	304,335	577,842
Leading Commodities^	Grapes (Wine), Cattle and Calves, Nursery (Woody Ornamental), Pasture	Grapes (Wine), Cattle and Calves, Livestock Products, Nursery Products	Mushrooms, Nursery (Products), Nursery (Woody Ornaments), Lettuce	Vegetables, Lettuce, Peppers (Bell), Grapes (Wine)

Notes:
Total agricultural land and irrigated land data are from the 2017 Census of Agriculture (USDA 2019).
* Important Farmland data are from the 2016 FMMP Inventory (CDOC 2016a).
+ Williamson Act Contract data are from 2015 Reported Enrollment (CDOC 2016b).
^ Commodity data are from the 2017-18 California Agriculture Statistics Review (CDFA 2018).
FMMP = Farmland Mapping and Monitoring Program

Table 3.2-6. Central Coast Region Agricultural Land Uses

Land Use	San Luis Obispo County	Santa Barbara County
Total Agricultural Land (acres)#	931,291	715,067
Total Irrigated Land (acres)#	75,766	119,925
Prime Farmland (acres)*	41,188	66,978
Farmland of Statewide Importance (acres)*	22,697	13,194
Unique Farmland (acres)*	45,175	37,325
Farmland of Local Importance (acres)*	288,127	8,951
Williamson Act Contracts (acres)+	783,649	515,294
Leading Commodities^	Grapes (Wine), Strawberries, Vegetables, Cattle and Calves	Strawberries, Broccoli, Grapes (Wine), Vegetables

Notes:
#Total agricultural land and irrigated land data are from the 2017 Census of Agriculture (USDA 2019).
* Important Farmland data are from the 2016 FMMP Inventory (CDOC 2016a).
+ Williamson Act Contract data are from 2015 Reported Enrollment (CDOC 2016b).
^ Commodity data are from the 2017-18 California Agriculture Statistics Review (CDFA 2018).
FMMP = Farmland Mapping and Monitoring Program

Southern California Region

The Southern California Region includes Ventura, Los Angeles, Orange, San Diego, Riverside, and San Bernardino counties. Of these six counties, Riverside County has the highest acreage of total agricultural land, irrigated land, and prime farmland, while Ventura County has the highest acreage enrolled in Williamson Act contracts (Table 3.2-7).

Table 3.2-7. Southern California Region Agricultural Land Uses

Land Use	Ventura County	Los Angeles County	Orange County	San Diego County	Riverside County	San Bernardino County
Total Agricultural Land (acres)#	260,102	57,809	32,401	222,094	263,796	68,228
Total Irrigated Land (acres)#	98,074	13,800	4,214	42,653	126,217	22,205
Prime Farmland (acres)*	40,976	22,613	2,391	5,669	117,484	11,323
Farmland of Statewide Importance (acres)*	32,992	770	411	8,075	43,757	5,770
Unique Farmland (acres)*	28,950	962	2,913	43,618	32,565	2,738
Farmland of Local Importance (acres)*	15,590	3,045	0	155,566	226,029	562
Williamson Act Contracts (acres)+	127,170	41,093	-	-	54,468	4,717
Leading Commodities^	Strawberries, Lemons, Celery, Raspberries	Nursery Products, Vegetables, Field Crops, Livestock Products	Nursery (Woody Ornaments), Strawberries, Vegetables, Citrus	Nursery (Woody Ornaments), Flowers, Nursery (Plants), Avocadoes	Milk, Nursery (Woody Ornaments), Grapes (Table), Lemons	Milk, Cattle and Calves, Eggs (Chicken), Nursery (Woody Ornaments)

Notes:
#Total agricultural land and irrigated land data are from the 2017 Census of Agriculture (USDA 2019).
* Important Farmland data are from the 2016 FMMP Inventory (CDOC 2016a).
+ Williamson Act Contract data are from 2015 Reported Enrollment (CDOC 2016b).
FMMP = Farmland Mapping and Monitoring Program
^ Commodity data are from the 2017-18 California Agriculture Statistics Review (CDFA 2018).
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3.2.1.2 Forestry Resources

Forestland is defined by Section 12220[g] of the California Public Resources Code as land that can support 10% native tree cover and woodland vegetation of any species, including hardwoods, under natural conditions and that allows management of one or more forest resources, including timber, aesthetics, fish and wildlife, biodiversity, water quality, recreation, and other public benefits. Approximately 33 million acres of forest are present in California, mostly found in mountainous areas, including the Cascade Range, the Sierra Nevada, and the Coast Ranges, and in the cool, mesic fog belt along California's north and central coasts (USDA 2016).

Timberland is defined as forestland that is producing or capable of producing more than 20 cubic feet per acre per year of wood but excludes reserved forestland (areas permanently reserved from wood products use through statute or administrative designation). In California, timberlands account for 50% of California's total forestland area. The principal timberlands include California mixed conifer, ponderosa pine, Douglas fir, and redwood forests. Unreserved forestland, consisting of forestland not withdrawn from harvest by statute or administration regulation, makes up approximately 30% of forestland area. Reserved forestland, consisting of areas permanently reserved from wood products use through statute or administrative designation, makes up approximately 18% of forestland area. Reserved forestland includes national forest wilderness areas, national parks, and monuments (CDFA 2016).

The following discussion describes forestland resources within for each region.

Delta Region

Among the counties in the Delta Region, Yolo County has the largest amount of forest area, with 66,600 acres, and the largest amount of unreserved forest area. Sacramento County has the smallest amount of forest area, with 9,700 acres (Table 3.2-8).

Table 3.2-8. Delta Region Forestland

County	Unreserved Forest Area (thousand acres)	Reserved Forest Area (thousand acres)	Total Forest Area (thousand acres)
Contra Costa	23.9	19.3	43.2
Sacramento	9.7	N/A	9.7
San Joaquin	24.6	N/A	24.6
Solano	26.5	1.5	28.0
Yolo	66.6	N/A	66.6

Source: CDFA 2016

San Joaquin River Region

In the San Joaquin River Region, Tulare County had the largest amount of forest area, with 1,374,800 acres. Kings County had the smallest amount, with no forestland area. Kern County had the largest amount of unreserved forest area, with 724,700 acres (Table 3.2-9).

Table 3.2-9. San Joaquin River Region Forestland

County	Unreserved Forest Area (thousand acres)	Reserved Forest Area (thousand acres)	Total Forest Area (thousand acres)
Fresno	620.8	646.0	1,266.8
Kern	724.7	72.7	797.4
Kings	N/A	N/A	N/A
Madera	540.0	183.0	723.0
Merced	24.9	6.9	31.8
Stanislaus	85.8	17.7	103.6
Tulare	500.2	874.6	1,374.8

Source: CDFA 2016

San Francisco Bay Area Region

In the San Francisco Bay Area Region, Santa Clara County has the largest amount of forest area, with 280,000 acres, and the largest amount of unreserved forest area. Alameda County has the smallest amount of forest area, with 106,200 acres (Table 3.2-10).

Table 3.2-10. San Francisco Bay Area Region Forestland

County	Unreserved Forest Area (thousand acres)	Reserved Forest Area (thousand acres)	Total Forest Area (thousand acres)
Alameda	86.6	19.7	106.2
Napa	172.4	7.5	179.9
San Benito	150.2	N/A	150.2
Santa Clara	214.1	65.9	280.0

Source: CDFA 2016

Central Coast Region

In the Central Coast Region, Santa Barbara County has the largest amount of forest area, with 308,800 acres. San Luis Obispo County has the smallest amount of forest area, with 298,000 acres, but the largest amount of unreserved forest area (Table 3.2-11).

Table 3.2-11. Central Coast Region Forestland

County	Unreserved Forest Area (thousand acres)	Reserved Forest Area (thousand acres)	Total Forest Area (thousand acres)
San Luis Obispo	269.1	28.9	298.0
Santa Barbara	231.6	77.2	308.8

Source: CDFA 2016

Southern California Region

Among Southern California Region counties, San Bernardino County has the largest amount of forest area, with 528,800 acres, and the largest amount of unreserved forest area. Orange County has the smallest amount of forest area, with 13,900 acres (Table 3.2-12).

Table 3.2-12. Southern California Region Forestland

County	Unreserved Forest Area (thousand acres)	Reserved Forest Area (thousand acres)	Total Forest Area (thousand acres)
Los Angeles	211.4	37.3	248.7
Orange	11.1	2.8	13.9
Riverside	65.4	66.7	132.1
San Bernardino	333.3	195.5	528.8
San Diego	94.1	53.1	147.1
Ventura	179.5	88.1	267.6

Source: CDFA 2016

3.2.2 DISCUSSION

a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance, and would therefore not have any direct impact on land uses in the project area. Proposed water deliveries to agricultural land uses as part of the long-term operation of the SWP would be consistent with historic deliveries, which fluctuate depending on water year type, water demands, and cropping patterns. The proposed long-term operation of the SWP would increase agricultural water deliveries to the seven SWP water contractors receiving agricultural water supplies by an average annual 59 thousand acre-feet (TAF). This increased supply would be divided by the SWP water contractors in three regions receiving agricultural water supplies, consisting of San Joaquin Valley 4 TAF, Tulare Basin 54 TAF, and South Coast 1 TAF.

Because the proposed long-term operation of the SWP would remain within the historic range of deliveries, the proposed long-term operation of the SWP would not cause indirect changes to agricultural lands. Therefore, there would be no conversion of lands designated as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland as a result of the proposed long-term operation of the SWP. Thus, **no impact** would occur.

b) Conflict with existing zoning for agricultural use or a Williamson Act contract?

As discussed under (a) above, the proposed long-term operation of the SWP would not have any direct or indirect impact on agricultural land uses in the project area, as the proposed actions would not involve any new construction of water facilities, infrastructure, or land disturbance, and water deliveries would be consistent with historic deliveries. Therefore, the proposed long-term operation of the SWP would not conflict with existing agricultural land use or Williamson Act contracts. Therefore, **no impact** would occur.

c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?

The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance, and would not change existing land uses within the project area. Therefore, the proposed long-term operation of the SWP would not conflict with existing forest land zoning or cause rezoning of forest land or timberland. Thus, **no impact** would occur.

d) Result in the loss of forest land or conversion of forest land to non-forest use?

The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance, and would not require any changes to SWP facilities that would convert forest land to non-forest uses. Therefore, the Proposed Project would not result in the loss of forest land or conversion of forest land to non-forest uses. **No impact** would occur.

e) Involve other changes in the existing environment that, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?

The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance, and would not directly change existing land uses within the project area. The proposed long-term operation of the SWP would continue the conveyance of irrigation water to areas north and south of the Delta and would not reduce water deliveries to agricultural lands currently served by the SWP. Proposed water deliveries under the long-term operation of the SWP would be within the historic range of water deliveries. Therefore, the Proposed Project would not cause indirect changes that would result in conversion of Farmland to non-agricultural use.

The Proposed Project would not involve any construction activities or changes to SWP facilities that would convert forest land to non-forest uses. This project would not conflict with existing zoning for forestland, timberland or Timberland Production Zone, nor would it result in the conversion of forestland to non-forest use. Thus, **no impact on** existing farmland or forestry resources would occur.

3.3 AIR QUALITY

Table 3.3-1. Potential Impacts on Air Quality

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
III. Air Quality. Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied on to make the following determinations. Would the project:	–
a) Conflict with or obstruct implementation of the applicable air quality plan?	No Impact
b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard?	No Impact
c) Expose sensitive receptors to substantial pollutant concentrations?	No Impact
d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?	No Impact
e) Create objectionable odors affecting a substantial number of people?	No Impact

Note:
"-" indicates blank cell

3.3.1 ENVIRONMENTAL SETTING

California is divided geographically into 15 different air basins to manage the state's air quality on a regional basis. Air quality is defined as the concentration of pollutants in relation to their impact on human health. Ambient concentrations of air pollutants are determined by the amount of emissions released by pollutant sources and the ability of the atmosphere to transport and dilute such emissions. Natural factors that affect transport and dilution include terrain, wind, atmospheric stability, and the presence of sunlight. Therefore, existing air quality conditions in the project area are influenced by factors such as topography, meteorology, and climate, as well as the quantity of emissions released by air pollutant sources.

Individual air pollutants at certain concentrations may adversely affect human or animal health, reduce visibility, damage property, and reduce the productivity or vigor of crops and natural vegetation. Six air pollutants have been identified by the U.S. Environmental Protection Agency (EPA) and the California Air Resources Board (CARB) as being of concern, both on a nationwide and statewide level: ozone; carbon monoxide (CO); nitrogen dioxide (NO_2); sulfur dioxide (SO_2); lead; and particulate matter (PM), which is subdivided into two classes based on particle size: PM equal to or less than 10 micrometers in diameter (PM_{10}), and PM equal to or less than 2.5 micrometers in diameter ($PM_{2.5}$). Because the air quality standards for these air pollutants are regulated using human and environment health-based criteria, they commonly are referred to as "criteria air pollutants."

Air quality in the project area is regulated by federal and State agencies, including EPA and CARB. CARB regulates air quality in California through local air pollution control districts and air quality management districts. Local air districts administer air quality laws and regulations within the air

basins. The local air districts have permitting authority over all stationary sources of air pollutants within their district boundaries and provide the primary review of environmental documents that are prepared for projects with air quality issues. Areas are classified under the federal Clean Air Act and California Clean Air Act as attainment, nonattainment, or maintenance (previously nonattainment and currently attainment) for each criteria pollutant, based on whether the federal and State air quality standards have been achieved.

The following subsections briefly describe the existing environmental setting by air basin for the project area. The counties within each air basin in the project area are shown in Table 3.3-2, along with nonattainment designations to characterize existing ambient air quality. Nonattainment designations indicate that concentrations of pollutants measured in ambient air exceed the applicable ambient air quality standards.

Table 3.3-2. Air Quality Status of the Project Area

County	Air Basin	Air District	Federal Nonattainment Designations	State Nonattainment Designations
Central Valley Region	-	-	-	-
Butte	Sacramento Valley	Butte	Ozone and $PM_{2.5}$ in Chico	Ozone, PM_{10}, $PM_{2.5}$
Yuba	Sacramento Valley	Feather River	–	Ozone, PM_{10}
Sutter	Sacramento Valley	Feather River	Ozone	Ozone, PM_{10}
Yolo	Sacramento Valley	Yolo-Solano	Ozone, $PM_{2.5}$	Ozone, PM_{10}
Sacramento	Sacramento Valley	Sacramento Metro	Ozone, $PM_{2.5}$	Ozone, PM_{10}
Plumas	Mountain Counties	Northern Sierra	–	$PM_{10,}$ $PM_{2.5}$ (Portola Valley)
San Joaquin	San Joaquin Valley	San Joaquin Valley	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Kings	San Joaquin Valley	San Joaquin Valley	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Tulare	San Joaquin Valley	San Joaquin Valley	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Kern	San Joaquin Valley, Mojave Desert	San Joaquin Valley, Kern	Ozone, $PM_{2.5}$, PM_{10} (East Kern)	Ozone, PM_{10}, $PM_{2.5}$ (San Joaquin Valley Air Basin)
San Francisco Bay Area Region	-	-	-	-
Napa	San Francisco Bay Area	Bay Area	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Solano	Sacramento Valley, San Francisco Bay Area	Yolo-Solano and Bay Area	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Contra Costa	San Francisco Bay Area	Bay Area	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Alameda	San Francisco Bay Area	Bay Area	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Santa Clara	San Francisco Bay Area	Bay Area	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
San Benito	North Central Coast	Monterey Bay Unified	–	Ozone, PM_{10}
Central Coast Region	-	-	-	-
San Luis Obispo	South Central Coast	San Luis Obispo	Ozone (Eastern San Luis Obispo)	Ozone, PM_{10}

County	Air Basin	Air District	Federal Nonattainment Designations	State Nonattainment Designations
Santa Barbara	South Central Coast	Santa Barbara	–	Ozone, PM_{10}
Southern California Region	-	-	-	-
Ventura	South Central Coast	Ventura	Ozone	Ozone, PM_{10}
Los Angeles	South Coast, Mojave Desert	South Coast, Antelope Valley	Ozone, $PM_{2.5}$, Lead	Ozone; PM_{10}; $PM_{2.5}$
San Bernardino	South Coast, Mojave Desert	South Coast, Mojave Desert	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Riverside	South Coast, Mojave Desert, Salton Sea	South Coast, Mojave Desert	Ozone, PM_{10}, $PM_{2.5}$	Ozone; PM_{10}; $PM_{2.5}$
Orange	South Coast	South Coast	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
San Diego	San Diego County	San Diego	Ozone	Ozone, PM_{10}, $PM_{2.5}$

Note:
PM_{10} -= PM equal to or less than 10 micrometers in diameter
$PM_{2.5}$ = PM equal to or less than 2.5 micrometers in diameter
"-" indicates blank cell

3.3.1.1 Sacramento Valley Air Basin

The Sacramento Valley Air Basin encompasses nine air districts and 11 counties, including all of Shasta, Tehama, Glenn, Colusa, Butte, Sutter, Yuba, Sacramento, and Yolo counties; the westernmost portion of Placer County; and the northeastern half of Solano County. The air basin is bounded by tall mountains, including the Coast Range to the west, the Cascade Range to the north, and the Sierra Nevada to the east. This air basin is within the northern portion of the Central Valley Region of the project area.

When air stagnates or is trapped by an inversion layer in the valley, ambient pollutant concentrations can reach or exceed threshold levels. On-road vehicles are the largest source of smog-forming pollutants, and PM emissions primarily are from area sources, such as fugitive dust from paved and unpaved roads and vehicle travel (CARB 2013).

3.3.1.2 San Francisco Air Basin

The San Francisco Bay Area Air Basin consists of a single air district and nine counties, including all of Napa, Marin, San Francisco, Contra Costa, Alameda, San Mateo, and Santa Clara counties; the southern portion of Sonoma County; and the southwestern portion of Solano County (CARB 2013). The hills of the Coast Ranges bound the San Francisco and San Pablo bays and the inland valleys of the air basin. This air basin includes the San Francisco Bay Area Region of the project area.

The San Francisco Bay Area Air Basin includes the second largest urban area in California, hosting industry, airports, international ports, freeways, and surface streets. On-road vehicles are the largest source of smog-forming pollutants, and PM_{10} emissions primarily are from area sources, such as fugitive dust from paved and unpaved roads and vehicle travel (CARB 2013). Air quality in the San Francisco Bay Area often is good because sea breezes blow clean air from the Pacific Ocean into the air basin, but transport of pollutants from the San Francisco Bay Area can exacerbate air quality problems

in the downwind portions of the San Francisco Bay Area Air Basin as well as in the Sacramento Valley and San Joaquin Valley air basins.

3.3.1.3 San Joaquin Valley Air Basin

The San Joaquin Valley Air Basin encompasses eight counties, including all of San Joaquin, Stanislaus, Madera, Merced, Fresno, Kings, and Tulare counties, and western Kern County. It is bounded on the west by the Coast Ranges, on the east by the Sierra Nevada, and in the south by the Tehachapi Mountains. This air basin is within the central and southern portions of the Central Valley Region of the project area.

The area is dominated by agricultural and other localized industries, such as forest products, oil and gas production, and oil refining. On-road vehicles are the largest source of smog-forming pollutants, and PM_{10} emissions primarily are from sources such as agricultural operations and fugitive dust from paved and unpaved roads and vehicle travel (CARB 2013). Air quality issues may be exacerbated under dry conditions. When water supplies and irrigation levels are decreased in urban, rural, and agricultural areas, increased potential exists for the formation and transport of fugitive dust.

3.3.1.4 North Central Coast Air Basin

The North Central Coast Air Basin includes Santa Cruz, San Benito, and Monterey counties (CARB 2013). This air basin includes San Benito County, which is within the San Francisco Bay Area Region of the project area. The North Central Coast Air Basin is in attainment for all National Ambient Air Quality Standards and is designated as nonattainment for the State ozone and PM_{10} standards (CARB 2014). Although separated by the Santa Cruz mountains and Coast Ranges to the north, wind can transport air pollution from the San Francisco Bay Area Air Basin and contribute to elevated ozone concentrations in the area (CARB 2013).

3.3.1.5 South Central Coast Air Basin

The South Central Coast Air Basin includes San Luis Obispo, Santa Barbara and Ventura counties. It is bordered by the Pacific Ocean on the south and west and lies just north of the highly populated South Coast Air Basin. This air basin includes the Central Coast Region and the northern Southern California Region of the project area.

Sources of pollutants in the air basin include power plants, oil production and refining, vehicle travel, and agricultural operations. San Luis Obispo, Santa Barbara, and Ventura counties are designated as nonattainment for the State ozone and PM_{10} standards. Eastern San Luis Obispo and Ventura counties are designated as nonattainment for the federal ozone standard (EPA 2015). Wind patterns link Ventura and Santa Barbara counties, resulting in pollutant transport between the South Central Coast and South Coast air basins. San Luis Obispo County is separated from these counties by mountains, and the air quality in San Luis Obispo County is linked more with conditions in the San Francisco Bay Area Air Basin and San Joaquin Valley Air Basin. In addition, air emissions from the South Coast Air Basin can be blown offshore and then carried to the coastal cities of the South Central Coast Air Basin. Under some conditions, the reverse air flow can carry pollutants from the South Central Coast Air Basin to the South Coast Air Basin and contribute to ozone violations there (CARB 2013).

3.3.1.6 South Coast Air Basin

The South Coast Air Basin is California's largest metropolitan region. The area includes the southern two-thirds of Los Angeles County, all of Orange County, and the western urbanized portions of Riverside and San Bernardino counties. The South Coast Air Basin is bounded by the Pacific Ocean on the west and by mountains on the other three sides. This air basin includes the west-central portion of the Southern California Region of the project area.

The area includes industry, airports, international ports, freeways, and surface streets. On-road vehicles are the largest source of smog-forming pollutants, and PM_{10} emissions primarily are from area sources, such as fugitive dust from paved and unpaved roads and vehicle travel (CARB 2013). One-third of the state's total criteria pollutant emissions are generated within the basin (CARB 2013). The pollutant emissions and fugitive dust generated in the South Coast Air Basin affects other air basins (e.g., the Salton Sea Air Basin and the Coachella Valley portion of Riverside County) (USGS 2014).

The persistent high-pressure system and frequent low inversion heights caused by the surrounding mountains on three sides of the air basin trap pollutants in the air basin, and the frequent sunny weather contributes to smog formation (CARB 2013). Portions of the South Coast Air Basin are designated as nonattainment for the federal and State ozone, PM_{10}, and $PM_{2.5}$ standards (CARB 2014; EPA 2015). Wind often transports air pollutants from the South Coast Air Basin to nearby air basins.

3.3.1.7 San Diego Air Basin

The San Diego Air Basin is in the southwestern corner of California and includes all of San Diego County. This air basin includes the southwestern portion of the Southern California Region of the project area.

The population and emissions are concentrated in the western portion of the air basin, which is bordered on the west by the Pacific Ocean.

The air basin includes industrial facilities, airports, an international port, freeways, and surface streets. The San Diego Air Basin is designated as nonattainment for the federal ozone standard and the State ozone, PM_{10}, and $PM_{2.5}$ standards (CARB 2014). Air quality in the San Diego Air Basin is affected not only by local emission sources, but also by transport of air emissions from the South Coast Air Basin and Mexico.

3.3.2 DISCUSSION

a) Conflict with or obstruct implementation of the applicable air quality plan?

The proposed long-term operation of the SWP would not result in construction of new facilities or infrastructure or other construction activities. Therefore, the proposed long-term operation of the SWP would not create a new source of air pollutant emissions or increase pollutant emissions that are associated with historical and current SWP operations. No new sources of pollutant emissions would be created that would violate applicable air quality standards or contribute to an existing or projected air quality violation. **No impact** would occur.

b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard?

The proposed long-term operation of the SWP would not alter physical SWP facilities or result in SWP operations that would contribute to a cumulatively considerable net increase of criteria pollutants, and therefore the Proposed Project would not produce additional pollutants in the project area. Consequently, **no impact** would occur.

c) Expose sensitive receptors to substantial pollutant concentrations?

The proposed long-term operation of the SWP would not produce additional pollutant emissions in the project area that would expose sensitive receptors to pollutants. **No impact** would occur.

d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?

The proposed long-term operation of the SWP would not involve construction activities or changes in operations that would result in other emissions that would affect a substantial number of people. **No impact** would occur.

e) Create objectionable odors affecting a substantial number of people?

The proposed long-term operation of the SWP would not involve any activity or operation that would produce odors that could affect a substantial number of people. **No impact** would occur.

3.4 BIOLOGICAL RESOURCES

Table 3.4-1. Potential Impacts on Aquatic Biological Resources

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
IVa. Aquatic Biological Resources. Would the project:	-
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	Potentially Significant Impact
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	No Impact
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	No Impact
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	Potentially Significant Impact
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	No Impact
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	No Impact

Note:
"-" indicates blank cell

3.4.1 AQUATIC BIOLOGICAL RESOURCES

3.4.1.1 Environmental Setting - Aquatic Biological Resources

The geographic area potentially affected by implementation of the Proposed Project includes regions that could be affected directly or indirectly by the SWP. The potentially affected area encompasses the following reservoirs, rivers, and land between the levees adjacent to rivers as well as areas that receive water from the SWP:

- Sacramento River from the confluence with the Feather River downstream to, and including, the Delta
- Feather River from the Federal Energy Regulatory Commission (FERC) boundary downstream to its confluence with the Sacramento River
- San Francisco Bay and Suisun Marsh
- Areas that are served water by the SWP

Fish and Aquatic Species for Detailed Consideration

For this analysis, fish and aquatic species retained for detailed consideration include species that are included in one or more of the following categories:

- species listed by the federal government as threatened or endangered;
- species listed by the State as threatened or endangered;
- species that are proposed formally for federal listing or are candidates for federal listing as threatened or endangered;
- species that are candidates for State listing as threatened or endangered;
- species that meet the definitions of rare, threatened, or endangered under CEQA;
- species identified by CDFW as species of special concern, species designated by California statute as fully protected (e.g., California Fish and Game Code, Sections, 4,700 [mammals], and 5,515 [fish]); and
- species that are recreationally or commercially important.

A total of 21 fish and aquatic species were identified with potential to occur in locations that could be directly or indirectly affected by the Proposed Project. The fish and aquatic species meeting these criteria are listed in Table 3.4-2.

Aquatic Resources within the Geographic Areas Potentially Affected by the Proposed Project

The fish species, water bodies, and aquatic habitat within the areas potentially affected by the Proposed Project are described in detail in Section 4.4 of the DEIR. Therefore, discussions of these species, water bodies, and aquatic habitat are not repeated in this IS.

3.4.1.2 Discussion - Aquatic Biological Resources

Would the Proposed Project:

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

Feather River

The lower Feather River is generally considered as that portion of the Feather River and its watershed that lies downstream of Oroville Dam, extending to the confluence with the Sacramento River at Verona. The river is almost entirely contained within a series of levees as it flows through the agricultural lands of the Sacramento Valley. Oroville Dam is a major component of the SWP, and it provides virtually all the water delivered by the California SWP. Flows are regulated for water supply and flood control through releases at Oroville Dam, and to a lesser extent, flows are regulated to maximize production of hydroelectric power.

Table 3.4-2. Special-Status and Commercially or Recreationally Important Fish and Aquatic Species Potentially Affected by Proposed Long-Term State Water Project Operations

Common Name	Scientific Name	Federal Status[1]	State Status[1]	Economically Important[2]	Recreationally Important[2]
Pacific Lamprey	*Entosphenus tridentatus*	N/A	SSC	N/A	N/A
River Lamprey	*Lampetra ayresi*	N/A	SSC	N/A	N/A
White Sturgeon	*Acipenser transmontanus*	N/A	SSC	Economically Important	Recreationally Important
Green Sturgeon, *Southern DPS*	*Acipenser medirostris*	FT	SSC	N/A	N/A
Steelhead, *Central California Coast DPS*	*Oncorhynchus mykiss*	FT	N/A	N/A	N/A
Steelhead, *Central Valley DPS*	*Oncorhynchus mykiss*	FT	N/A	Economically Important	Recreationally Important
Chinook Salmon, *Central Valley Fall-run ESU*	*Oncorhynchus tshawytscha*	SC	SSC	Economically Important	Recreationally Important
Chinook Salmon, *Central Valley Late Fall–run ESU*	*Oncorhynchus tshawytscha*	SC	SSC	Economically Important	Recreationally Important
Chinook Salmon, *Sacramento River Winter-run ESU*	*Oncorhynchus tshawytscha*	FE	SE	N/A	N/A
Chinook Salmon, *Central Valley Spring-run ESU*	*Oncorhynchus tshawytscha*	FT	ST	Economically Important	Recreationally Important
Longfin Smelt	*Spirinchus thaleichthys*	FC	ST	N/A	N/A
Delta Smelt	*Hypomesus transpacificus*	FT	SE	N/A	N/A
Sacramento Splittail	*Pogonichthys macrolepidotus*	N/A	SSC	N/A	N/A
Hardhead	*Mylopharodon conocephalus*	N/A	SSC	N/A	N/A
Central California Roach	*Lavinia symmetricus*	N/A	SSC	N/A	N/A
Striped Bass	*Morone saxatilis*	N/A	N/A	Economically Important	Recreationally Important
Largemouth Bass	*Micropterus salmoides*	N/A	N/A	Economically Important	Recreationally Important
Smallmouth Bass	*Micropterus dolomieu*	N/A	N/A	Economically Important	Recreationally Important
Spotted Bass	*Micropterus punctulatus*	N/A	N/A	Economically Important	Recreationally Important
American Shad	*Alosa sapidissima*	N/A	N/A	Economically Important	Recreationally Important
Killer Whale, Southern Resident DPS[3]	*Orcinus orca*	FE	N/A	N/A	N/A

Sources: CDFW 2017b; USFWS 2017a; Moyle et al. 2015

Notes:

DPS = Distinct Population Segment; ESU = Evolutionarily Significant Unit; N/A = not applicable

[1] Listing Statuses:
FC = Federal candidate for listing
FE = Federally listed as endangered
FT = Federally listed as threatened
SC = Federal species of concern (National Marine Fisheries Service)
SE = State listed as endangered
SSC = State species of special concern
ST = State listed as threatened

[2] Species considered important because of existing regulatory management that limits commercial or recreational harvesting.

[3] Killer Whales of the Southern Resident DPS (federal status FE) are included because of their known relationship to the abundance of the salmon population.

DWR currently manages flows in the Feather River based on an agreement between DWR and CDFW signed in 1983. The *Agreement Concerning the Operation of the Oroville Division of the State Water Project for Management of Fish and Wildlife* established criteria for flow and water temperature in the Low Flow Channel and the reach of the Feather River downstream of the Thermalito Afterbay Outlet to the confluence with the Sacramento River to preserve salmon and steelhead spawning and rearing habitat.

On December 5, 2016, NMFS issued a Biological Opinion on the FERC's relicensing of the Oroville facilities (FERC Project No. 2100-134) (NMFS 2016), which evaluated the effects of DWR's proposed operations that would be implemented under a new FERC license. The BiOp evaluated effects of operations under the proposed license on federal Endangered Species Act-listed fish species in the Feather River and Essential Fish Habitat (EFH) for Chinook Salmon. FERC has not yet issued a new license to operate the facilities. Nonetheless, upon issuance of the new FERC license, DWR will operate the Oroville facilities according to the Proposed Action, incidental take authorization, and EFH Conservation Recommendations described in the BiOp. Because DWR is not proposing changes to current operations of the Oroville facilities or those evaluated in the BiOp for the Oroville facilities relicensing, DWR is not including operations of the Oroville facilities in the Proposed Project and is not seeking additional incidental take authorization under CESA for Oroville Facilities operations. Therefore, no further evaluation of Feather River aquatic resources is conducted.

State Water Project Service Area

SWP water from the Delta is delivered to San Luis Reservoir via the California Aqueduct. Water is released from the San Luis Reservoir into the California Aqueduct that extends to Lake Perris in Riverside County and delivers water to the San Joaquin Valley, Central Coast, and Southern California.

No sensitive fish species occur naturally in the California Aqueduct, Delta Mendota Canal, or the reservoirs receiving exported SWP. Special-status fish species and commercially or recreationally important fish species could occur in these water bodies if individuals are entrained by the SWP pumping facilities in the Delta. However, these individuals have already been lost to their populations. Therefore, analyses of potential changes in SWP service area water bodies are not conducted, and any potentially occurring special-status or commercially or recreationally important fish species are not considered further. Analyses of effects on special-status fish species and commercially or recreationally important fish species entrained into the SWP facilities are conducted as part of the analyses of effects of the SWP facilities in the Delta.

Effects in the San Francisco Bay and Pacific Ocean

San Francisco Bay and the Pacific Ocean and could potentially be affected by changes in Delta outflow. However, potential changes in Delta outflow of the magnitude associated with the Proposed Project have limited ability to influence the hydrodynamics, salinity, and hydrology of the San Francisco Bay and nearshore Pacific Ocean relative to existing conditions (see Section 3.10, "Hydrology and Water Quality"). Specifically, tributary inflow, non-tributary runoff, and tidal effects in these areas have much greater influence on potential habitat conditions (e.g., salinity, depth, velocity, etc.) than changes in Delta outflow associated with implementation of the Proposed Project. Therefore, no additional

analyses are conducted for the San Francisco Bay and Pacific Ocean, and special-status or commercially or recreationally important fish species in these areas are not considered further in this analysis.

Effects in the Sacramento River Downstream of the Feather River and the Delta

Implementation of the Proposed Project potentially could affect flows in the Sacramento River below the Feather River confluence, which could affect migratory habitat for special-status anadromous species. In addition, hydrodynamic conditions in the Delta could be altered by implementation of the proposed long-term operation of the SWP, which could increase the entrainment potential of special-status and commercially and recreationally important fish species.

These hydrologic and hydrodynamic changes potentially could substantially affect habitat conditions, and increased entrainment potential could substantially and directly affect individuals and populations. Therefore, potential effects on the special-status species listed in Table 3.4-2 and their habitat will be evaluated in the DEIR. The impact would be **potentially significant**.

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

Riparian habitat and other sensitive natural communities are addressed under "Wildlife Habitats" in Section 3.4.7, "Terrestrial Biological Resources Environmental Setting."

c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

Federally protected wetlands are addressed under "Wildlife Habitats" in Section 3.4.2, "Terrestrial Biological Resources."

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

Implementation of the Proposed Project potentially could affect flows in the Sacramento River below the Feather River confluence, which could affect migratory habitat for special-status anadromous species. In addition, hydrodynamic conditions would be altered by implementation of the Proposed Project, which could increase the entrainment potential of special-status and commercially or recreationally important migratory or resident fish species.

These hydrologic and hydrodynamic changes potentially could substantially affect habitat conditions, and increased entrainment potential could affect individuals and populations substantially and directly. Therefore, potential effects on the special-status species and their habitats that are listed in Table 3.4-2 will be evaluated in the DEIR. The impact would be **potentially significant**.

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

Implementation of the proposed long-term operation of the SWP would not conflict with any local policies or ordinances protecting fish and aquatic resources in the Sacramento River downstream of the confluence with the Feather River or in the Delta. **No impact** would occur.

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

Implementation of the Proposed Project would not conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or State habitat conservation plan protecting fish and aquatic resources in the Sacramento River below the confluence with the Feather River or in the Delta. **No impact** would occur.

Table 3.4-3. Potential Impacts on Terrestrial Biological Resources

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
IVb. Terrestrial Biological Resources. Would the project:	-
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	No Impact
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	No Impact
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	No Impact
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	No Impact
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	No Impact
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	No Impact

Note:
"-" indicates blank cell

3.4.2 TERRESTRIAL BIOLOGICAL RESOURCES

3.4.2.1 Environmental Setting - Terrestrial Biological Resources

Feather River

The Upper Feather River lakes, including Antelope Lake, Lake Davis, and Frenchman Lake, are SWP facilities on the upper Feather River, upstream from Lake Oroville. Lake Oroville is in the foothills on the western slope of the Sierra Nevada, about 1 mile downstream from the confluence of its major tributaries. Downstream from Oroville Dam, a portion of the river flow is diverted by Thermalito Diversion Dam and routed to the Thermalito Forebay, an offstream reservoir with a surface area of up to 630 acres (DWR 2007a, 2007b). Downstream from the forebay, water is stored in Thermalito Afterbay (up to 4,300 surface acres), which serves as a warming basin for agricultural water, among other purposes.

The majority of vegetation around Lake Oroville consists of a variety of native vegetation associations, including mixed oak woodlands, foothill pine/mixed oak woodlands, and oak/pine woodlands, with a mosaic of chaparral (DWR 2004a, 2007a). Open areas in the woodlands consist of annual grassland species. Native riparian habitats are restricted to narrow strips along tributaries consisting mostly of

alder, willow, and occasional cottonwood and sycamore. Limited wetland vegetation exists around Lake Oroville, and most of the vegetation is associated with seeps and springs that are a natural part of the landscape above the high-water line. Emergent wetlands generally are absent in the drawdown zone of Lake Oroville.

Riparian vegetation occurs around the northern shore of the Thermalito Forebay as a thin strip of mixed riparian species (mostly willows), with an understory of emergent wetland vegetation. Cottonwoods and willows occur in scattered areas around the high-water surface elevation of the Thermalito Afterbay shoreline (FERC 2007). Emergent wetlands, ranging from thin strips to more extensive areas, are found around the Thermalito Forebay and Thermalito Afterbay. Waterfowl brood ponds, constructed in inlets of the Thermalito Afterbay, support emergent vegetation along much of their shores. Several invasive plant species are found around Lake Oroville and downstream in and around the Thermalito Complex. Invasive species associated with riparian and wetland areas include purple loosestrife, giant reed, tree-of-heaven, and red sesbania. About 85 of the roughly 900 acres of wetlands and riparian areas along the margin of the Thermalito Afterbay contain varying densities of purple loosestrife (DWR 2007a). Purple loosestrife adversely affects native vegetation.

The Feather River from Oroville Dam to its confluence with the Sacramento River supports stands of riparian vegetation, which have been restricted over time by flood control levees and land clearing for agriculture and urbanization. Consequently, the vegetation generally occurs in a narrow zone along much of the river in this reach. However, remnant riparian forest exists in areas where wide meander bends persist, such as at Abbott Lake and O'Connor Lake near the Lake of the Woods State Recreation Area (DWR 2004b). This area contains mixed riparian forests, including Fremont cottonwood, willow, boxelder, alder, and Oregon ash. The riparian strip along the river is bordered mostly by agricultural fields. Downstream from Yuba City near the confluence with the Sacramento River, valley oak and cottonwood riparian stands become more common.

Sacramento–San Joaquin Delta and Suisun Marsh

The Delta overlies the western portions of the Sacramento River and San Joaquin River watersheds. The Delta is a network of islands, channels, and marshland at the confluence of the Sacramento and San Joaquin rivers. The major waterways entering the Delta are the Sacramento River, flowing from the north, the San Joaquin River, flowing from the south, and eastside tributaries (the Cosumnes, Mokelumne, and Calaveras rivers).

Suisun Marsh is a tidally influenced brackish marsh about 35 miles northeast of San Francisco in southern Solano County. It is a critical part of the Sacramento–San Joaquin Delta estuary ecosystem. The Delta, Suisun Marsh, and greater San Francisco Bay make up the largest estuary on the west coast of North and South America (DWR 2009a).

The Delta once was composed of extensive freshwater and brackish marshes, with tules and cattails, broad riparian thickets of scrub willows, buttonwillow, and native brambles. In addition, it had extensive riparian forests of Fremont cottonwood, valley oak, Oregon ash, boxelder, white alder, and Goodding's black willow. Upland, nonriparian stands of valley oak and coast live oak occurred in a

mosaic with seasonally flooded herbaceous vegetation, including vernal pools and alkali wetlands (SFEI 2012).

Substantial areas of the Delta and Suisun Marsh have been modified by agricultural, urban and suburban, and recreational land uses (Reclamation et al. 2011; SFEI 2012). Over the past 150 years, levees were constructed in the Delta and Suisun Marsh to provide lands for agricultural, municipal, industrial, and recreational land uses. The remaining natural vegetation is fragmented and largely restricted to the edges of waterways, flooded islands, and small protected areas such as parks, wildlife areas, and nature reserves (Hickson and Keeler-Wolf 2007). A substantial portion of the emergent wetlands exists as thin strips along the margins of constructed levees (SFEI 2012). Current habitat along the Delta waterways includes seasonal wetlands, tidal wetlands, managed wetlands, riparian forests, and riparian scrub.

Seasonal wetlands historically occurred along the riparian corridor at elevations that were inundated during high-flow events. Many of the levees were constructed along the riparian corridor edges; therefore, the historic seasonal wetlands were substantially modified (SFEI 2012). Adjacent areas of perennial wetlands on the water side of the riparian corridor were modified as levees were constructed and channels enlarged. In many of these areas, the perennial wetlands were replaced by seasonal wetlands.

Alkali-related habitats occur near salt-influenced seasonal and perennial wetlands. Alkali seasonal wetlands occur on fine-textured soils that contain relatively high concentrations of dissolved salts. These types of soils typically are found at the historical locations of seasonal ponds in the Yolo Basin, in and around the CDFW Tule Ranch Preserve, and upland in seasonal drainages that receive salts in runoff from upslope salt-bearing bedrock, such as areas near Suisun Marsh and the CCF. Alkali wetlands include saltgrass, alkali weed, saltbush, alkali heath, and iodine bush. Small stands of alkali sink scrub (also known as valley sink scrub) are characterized by iodine bush.

The tidal brackish wetlands occur either in relatively substantial tracts of complex tidal wetlands or in narrow bands of fringing tidal wetlands (Siegel et al. 2010). Fringing tidal marsh exists along the outboard side of exterior levees and generally has formed since diking for managed wetlands began. Fringing tidal wetlands vary in size and vegetation composition, exhibit less geomorphic complexity, and have a low area-to-edge ratio. Fringing tidal marshes lack connection with the upland transition, often are found in small, discontinuous segments, and can limit movement of terrestrial marsh species.

Plant zones in complex tidal wetlands are influenced by inundation regime and salinity. Tidal wetlands can be divided into three zones: low marsh, middle marsh, and high marsh (Reclamation et al. 2011). The low tidal wetland zone is tidally inundated once or twice per day. At the lowest elevations, vegetation is inhibited by frequent, prolonged, and often deep inundation, and by disturbance from waves or currents. The dominant plant species are bulrushes.

The middle tidal wetland zone is inundated tidally at least once per day; this zone has relatively little cover and offers no refuge from higher tides, which completely flood the vegetation of the middle marsh. The dominant plant species are pickleweed, saltgrass, and bulrush.

The high tidal wetland zone receives intermittent inundation during the monthly tidal cycle, with the higher elevations being inundated only during the highest tides. Historically, the high marsh was an expansive transitional zone between the tidal wetlands and adjacent uplands. The high marsh and associated upland transition zone have been affected by land use changes (e.g., managed wetlands, agriculture). The dominant plants are native species, such as saltgrass, pickleweed, and Baltic rush, and non-native species, including perennial pepperweed, poison hemlock, and fennel.

Managed wetlands are found primarily in Suisun Marsh and Cache Slough and near the confluence of the Mokelumne and Sacramento rivers within the historical limits of the high tidal marsh and adjacent uplands that were diked and leveled for agricultural purposes and later managed to enhance habitat values for specific wildlife species (CALFED 2000a, 2000b). Diked managed wetlands and uplands are the most typical land cover type in the Suisun Marsh area. Managed wetlands are considered seasonal wetlands because they may be flooded and drained several times throughout the year. Watergrass and smartweed typically are the dominant species in managed wetlands that use fresher water. Bulrush, cattail, and tule are the dominant species in managed wetlands that employ late drawdown management. Pickleweed, fat hen, and brass buttons are typical in the higher elevations of the managed wetlands. In marshes with higher soil salinity, pickleweed, saltgrass, and other salt-tolerant species are dominant.

Riparian forest areas still are present in some portions of the Delta, along many of the major and minor waterways, oxbows, and levees (CALFED 2000a, 2000b). Riparian forest and woodland communities, which are dominated by tree species, are limited mostly to narrow bands along sloughs, channels, rivers, and other freshwater features throughout the Delta. Isolated patches of riparian vegetation also are found on the interior of reclaimed Delta islands, along drainage channels, along pond margins, and in abandoned, low-lying fields. Cottonwoods and willows, Oregon ash, boxelder, and California sycamore are the most typical riparian trees in Central California. Valley oak and black walnut are typical in riparian areas in the Delta.

Riparian scrub in the Delta and Suisun Marsh consists of woody riparian shrubs in dense thickets (SFEI 2012). Riparian scrub thickets usually are associated with higher, sloping, and better drained edges of marshes or topographic high areas, such as levee remnants and elevated flood deposits, and along shorelines of ponds or banks of channels in tidal or non-tidal freshwater habitats. Willow-dominated habitat types appear to be increasing in extent in recent years; willows line many miles of artificial levees where waterways historically flowed into freshwater emergent wetland. Non-native Himalayan blackberry thickets are a typical element of riparian scrub communities along levees and riparian zones.

State Water Project Reservoirs

Bethany Reservoir, Patterson Reservoir, and Lake Del Valle are SWP facilities associated with the South Bay Aqueduct in Alameda County. Vegetative communities around Bethany Reservoir are characterized by annual grasslands with several areas of woodland habitat (DWR 2014). Emergent vegetation does not occur along the shoreline at Bethany Reservoir (DWR 2005).

Patterson Reservoir is a small, 100-acre-foot SWP reservoir, located along the South Bay Aqueduct between Bethany Reservoir and Lake Del Valle. Vegetation around Patterson Reservoir is characterized by grasslands and upland habitat. Lake Del Valle is a 77,100-acre-foot SWP facility, located along the South Bay Aqueduct (DWR 2001). Vegetation around Lake Del Valle includes grasslands, chaparral, shrub, oak woodland, and riparian and freshwater habitats (EBRPD 1996, 2001, 2012, 2013). The grasslands include non-native grasses and native perennial bunchgrass. Mixed deciduous riparian woodlands occur along perennial streams.

Wildlife Habitats

The value of a site to wildlife is influenced by a combination of the physical and biological features of the immediate environment. Species diversity is a function of abiotic and biotic conditions and may be greatly affected by human use of the land. The wildlife habitat quality of an area, therefore, ultimately is determined by the type, size, and diversity of the vegetation communities present and their degree of disturbance. For example, as a plant community is degraded by the loss of understory diversity, creation of openings, or reduction in area, generally a loss of structural diversity occurs. Degradation of the structural diversity of a community typically diminishes wildlife habitat quality and usually results in a reduced ability to support a variety of wildlife species.

Wildlife habitats typically are distinguished by vegetation type, with varying combinations of plant species providing different resources for use by wildlife. Because the project area spans such a wide geographical area, many sites are high in structural and species diversity, while many other sites are not. Sites described above as having a variety of large intact vegetation communities, broad floodplains and/or riparian corridors, and areas of continuous, connected vegetation communities have significant value to wildlife because those areas provide habitat for a suite of resident and migratory wildlife species typically found in the various habitats. In addition, sites with multiple vegetation communities provide edge habitats, such as the interface between grassland and scrub and grassland and woodland, which typically support a high diversity of wildlife species.

Lacustrine, riparian, freshwater marsh, and other wetland and aquatic habitats are very productive for wildlife because they offer water, food, and cover for a variety of species. Lakes and reservoirs attract resting and foraging waterfowl and other species that favor standing or slow-moving water. Wildlife species that use freshwater and seasonal wetlands include reptiles and amphibians, such as California red-legged frog, California tiger salamander, western pond turtle, garter snakes, western toad, Pacific chorus frog, and bullfrog; and avian species, such as green heron, mallard, and red-winged blackbird. Lacustrine riparian habitat provides excellent bird nesting habitat, and the impounded water in lakes and reservoirs also provide foraging habitat for eagles and other raptors that prey on fish (e.g., ospreys) and waterfowl.

Within riverine systems, backwater ponds, wetlands, and open water support wildlife species, such as pied-billed grebe, American bittern, green heron, great blue heron, great egret, duck species, American coot, common merganser, double-crested cormorant, American wigeon, Canada goose, western grebe, and gull species, as well as white-tailed kite, wood duck, yellow warbler, warbling vireo, dusky-footed

woodrat, western gray squirrel, deer mouse, California vole, long-tailed weasel, and other mammals that use the adjacent woodlands and grasslands.

Lack of vegetative cover within the drawdown zone around Lake Oroville severely limits wildlife use of this area. Thirty-six wildlife species have been detected using habitats in the drawdown zone on at least one occasion during field surveys (DWR 2004a). Several of these species may use habitats in the drawdown zone for reproduction, including belted kingfisher, Canada goose, canyon wren, American dipper, killdeer, mallard, common merganser, and northern rough-winged swallow.

In contrast to the drawdown area around the margin of Lake Oroville, the drawdown zone of Thermalito Afterbay supports a richer wildlife community and greater habitat diversity. Survey data collected as part of the relicensing process indicate that exposed mudflats seasonally provide habitat for a variety of migratory waterbirds, including black-necked stilt, black tern, California gull, Caspian tern, Forster's tern, greater yellowlegs, least sandpiper, long-billed dowitcher, ring-billed gull, semipalmated sandpiper, spotted sandpiper, and white-faced ibis. Wading birds and other waterfowl have been observed on the mudflats as well as shallow flooded areas (DWR 2004a).

Potentially suitable giant garter snake habitat is present along portions of the afterbay and forebay margins. The existing waterfowl brood ponds provide a refuge for giant garter snakes during periods of afterbay drawdown. Species observed in the wetland margin of Thermalito Afterbay include barn swallow, black phoebe, white-tailed kite, black-tailed jackrabbit, brown-headed cowbird, bullfrog, common garter snake, common yellowthroat, gopher snake, northern harrier, Pacific tree frog, raccoon, red-winged blackbird, ring-necked pheasant, short-eared owl, striped skunk, tree swallow, Virginia opossum, and violet-green swallow (DWR 2004a).

The open water habitat of the Los Vaqueros Reservoir provides forage, winter, and brood habitat for Canada goose, American wigeon, gadwall, mallard, northern shoveler, northern pintail, green-winged teal, canvasback, redhead, greater scaup, lesser scaup, bufflehead, common goldeneye, hooded merganser, common merganser, and ruddy ducks; the reservoir's habitat provides other habitat values for grebe, sandpiper, pelican, cormorant, egret, heron, and gull. Annual grassland habitats surrounding many of the reservoirs in the proposed project area support species such as burrowing owl, horned lark, western meadowlark, turkey vulture, northern harrier, American kestrel, white-tailed kite, red-tailed hawk, Brewer's blackbird, mourning dove, savannah sparrow, white-crowned sparrow, western fence lizard, common garter snake, gopher snake, western skink, western rattlesnake, yellow-bellied racer, black-tailed jackrabbit, California ground squirrel, Botta's pocket gopher, western harvest mouse, California vole, California kangaroo rat, Audubon's cottontail, American badger, bobcat, mule deer, and coyote.

Riparian scrub, woodlands, and forests provide high value for wildlife and support a wide range of species of birds, mammals, reptiles, amphibians, and invertebrates. Riparian habitats support breeding, foraging, and roosting habitat for tree swallow, bushtit, white-breasted nuthatch, Nuttall's woodpecker, downy woodpecker, acorn woodpeckers, spotted towhee, northern flicker, yellow warbler, western scrub jay, white-tailed kite, Cooper's hawk, red-shouldered hawk, American kestrel, great horned owl, song sparrow, black phoebe, European starling, western bluebird, and tree swallow. Scrub habitat in particular supports species such as California quail, western scrub-jay, bushtit,

California thrasher, spotted towhee, sage sparrow, western fence lizard, common garter snake, common king snake, western rattlesnake, deer mouse, and feral pig.

Riparian areas support mammal species, such as river otter, beaver, big brown bat, and Yuma myotis (bat), and they provide cover and habitat for common mammal species, such as raccoon, Virginia opossum, mule deer, coyote, striped skunk, deer mouse, harvest mouse, dusky-footed woodrat, and gray fox. Although riparian woodlands along the upper Sacramento River typically occur in narrow or discontinuous patches, they provide value for wildlife and support both common and special-status species of migratory and resident birds, raptors, waterfowl, mammals, reptiles, amphibians, and invertebrates.

In the Bay–Delta Region and Suisun Marsh, the low tidal wetland zone provides foraging habitat for waterfowl and shorebirds, California Ridgway's rail, California black rail, and other wading birds. The middle tidal wetland zone provides foraging habitat for salt marsh harvest mouse and Suisun shrew, as well as for common and special-status bird species, including waterfowl and shorebirds, California Ridgway's rail, California black rail, and other wading birds. This zone also provides nesting and foraging habitat for Suisun song sparrow and salt marsh common yellowthroat (Reclamation et al. 2011).

The high tidal marsh provides habitat for special-status plants, including Suisun marsh aster, soft bird's beak, and Suisun thistle (Siegel et al. 2010). The high marsh zone provides foraging and nesting habitat for waterfowl, shorebirds, California Ridgway's rail, California black rail, and other birds. It also provides foraging and nesting habitat for special-status species, such as salt marsh harvest mouse and Suisun shrew, and it provides escape cover for salt marsh harvest mouse and Suisun shrew during periods when the middle and lower portions of the high tidal wetland zone are inundated (Reclamation et al. 2011).

As in other locations in the study area, riparian trees in the Bay–Delta Region are used for nesting, foraging, and protective cover by many bird species, and riparian canopies provide nesting and foraging habitat for a variety of mammals. Understory shrubs provide cover for ground-nesting birds that forage among the vegetation and leaf litter. Willow thickets provide habitat for a wide range of wildlife species, including song sparrow, lazuli bunting, and valley elderberry longhorn beetle.

Many managed wetlands, found primarily in the Delta region, are managed specifically as habitat for wintering waterfowl species. Commonly referred to as "brood ponds," these wetlands are flooded during the spring and summer but may experience a 2- to 6-month dry period each year. These semi-permanent wetlands provide breeding ducks, ducklings, and other wetland wildlife with protection from predators and abundant invertebrate food supplies (CDFG and Yolo Basin Foundation 2008). Permanent wetlands remain flooded throughout the year. Because of year-round flooding, permanent wetlands support a diverse, but usually not abundant, population of invertebrates. Permanent managed wetlands provide deep water habitat for diving ducks, such as ruddy duck, scaup, and goldeneye, and for other water birds, including pied-billed grebe, coot, and moorhen. They often have dense emergent cover on their edges, which is the preferred breeding habitat for marsh wren and red-winged blackbird, and roosting habitat for black-crowned night heron, white-faced ibis, and egret.

Some unique habitats found in the proposed project area are native redwood and knobcone pine forests, located at the Upper San Leandro Reservoir. Non-native eucalyptus and Monterey pine forests occur at the San Pablo Reservoir and Lake Chabot. The eucalyptus trees provide specific habitat for hummingbird, bald eagle, great blue heron, and great egret.

Special-Status Species

For this analysis, special-status wildlife species are plants and wildlife that fall within any of the following categories:

- Species listed by the federal government as threatened or endangered;
- Species listed by the State as threatened, endangered, or rare (rare status is for plants only);
- Species that are formally proposed for federal listing or are candidates for federal listing as threatened or endangered;
- Species that are candidates for State listing as threatened or endangered;
- Species that meet the definitions of rare, threatened, or endangered under the California Environmental Quality Act;
- Species identified by USFWS as Birds of Conservation Concern;
- Species identified by CDFW as species of special concern, species designated by California statute as fully protected (e.g., California Fish and Game Code, Sections 3,511 [birds], 4,700 [mammals], 5,050 [reptiles and amphibians], and 5,515 [fish]), or bird species on the CDFW Watch List; and
- Species, subspecies, and varieties of plants considered by CDFW and the California Native Plant Society (CNPS) to be rare, threatened, or endangered in California. The CNPS Inventory of Rare and Endangered Plants of California assigns California Rare Plant Ranks (CRPR) categories for plant species of concern. Only plant species in CRPR categories 1 and 2 are considered special-status plant species in this document.
    - CRPR 1A — Plants presumed to be extinct in California.
    - CRPR 1B — Plants that are rare, threatened, or endangered in California and elsewhere.
    - CRPR 2 — Plants that are rare, threatened, or endangered in California but more common elsewhere.

Attachment 1 provides a complete list of species considered in assessing the direct and indirect impacts of SWP operations.

Tables 3.4-4 and 3.4-5 list the species that are discussed in this Initial Study. These are species with the potential to occur in areas in the project area that may be directly or indirectly affected by the proposed changes to the SWP because they occur 1) along rivers downstream from SWP facilities, 2) in potential habitat restoration areas in the Yolo Bypass and Suisun Marsh, or 3) in riparian corridors in the Delta. The geographic scope includes the Sacramento River from the Feather River confluence downstream to, and including, the Delta and Suisun Marsh.

Table 3.4-4. Special-Status Wildlife Species

Common Name	Scientific Name	Status Federal/State/CDFW
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	FT/–/–
Western pond turtle	*Emmys marmorata*	–/–/SSC
Giant garter snake	*Thamnophis gigas*	FT/ST/–
Tricolored blackbird (nesting colony)	*Agelaius tricolor*	BCC/ST/–
Tule greater white-fronted goose (wintering)	*Anser albifrons elgasi*	–/–/SSC
Short-eared owl (nesting)	*Asio flammeus*	–/–/SSC
Burrowing owl (nesting and wintering sites)	*Athene cunicularia*	–/–/SSC
Swainson's hawk (nesting)	*Buteo swainsoni*	BCC/ST/–
Western yellow-billed cuckoo (nesting)	*Coccyzus americanus occidentalis*	FT/SE/–
Yellow warbler	*Dendroica petechia brewsteri*	BCC/–/SSC
White-tailed kite (nesting)	*Elanus leucurus*	–/–/FP
Willow flycatcher	*Empidonax traillii*	BCC/SE/–
Saltmarsh common yellowthroat	*Geothlypis trichas sinuosa*	BCC/–/SSC
Greater sandhill crane (wintering)	*Grus canadensis tabida*	–/ST/FP
Bald eagle (nesting and wintering)	*Haliaeetus leucocephalus*	BCC/FD/SE/FP
Least bittern (nesting)	*Ixobrychus exilis*	BCC/–/SSC
Suisun song sparrow	*Melospiza melodia maxillaris*	BCC/–/SSC*
White-faced ibis (nesting colony)	*Plegadis chihi*	–/–/WL
California Ridgway's rail	*Rallus obsoletus*	FE/SE/FP
Bank swallow (nesting)	*Riparia*	–/ST/–
Least Bell's vireo (nesting)	*Vireo bellii pusillus*	FE/SE/–
Riparian (= San Joaquin Valley) woodrat	*Neotoma fuscipes riparia*	FE/–/SSC
Salt marsh harvest mouse	*Reithrodontomys raviventris*	FE/SE/FP
Suisun shrew	*Sorex ornatus sinuosus*	–/–/SSC
Riparian brush rabbit	*Sylvilagus bachmani riparius*	FE/SE/–

Source: CDFW 2019; USFWS 2019

Status Codes:

Federal—U.S. Fish and Wildlife Service:

BCC = bird species of conservation concern
FE = federally endangered
FT = federally threatened
FC = candidate for federal listing under the federal Endangered Species Act
FD = federal delisted
DPS = Distinct Population Segment
– = no status

State—California Department of Fish and Wildlife:

SE = state endangered
ST = state threatened
FP = California fully protected species
PT = proposed threatened
SSC = California species of special concern
WL = CDFW watch list
– = no status

Table 3.4-5. Special-Status Plants

Common Name	Scientific Name	Status Federal/State/CRPR*
Bolander's water hemlock	*Cicuta maculata* var. *bolanderi*	–/–/2.1
Delta button-celery	*Eryngium racemosum*	--/SE/1B.1
Delta tule pea	*Lathyrus jepsonii* var. *jepsonii*	--/--/1B.2
Mason's lilaeopsis	*Lilaeopsis masonii*	--/SR/1B.1
Soft salty bird's-beak	*Chloropyron molle* ssp. *molle*	FE/SR/1B.2
Suisun Marsh aster	*Symphyotrichum lentum*	--/--/1B.2
Suisun thistle	*Cirsium hydrophilum* var. *hydrophilum*	FE/--/1B.1

Source: CalFlora 2019; CDFW 2019; CNPS 2019; USFWS 2019

Status Codes

Federal—U.S. Fish and Wildlife Service:

E = endangered

– = no status

State—California Department of Fish and Wildlife:

E = endangered

– = no status

California Rare Plant Ranks (CRPRs):

1B = plant species considered rare, threatened, or endangered in California and elsewhere

2 = plant species considered rare, threatened, or endangered in California but more common elsewhere

California Rare Plant Rank Extensions:

1 = seriously endangered in California (>80% of occurrences are threatened and/or have high degree and immediacy of threat)

2 = fairly endangered in California (20–80% of occurrences are threatened)

3 = not very endangered in California

Special-status plant and wildlife species were included if they potentially could be directly or indirectly affected because of:

- potential changes to wildlife and plant habitat on river banks (changes in flows could affect plants and wildlife along stream and reservoir banks),
- potential changes to existing marshes and associated special-status species in the Delta region (habitat restoration may result in short-term loss of tidal marsh habitat), and
- potential changes to existing riparian areas and associated special-status species (habitat restoration may result in the loss of riparian habitat).

3.4.2.2 Discussion - Terrestrial Biological Resources

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

The Proposed Project would not involve construction of water facilities, infrastructure, or other projects that would result in disturbance to habitat supporting terrestrial plant and wildlife species, wetlands, or other sensitive plant communities. The Proposed Project would continue the conveyance of irrigation water to areas north and south of the Delta and would not reduce water deliveries to agricultural lands. Therefore, conditions would not change for wildlife species that rely on agricultural lands. Under the Proposed Project, flows in the Sacramento River would generally be similar to the Existing Conditions scenario, and hydrodynamic conditions would not differ such that riparian habitat

or other existing plant or wildlife communities supporting special-status species would be altered substantially adjacent to the Sacramento River downstream of the confluence with the Feather River or within the Delta. Section 3.10, "Hydrology and Water Quality," further discusses the hydrologic changes associated with the Proposed Project.

Tables 3.4-6 and 3.4-7 describe the impacts of the Proposed Project on focal special-status wildlife and plant species analyzed in this IS (i.e., those that could potentially occur adjacent to the Sacramento River downstream of the confluence with the Feather River, and in the Delta) and the rationale for determining potential impacts. As detailed within those tables, the Proposed Project would not impact any of the analyzed species. Therefore, **no impact** would occur.

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

Proposed long-term operation of the SWP would remain within the historic range of past SWP operations and would not result in changes in reservoir surface elevations or downstream surface water flows that would alter riparian habitat, freshwater marshes, or other sensitive natural communities. Therefore, **no impact** would occur.

c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

Proposed long-term operation of the SWP would not involve construction of water facilities, infrastructure, or other projects that would result in adverse effects on wetlands, marshes, vernal pools, or other federally protected wetlands. Therefore, **no impact** would occur.

Table 3.4-6. Special-Status Wildlife Species and Potential for Impact

Common Name	Scientific Name	Status Federal/ State/ CDFW*	Habitat/Distribution	Potential for Impact
Valley Elderberry Longhorn Beetle	*Desmocerus californicus dimorphus*	FT/–/–	Found only in association with its host plant, blue elderberry (*Sambucus nigra* ssp. *caerulea*). In the Central Valley, the elderberry shrub is found primarily in riparian vegetation. Known to occur in elderberry shrubs present in the riparian woodland and expected to occur in suitable habitat in other locations along the San Joaquin River. Recorded at Caswell Memorial State Park and other locations along the Stanislaus River.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to elderberry shrubs, nor would changes occur in flows or surface water elevations affecting riparian habitat where elderberry shrubs could occur.
Western Pond Turtle	*Emmys marmorata*	–/–/SSC	Inhabits slow-moving streams, sloughs, ponds, irrigation and drainage ditches, and adjacent upland areas. Potentially occurs near New Melones Reservoir. Recorded within Whiskeytown Lake and Clear Creek and near Lewiston Reservoir. Known to occur in suitable habitat on the San Luis NWR complex, in the Mendota Wildlife Area, and at Mendota Pool; expected to occur in suitable habitat in other locations in the San Joaquin River Restoration Area.	None. No water facilities, infrastructure, or restoration projects proposed in areas supporting western pond turtle habitat, nor would changes occur in flows or water surface elevations in aquatic habitat for this species.
Giant Garter Snake	*Thamnophis gigas*	FT/ST/–	Marshes, ponds, sloughs, small lakes, low-gradient streams, and other waterways, and in agricultural wetlands, including irrigation and drainage canals, rice fields, and adjacent uplands. Current distribution extends from near Chico in Butte County south to the Mendota Wildlife Area in Fresno County. Known from White Slough/Caldoni Marsh and Yolo Basin/Willow Slough. Known to occur in suitable habitat on the San Luis NWR complex and in the Mendota Wildlife Area; reported from Mendota Pool.	None. No water facilities, infrastructure, or restoration projects proposed in areas supporting giant garter snake habitat, nor would SWP operations change flows or water surface elevations in aquatic habitat for this species, or change water deliveries to agricultural lands or wildlife refuges

Common Name	Scientific Name	Status Federal/ State/ CDFW*	Habitat/Distribution	Potential for Impact
Tricolored Blackbird (nesting colony)	*Agelaius tricolor*	–/BCC/ST	Nests colonially in tules, cattails, willows, thistles, blackberries, and other dense vegetation. Forages in grasslands and agricultural fields. Reclamation (2010) concluded this species occurs near New Melones Reservoir. Suitable nesting and foraging habitat is present in the upper Sacramento River area. Known to occur in suitable habitat on the San Luis NWR complex and other sites in the Yolo Bypass.	None. No water facilities, infrastructure, or restoration projects proposed in areas supporting tricolored blackbird habitat, nor would SWP operations change flows or surface elevations in aquatic habitat for this species, or change water deliveries to agricultural lands or wildlife refuges
Tule Greater White-fronted Goose (wintering)	*Anser albifrons elgasi*	–/–/SSC	Winters in California. Associated with dense tule–cattail marsh habitat. Has been documented near Sherman Island and at various locations in the Suisun Marsh. Winters at Sacramento Valley wildlife refuges and surrounding rice fields, Suisun Marsh, and Grizzly Island Wildlife Area.	None. No water facilities, infrastructure, or restoration projects proposed in areas supporting waterfowl wintering habitat, nor would SWP operations change flows or water surface elevations in aquatic habitat for this species, or change water deliveries to agricultural lands or wildlife refuges.
Short-eared Owl (nesting)	*Asio flammeus*	–/–/SSC	Widespread winter migrant, found primarily in the Central Valley, in the western Sierra Nevada foothills, and along the coastline. Usually found in open areas with few trees, such as annual and perennial grasslands, prairies, dunes, meadows, irrigated lands, and saline and fresh emergent wetlands. Occasionally still breeds in northern California. Known to occur in suitable habitat on the San Luis NWR complex, where it possibly also nests. Breeding range includes coastal areas in Del Norte and Humboldt counties, the San Francisco Bay Delta, northeastern Modoc plateau, the east side of the Sierra from Lake Tahoe south to Inyo County, and the San Joaquin Valley.	None. No water facilities, infrastructure, or restoration projects proposed in areas supporting short-eared owl nesting habitat.

Common Name	Scientific Name	Status Federal/ State/ CDFW*	Habitat/Distribution	Potential for Impact
Burrowing Owl (nesting and wintering sites)	*Athene cunicularia*	–/–/SSC	Nests and forages in grasslands, shrub lands, deserts, and agricultural fields, especially where ground squirrel burrows are present. Occurs near New Melones Reservoir. Unlikely to occur along the Sacramento River corridor due to a lack of suitable nesting habitat. Known to occur in suitable habitat in the Yolo Bypass, in the Chowchilla Bypass, on the San Luis NWR complex, and at Mendota Pool.	None. No water facilities, infrastructure, or restoration projects proposed in areas supporting burrowing owl nesting or wintering habitat.
Swainson's Hawk (nesting)	*Buteo swainsoni*	BCC/ST/–	Nests in riparian woodlands, roadside trees, tree rows, isolated trees, woodlots, and trees in farmyards and rural residences. Forages in grasslands and agricultural fields in the Central Valley. Occurs near New Melones Reservoir. Known to nest in suitable habitat on the San Luis NWR complex and Great Valley Grasslands State Park and other areas along the San Joaquin River. Suitable nesting and foraging habitat is present along Sacramento River.	None. No water facilities, infrastructure, or restoration projects proposed in areas supporting Swainson's hawk foraging or nesting habitat, nor would changes occur to water deliveries to agricultural lands or wildlife refuges that support this species.
Western Yellow-billed Cuckoo (nesting)	*Coccyzus americanus occidentalis*	BCC/FT/SE/–	Densely foliaged, deciduous trees and shrubs, especially willows, required for roosting sites. An uncommon to rare summer resident of valley foothill and desert riparian habitats in scattered locations in California. Breeding pairs known from Sacramento Valley. Reclamation (2010) concluded this species could potentially occur near New Melones Reservoir. Detected by BDCP surveys in 2009 near Walnut Grove. Likely to nest and forage in the upper Sacramento River area.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to riparian habitat. nor would changes occur in flows or surface water elevations that would affect riparian habitat.
Yellow Warbler	*Dendroica petechia brewsteri*	BCC/–/SSC	Nests in riparian woodland and riparian scrub habitats. Forages in a variety of wooded and shrub habitats during migration. Reclamation (2010) concluded this species occurs near New Melones Reservoir. No recent nesting records, but potential nesting habitat present; known to occur during migration in suitable habitat on the San Luis NWR. Could nest and forage in the upper Sacramento River area. Likely to use riparian woodlands during migration.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to riparian habitat. nor would changes occur in flows or surface water elevations that would affect riparian habitat.

Common Name	Scientific Name	Status Federal/ State/ CDFW*	Habitat/Distribution	Potential for Impact
White-tailed Kite (nesting)	*Elanus leucurus*	–/–/FP	Nests in woodlands and isolated trees; forages in grasslands, shrub lands and agricultural fields. Common to uncommon and a year-round resident in the Central Valley, in other lowland valleys, and along the entire length of the coast. Recent surveys in Yolo and Sacramento counties have documented active nest sites in riparian habitats in the Yolo Bypass and along Steamboat and Georgiana sloughs and along the Sacramento River. Suitable nesting and foraging habitat is present along the upper Sacramento River. Expected to occur in suitable habitat along the San Joaquin River and in the Yolo Bypass.	None. No water facilities, infrastructure, or restoration projects proposed in areas supporting white-tailed kite foraging or nesting habitat.
Saltmarsh Common Yellowthroat	*Geothlypis trichas sinuosa*	BCC/–/SSC	Primarily brackish marsh, but also brackish and fresh woody swamps and riparian areas. Ranges generally in the San Francisco Bay area.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to brackish marsh or riparian habitat, nor would changes occur in flows or surface water elevations that would affect marshes or riparian habitat.
Greater Sandhill Crane (wintering)	*Grus canadensis tabida*	–/ST/FP	Eight distinct wintering locations in the Central Valley, from Chico/Butte Sink on the north to Pixley National Wildlife Refuge near Delano on the south, with more than 95% occurring within the Sacramento Valley between Butte Sink and the Delta. Unlikely to breed in the upper Sacramento River area. Known to occur during winter in suitable habitat on the San Luis NWR complex, along the San Joaquin River, and in the Delta.	None. No water facilities, infrastructure, or restoration projects proposed in areas supporting crane wintering habitat, or in water deliveries to agricultural lands or wildlife refuges.
Bald Eagle (nesting and wintering)	*Haliaeetus leucocephalus*	BCC/FD/SE/FP	Requires large bodies of water or free-flowing rivers with abundant fish and adjacent snags or other perches for foraging. Occurs near New Melones Reservoir, Whiskeytown Lake, Trinity Lake, and Lewiston Reservoir. Known to nest in suitable habitat around Lake Millerton and in the Chowchilla Bypass.	None. No water facilities, infrastructure, or restoration projects proposed in areas supporting bald eagle nesting habitat, nor would SWP operations change flows or water surface elevations in streams or reservoirs that provide eagle foraging habitat.

Common Name	Scientific Name	Status Federal/ State/ CDFW*	Habitat/Distribution	Potential for Impact
Least Bittern (nesting)	*Ixobrychus exilis*	BCC/–/SSC	Rare to uncommon April to September nester in large, fresh emergent wetlands of cattails and tules in the Sacramento Valley and San Joaquin Valley. Occurs in freshwater marsh habitats in the Yolo Bypass, east of the Sacramento River, and in the western Delta. Uncommon but regular breeder in suitable habitat in the San Joaquin Valley.	None. No water facilities, infrastructure, or restoration projects proposed in areas supporting bittern nesting habitat.
California Black Rail	*Laterallus jamaicensis coturniculus*	BCC/ST/FP	Tidal marshes in the northern San Francisco Bay estuary, Tomales Bay, Bolinas Lagoon, the Delta, Morro Bay, the Salton Sea, and the lower Colorado River. Found recently at several inland freshwater sites in the Sierra Nevada foothills in Butte, Yuba, and Nevada counties; the Cosumnes River Preserve in south Sacramento County; and Bidwell Park in Chico, Butte County.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to tidal marshes or riparian habitat, nor would changes occur in flows or water surface elevations in tidal marshes.
Suisun Song Sparrow	*Melospiza melodia maxillaris*	BCC/–/SSC	Brackish marshes around Suisun Bay.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to brackish marshes, nor would changes occur in flows or water surface elevations in brackish marshes.
White-faced Ibis (nesting colony)	*Plegadis chihi*	–/–/WL	Forages in wetlands and irrigated or flooded croplands and pastures. Breeds colonially in dense freshwater marsh. Known to occur in suitable habitat on the San Luis NWR complex and other sites in the Restoration Area and the Yolo Bypass.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to ibis nesting habitat or in disturbance to water deliveries to agricultural lands or wildlife refuges.
California Ridgway's Rail	*Rallus obsoletus*	FE/SE/FP	Dense marshy areas of the Delta region.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to Delta marshes.

Common Name	Scientific Name	Status Federal/ State/ CDFW*	Habitat/Distribution	Potential for Impact
Bank Swallow (nesting)	*Riparia*	–/ST/–	Neotropical migrant found primarily in riparian and other lowland habitats in California west of the deserts during the spring-fall period. In summer, restricted to riparian, lacustrine, and coastal areas with vertical banks, bluffs, and cliffs with fine-textured or sandy soils into which it digs nesting holes. Approximately 75% of the current breeding population in California occurs along banks of the Sacramento and Feather rivers in the northern Central Valley.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to river banks supporting bank swallow colonies. Long-term SWP operations would not change existing peak flow regimes that create bank swallow nesting habitat.
Least Bell's Vireo (nesting)	*Vireo bellii pusillus*	FE/SE/–	Nests in dense, low, shrubby vegetation, generally early successional stages in riparian areas, particularly cottonwood-willow forest, but also in brushy fields, young second-growth forest or woodland, scrub oak, coastal chaparral, and mesquite brush lands, often near water in arid regions. Singing males observed in Yolo Bypass Wildlife Area. Successfully nested at the San Joaquin River NWR in 2005 and 2006.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to early successional riparian habitat, nor would changes occur in flows or surface water elevations affecting riparian habitat.
Riparian (= San Joaquin Valley) Woodrat	*Neotoma fuscipes riparia*	FE/–/SSC	Historically found in riparian habitat along the San Joaquin, Stanislaus, and Tuolumne Rivers. Now known only from Caswell Memorial State Park on the Stanislaus River near its confluence with the San Joaquin River in a very low gradient portion of the river. No actions proposed that could affect this species in this area. Last reported at Caswell Memorial State Park in 2002. Likely still extant.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to riparian habitat at Caswell State Park, nor would changes occur in flows or surface water elevations affecting riparian habitat.
Salt Marsh Harvest Mouse	*Reithrodontomys raviventris*	FE/SE/FP	Found only in saline emergent wetlands of San Francisco Bay and its tributaries. Pickleweed saline emergent wetland is preferred habitat, where it may be locally common. Grasslands adjacent to pickleweed marsh are used, but only when new grass growth affords suitable cover in spring and summer. Reported occurrences of the salt marsh harvest mouse from within the Delta are restricted to salt and brackish tidal marshes along the northern edge of the Sacramento River and the southern edge of the San Joaquin River as far east as the vicinity of Collinsville and Antioch, west of Sherman Island.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to wetlands in the San Francisco Bay, tributaries or in the Delta, nor would salinity changes occur affecting saline wetlands that support this species.

Common Name	Scientific Name	Status Federal/ State/ CDFW*	Habitat/Distribution	Potential for Impact
Suisun Shrew	*Sorex ornatus sinuosus*	–/–/SSC	Historically known from tidal wetlands of Solano, Napa, and eastern Sonoma counties. Currently limited to the northern borders of San Pablo and Suisun bays.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to wetlands in the San Francisco Bay, tributaries, or in the Delta, nor would salinity changes occur affecting wetlands that support this species.
Riparian Brush Rabbit	*Sylvilagus bachmani riparius*	FE/SE/–	Historical distribution may have extended along portions of the San Joaquin River and its tributaries on the valley floor from at least Stanislaus County to the Delta. Currently restricted to several populations at Caswell Memorial State Park, near Manteca in San Joaquin County, along the Stanislaus River, along Paradise Cut (a channel of the San Joaquin River in the southern part of the Delta), and a recent reintroduction on private lands adjacent to the San Joaquin River NWR.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to riparian habitat, nor would changes occur in flows or surface water elevations affecting riparian habitat.

Sources: CDFW 2019, USFWS 2019, U.S. Bureau of Reclamation 2019

*Status Codes:

BCC = bird species of conservation concern

BDCP = Bay Delta Conservation Plan

CDFW = California Department of Fish and Wildlife

FC = candidate for federal listing under the federal Endangered Species Act

FD = federal delisted

FE = federally endangered

FP = California fully protected species

FS = Forest Service sensitive species

FT = federally threatened

NWR = National Wildlife Refuge

PT = proposed threatened

SE = state endangered

SSC = California species of special concern

ST = state threatened

WL = CDFW watch list

Table 3.4-7. Special-Status Plant Species and Potential for Impact

Common Name	Scientific Name	Status Federal/State/CRPR*	Habitat/Distribution	Potential for Impact
Bolander's Water Hemlock	*Cicuta maculata* var. *bolanderi*	–/–/2.1	Coastal fresh or brackish marshes and swamps in Contra Costa, Sacramento, Marin, and Solano counties. Present in the North and Central Delta and in Suisun Marsh.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to coastal or brackish wetlands, nor would changes occur in flows, surface water elevations, or salinities that would affect habitat supporting this species.
Delta Button-celery	*Eryngium racemosum*	–/SE/1B.1	Vernally mesic clay depressions in riparian scrub. Extant occurrences recorded along the San Joaquin River in Merced County, and in the South Delta. Reclamation (2010) concluded this species could potentially occur near New Melones Reservoir.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to habitat for this species.
Delta Tule Pea	*Lathyrus jepsonii* var. *jepsonii*	–/–/1B.2	Freshwater and brackish marshes and swamps in the Delta region. Known from the north, central, and west Delta, and Suisun Marsh. CNDDB documents occurrences at Snodgrass, Barker, Lindsey, Hass, and Cache sloughs; Delta Meadows Park; and Calhoun Cut.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to freshwater or brackish wetlands, nor would changes occur in flows, surface water elevations, or salinities that would affect habitat supporting this species.
Mason's Lilaeopsis	*Lilaeopsis masonii*	–/SR/1B.1	Brackish or freshwater marshes and swamps, riparian scrub in Delta region. Known and locally common in certain regions of Delta and in Suisun Marsh. CNDDB documents occurrences of this species in Barker, Lindsey, Cache, and Snodgrass sloughs as well as in Calhoun Cut.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to freshwater or brackish wetlands or riparian scrub, nor would changes occur in flows, surface water elevations, or salinities that would affect habitat supporting this species.
Soft Salty Bird's-beak	*Chloropyron molle* ssp. *molle*	FE/SR/1B.2	Coastal salt marshes and swamps in Contra Costa, Napa, and Solano counties.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to coastal marshes, nor would changes occur in flows, surface water elevations, or salinities that would affect habitat supporting this species.
Suisun Marsh Aster	*Symphyotrichum lentum*	–/–/1B.2	Endemic to the Delta, generally occurs in marshes and swamps, often along sloughs, from 0 to 3 meters in elevation. Brackish and freshwater marshes and swamps in the Delta region. Known from many areas of the Delta and from Suisun Marsh.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to brackish or freshwater marshes, nor would changes occur in flows, surface water elevations, or salinities that would affect habitat supporting this species.

Common Name	Scientific Name	Status Federal/State/CRPR*	Habitat/Distribution	Potential for Impact
Suisun Thistle	*Cirsium hydrophilum* var. *hydrophilum*	FE/–/1B.1	Salt marshes and swamps. Two known occurrences in Grizzly Island Wildlife Area and Peytonia Slough Ecological Reserve. Present at Suisun Marsh.	None. No water facilities, infrastructure, or restoration projects proposed that would result in disturbance to salt marshes and swamps, nor would changes occur in flows, surface water elevations, or salinities that would affect habitat supporting this species.

Sources: CDFW 2019; USFWS 201; CalFlora 2019; CNPS 2019; U.S. Bureau of Reclamation 2019.

Notes: Status Codes

Federal—U.S. Fish and Wildlife Service:

E = endangered

– = no status

State—California Department of Fish and Wildlife:

E = endangered

– = no status

California Rare Plant Ranks (CRPRs):

1B = plant species considered rare, threatened, or endangered in California and elsewhere

2 = plant species considered rare, threatened, or endangered in California but more common elsewhere

California Rare Plant Rank Extensions:

.1 = seriously endangered in California (>80% of occurrences are threatened and/or have high degree and immediacy of threat)

.2 = fairly endangered in California (20–80% of occurrences are threatened)

.3 = not very endangered in California

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

Proposed long-term operation of the SWP would not involve construction of water facilities, infrastructure, or other projects that may affect wildlife movement or nursery sites, and would not result in alterations in habitat that would interfere with wildlife movement and migratory wildlife corridors, or impede the use of native wildlife nursery sites. Therefore, **no impact** would occur.

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

Proposed long-term operation of the SWP would not involve activities that would conflict with local policies or ordinances protecting biological resources. Therefore, **no impact** would occur.

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

Proposed long-term operation of the SWP would not conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or State habitat conservation plan protecting special-status plants and wildlife or sensitive natural communities. Therefore, **no impact** would occur.

3.5 CULTURAL RESOURCES

Table 3.5-1. Potential Impacts on Cultural Resources

	ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
V.	**Cultural Resources. Would the project:**	-
a)	Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?	No Impact
b)	Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	No Impact
c)	Disturb any human remains, including those interred outside of formal cemeteries?	No Impact

Note:
"-" indicates blank cell

3.5.1 ENVIRONMENTAL SETTING

3.5.1.1 Prehistoric Context

The area of the Proposed Project has a long and complex cultural history with distinct regional patterns that extend back more than 11,000 years (Reclamation 1997, as cited in Reclamation 2019). The presence of prehistoric peoples in the area is represented by the distinctive fluted spear points called Clovis points. These artifacts have been found on the margins of extinct lakes in the San Joaquin Valley. The Clovis points are found on the same surface with the bones of animals that are now extinct, such as mammoths, sloths, and camels. The subsequent period from about 10,000 to 8,000 Before Present (B.P.) was characterized by a small number of sites with stemmed spear points instead of fluted spear points.

Approximately 8,000 years ago, many California cultures shifted the main focus of their subsistence strategies from hunting to seed gathering, as evidenced by the increase in food-grinding implements found in archaeological sites dating to this period. By approximately 4,000 B.P., people possibly from the Great Basin were hunting and gathering seasonally in the Sierra Nevada and the Sacramento Valley. The earliest evidence of widespread villages and permanent occupation of the lower Sacramento Valley and Suisun Marsh comes from several sites assigned to the Windmiller Pattern (previously, "Early Horizon"), dated circa 4,500 to 2,500 B.P. (Ragir 1972, as cited in Reclamation 2019; Reclamation 1997, as cited in Reclamation 2019; Reclamation et al. 2010, as cited in Reclamation 2019).

In the last 3,000 years, the archaeological record becomes more complex, as specialized adaptations to locally available resources were developed and populations expanded. Many sites dating to this period contain mortars and pestles or are associated with bedrock mortars, implying that the occupants exploited acorns intensively. The range of subsistence resources that were used increased, exchange systems expanded, and social stratification and craft specialization occurred, as indicated by well-made artifacts such as charm stones and beads, which have often been found with burials.

In the Bay–Delta region from 5,000 to 2,500 B.P., dense settlements extended from the coastal marshes to the interior grasslands and woodlands (Zone 7 Water Agency 2006, as cited in Reclamation

2019). From about 2,500 to 950 B.P., coastal communities relied on shellfish, and major shell mounds were created near these communities, including near the present Alameda County shorelines and some interior valleys. In the Sacramento Valley, the last 1,500 years is characterized by intensified hunting, fishing, and gathering subsistence with larger communities, highly developed trade networks, elaborate ceremonial and mortuary practices, and social stratification. Interaction among groups became more developed through time.

From approximately 1,650 to 950 B.P., evidence indicates that the people of the eastern San Joaquin Valley may have interacted with people in the Delta area, and from approximately 450 to 100 B.P., the people of the eastern San Joaquin Valley may have interacted with people in the Central Coast and Southern California areas (Reclamation 1997, as cited in Reclamation 2019).

Ethnographic Context

This section presents brief ethnographic sketches for each native cultural group whose traditional territories are in the study area. The Proposed Project area encompasses lands occupied by more than 40 distinct Native American cultural groups. Although most California tribes shared similar elements of social organization and material culture, linguistic affiliation and territorial boundaries primarily distinguish them from each other. Before European settlement of California, an estimated 310,000 native Californians spoke dialects of as many as 80 mutually unintelligible languages, representing six major North American language stocks (Cook 1978, as cited in Reclamation 2019; Moratto 1984; Reclamation 1997, as cited in Reclamation 2019; Shipley 1978).

Ethnography

Patwin

The Patwin lived along the western side of the Sacramento Valley, from what is now Princeton to Benicia, including Suisun Marsh (Kroeber 1925; Reclamation 1997, as cited in Reclamation 2019; Reclamation et al. 2010, as cited in Reclamation 2019). Within this large area, the Patwin traditionally are divided into the River, Hill, and Southern Patwin groups. Settlements generally were on high ground along the Sacramento River or tributary streams, or in the eastern Coast Range valleys (P. Johnson 1978b; Reclamation 1997, as cited in Reclamation 2019; Reclamation et al. 2010, as cited in Reclamation 2019).

Miwok

The Miwok cultures included the Coast Miwok, Lake Miwok, and Eastern Miwok divisions. The Eastern Miwok included five separate groups (i.e., Bay, Plains, Northern Sierra, Central Sierra, and Southern Sierra) who inhabited the area from present-day Walnut Creek in Contra Costa County and the Delta, along the lower Mokelumne and Cosumnes rivers and along the Sacramento River from present-day Rio Vista to Freeport, the foothill and mountain areas of the upper Mokelumne River and Calaveras River watersheds, the upper Stanislaus River and Tuolumne River watersheds, and the upper Merced River and Chowchilla River watersheds, respectively (Levy 1978; Reclamation 1997, as cited in Reclamation 2019; Shipley 1978).

In the Bay–Delta region, the Coast Miwok people lived along the lower San Joaquin River and San Pablo Bay and in the interior of present-day Contra Costa and Alameda counties (Reclamation 1997, as cited in Reclamation 2019; ECCCHCPA and USFWS 2006, as cited in Reclamation 2019; Kelly 1978, as cited in Reclamation 2019). The Bay Miwok villages were in the San Ramon Valley, and other settlements were on the western slopes of the Diablo Range (CCWD et al. 2009, as cited in Reclamation 2019). The Miwok people may have held lands on the peak of Mount Diablo.

Yokuts

Yokuts were a large and diverse group of people in the San Joaquin Valley and Sierra Nevada foothills of central California, including the Southern San Joaquin Valley Yokuts, Northern San Joaquin Valley Yokuts, and Foothill Yokuts (Reclamation 1997, as cited in Reclamation 2019; Reclamation and DWR 2011, as cited in Reclamation 2019; SJRRP 2011, as cited in Reclamation 2019). The three subdivisions of the Yokuts languages belong to the Yokutsan family, or Penutian stock (Shipley 1978).

The Southern Valley Yokuts inhabited the southern San Joaquin Valley from present-day Fresno to the Tehachapi Mountains (Wallace 1978a). The Northern Valley Yokuts inhabited the northern San Joaquin Valley from Bear Creek to the San Joaquin River near present-day Mendota, the western San Joaquin Valley near present-day San Luis Reservoir, and what is now eastern Contra Costa and Alameda counties (ECCCHCPA and USFWS 2006, as cited in Reclamation 2019; Wallace 1978b; Reclamation and State Parks 2013, as cited in Reclamation 2019; Reclamation and DWR 2011, as cited in Reclamation 2019). The Foothill Yokuts inhabited the western slopes of the Sierra Nevada foothills, from the Fresno River to the Kern River (Spier 1978, as cited in Reclamation 2019; Reclamation and State Parks 2013, as cited in Reclamation 2019).

3.5.1.2 Historical Context

In 1579, Sir Francis Drake and Spanish explorers led expeditions into the San Francisco Bay Area. However, initial contact between Europeans and Native Americans occurred with Spanish missionaries and soldiers, who entered California from the south in 1769, eventually founding 21 missions along the California coast (Reclamation 1997, as cited in Reclamation 2019).

Numerous expeditions travelled through the San Joaquin Valley between 1769 and 1848, but did not establish major settlements (Reclamation 2010, as cited in Reclamation 2019). Europeans, Americans, and Canadians initially may have entered the Sacramento Valley in the late 1700s and early 1800s as part of missionary or military expeditions (Reclamation 1997, 2005a, as cited in Reclamation 2019; Reclamation et al. 2006, as cited in Reclamation 2019; Placer County 2007, as cited in Reclamation 2019). Fur trappers moved through this area from the 1820s to 1840s.

When Mexico became independent from Spain in 1822, the mission lands were divided by government grants into large ranchos, often consisting of tens of thousands of acres (DSC 2011, as cited in Reclamation 2019). During the Spanish and Mexican periods, explorers entered the region. In 1848, the Treaty of Guadalupe Hidalgo transferred the lands of California from the Mexican Republic to the United States and initiated what is called the American Period in California history (Reclamation 1997, as cited in Reclamation 2019).

To support growth, extensive transportation systems were created to enable wagon routes, steamboats on the major rivers, and numerous railroads (Reclamation 1997, as cited in Reclamation 2019). During the latter part of the nineteenth century, American ranchers amassed large tracts of former rancho land, and several great cattle empires were formed. With development of irrigation and improved transportation in the 1880s, new crops, including vegetables, fruits, and nuts, were added to the grains obtained from dry farming.

Following the discovery of gold in the Sacramento Valley, settlements occurred in the Delta to provide support services and agricultural products for those traveling to the gold fields and the Sacramento and San Francisco areas. Passage of the Swamp and Overflow Act in 1850 led to the transfer of lands from the U.S. government in the Delta to the State of California, which subsequently sold the land to individuals. The new settlers in the Delta constructed levees to protect the lands from periodic flooding and drained other lands to reduce the potential for mosquito-borne diseases (DSC 2011, as cited in Reclamation 2019; Reclamation et al. 2010, as cited in Reclamation 2019).

Urban water supply and irrigation capabilities further expanded in the 1950s and 1960s with implementation of multiple water projects. The SWP includes water, power, and conveyance systems. The principal facilities of the SWP are Oroville Reservoir and its related facilities, San Luis Dam and its related facilities, and facilities in the Delta; the Suisun Marsh Salinity Control Gates; the California Aqueduct, including its terminal reservoirs; and the North and South Bay Aqueducts.

The SWP facilities in the Delta provide for delivery of water supply to areas within and immediately adjacent to the Delta and to regions south of the Delta. The main SWP Delta features are the Suisun Marsh facilities, the Harvey O. Banks Pumping Plant, the Skinner Fish Facility, and the Barker Slough Pumping Plant. The locations of these facilities are shown in Figure 2-2, and descriptions of each are presented in Section 2.1.3.

3.5.1.3 Known Cultural Resources

No physical or record surveys were conducted for this IS because no site-specific construction actions are proposed. The resources described in this subsection indicate the types of resources that occur in areas served by SWP water and adjacent areas.

Most of the cultural resources are located within areas that would not be affected by land use changes that could result from changes in SWP water supplies.

3.5.2 DISCUSSION

The discussion in this section focuses on the potential impacts on cultural resources that may result from proposed long-term operation of the SWP and facilities described in detail in Section 3.1.2 and assessed on a project-level basis.

a) Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?

Proposed project-level actions would not increase water flow and raise water levels beyond existing conditions, would not include installation of additional barriers beyond those that already are in place,

and would not involve any construction or land-disturbing activities. The Proposed Project includes removing sediment that builds up at the Barker Slough Pumping Plant (BSPP) intake gates and disposing of those materials at existing spoils locations at the BSPP. These activities must be done periodically as part of routine maintenance in order to keep the intake gates clear of debris and functioning. Sediment disposal sites are located on previously disturbed areas that were associated with construction and maintenance at the BSPP, including regular graveling and grading. All access routes are existing, maintained gravel roadways. Staging for the activities will occur within existing graveled and paved surfaces at the BSPP. No cultural resources were observed during the pedestrian survey of the BSPP. The windshield survey of the access road noted that the road exists on top of an unrecorded historical-era levee. The levee is a portion of Unit 107 of the USACE Sacramento River Flood Control Project. Therefore, **no impact** would occur.

b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?

Proposed project-level actions would not increase water flow nor raise water levels beyond existing conditions, would not include installation of additional barriers beyond those that already are in place, nor involve any construction or land-disturbing activities. Proposed program-level operations would continue water transfers and continue the removal of aquatic weeds, which would not result in impacts on archaeological resources. Proposed environmental protective measures would continue operations along with studies for installing additional facilities. Therefore, **no impact** would occur.

c) Disturb any human remains, including those interred outside of formal cemeteries?

Proposed project-level actions would not increase water flow nor raise water levels beyond existing conditions, would not include installation of additional barriers beyond those that already are in place, nor involve any construction or land-disturbing activities. Proposed program-level operations would continue water transfers and continue removal of aquatic weeds from SWP facilities, which would not result in impacts on human remains. Such activities would not alter undisturbed lands or waterway channels. Therefore, **no impact** would occur.

3.6 ENERGY

Table 3.6-1. Potential Impacts on Energy

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
VI. Energy. Would the project:	-
a) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	No Impact
b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	No Impact

Note:
"-" indicates blank cell

3.6.1 ENVIRONMENTAL SETTING

This section describes the existing sources and amounts of energy used by the SWP and the types and amounts of energy generated by SWP facilities; it also describes energy use and generation by hydroelectric generation facilities and power demands for the SWP and how these facilities may be affected from the implementation of the proposed long-term operation of the SWP evaluated in this IS. Implementation of the alternatives could affect SWP power generation and energy demands through potential changes in operation of the SWP facilities.

Water and energy are often managed separately, despite the important links between the two. Water is used in the production of nearly every major energy source, and energy is used in multiple ways and at multiple stems in water delivery and treatment systems as well as in wastewater collection and treatment. Approximately 12% of California's total energy use is related to water.

The sources of energy used to power water activities are also directly linked to the volume of associated greenhouse gas (GHG) emissions. The primary environmental impact of wasteful, inefficient, or unnecessary consumption of energy resources is the increased emission of GHGs and the associated impacts on climate change. The potential climate change impacts from GHG emissions associated with the proposed long-term operation of the SWP are discussed in Section 3.8, "Greenhouse Gas Emissions." Therefore, this section focuses on whether proposed long-term operation of the SWP would result in wasteful, inefficient, or unnecessary consumption of energy or would conflict with relevant renewable energy or energy efficiency plans.

3.6.1.1 Relevant Regulations

The National Energy Policy, established in 2001 by the National Energy Policy Development Group (NEPDG), is designed to help the private sector and state and local governments promote dependable, affordable, and environmentally sound production and distribution of energy for the future (NEPDG 2001). Key issues addressed by the energy policy are energy conservation, repair and expansion of energy infrastructure, and ways of increasing energy supplies while protecting the environment.

The 2008 update to the 2005 Energy Action Plan II is the State's principal energy planning and policy document (State of California 2008). The updated document examines the State's ongoing actions in

the context of global climate change and examines policy changes in the areas of energy efficiency, demand response, renewable energy, electricity reliability and infrastructure, electricity market structure, natural gas supply and infrastructure, research and development, and climate change. The 2005 Energy Action Plan II continues the goals of the original 2003 Energy Action Plan, describes a coordinated implementation plan for State energy policies, and identifies specific action areas to ensure that California's energy resources are adequate, affordable, technologically advanced, and environmentally sound.

In accordance with the 2008 Plan update, the first-priority actions to address California's increasing energy demands are energy efficiency and demand response (i.e., reduction of customer energy usage during peak periods to address system reliability and support the best use of energy infrastructure). Additional priorities include the use of renewable sources of power and distributed generation (i.e., the use of relatively small power plants near or at centers of high demand). To the extent that these actions are unable to satisfy the increasing energy demand and transmission capacity needs, clean and efficient fossil-fired generation is supported. California first established a state Renewables Portfolio Standard (RPS) in 2002 under Senate Bill (SB) 1078, when it set an RPS standard of 20% before 2017 for investor-owned utilities. California later accelerated this RPS requirement in 2006 under SB 107, when it moved the date up to 2010. In 2011, California expanded this requirement to include publicly owned municipal power and increased the RPS requirement to 33% by 2020 (i.e., Sacramento Municipal Utility) under SB X1-2.

The RPS program requires investor-owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable resources to 33% of total procurement by 2020. In 2015, passage of SB 350 created a 50% RPS requirement by 2030. During the 2017 legislative session, SB 100 was enacted and established a 60% RPS requirement by 2030, with a State policy requirement of 100% carbon-free by 2045. This also was captured in Gubernatorial Executive Order B-55-18 on carbon neutrality. For the State's RPS requirements, renewable energy resources do not include hydropower facilities over 30 megawatts, in accordance with Section 399.12(e) of the California Public Utilities Code and Section 25741 of the California Public Resources Code. However, hydropower generation is not precluded from counting toward the California carbon-free policy.

As described in Section 25741 (1) (a) of the Public Resources Code, a renewable electrical generation facility is defined as a facility that meets all of the following criteria: the facility uses biomass, solar thermal, photovoltaic, wind, geothermal, fuel cells using renewable fuels, small hydroelectric generation of 30 megawatts or less, digester gas, municipal solid waste conversion, landfill gas, ocean wave, ocean thermal, or tidal current, and any additions or enhancements to the facility using that technology. Section 14(1)(b) of the Public Utilities Code, as amended, states that an existing conduit hydroelectric facility of 30 megawatts or less shall be an eligible renewable energy resource.

Assembly Bill (AB) 32 requires California to reduce its total GHG emissions to 1990 levels by 2020, which represents about a 30% decrease from current levels. In September 2007, the California Air Resources Board (CARB) approved a list of nine Discrete Early Actions to reduce GHG emissions. CARB's Discrete Early Actions include maximizing energy efficient building and appliance standards; pursuing additional efficiency efforts, including new technologies and new policy and implementation

mechanisms; and pursuing comparable investment in energy efficiency by all retail providers of electricity in California (including both investor-owned and publicly owned utilities).

3.6.1.2 Existing SWP Energy Use and Generation Facilities

The SWP is one of the largest electricity users in California (DWR 2019a). The amount of energy the SWP uses each year varies with the amount of water that moves through its network of pumping stations to meet the annual water allocations and water contractor demand. The amount of water delivered fluctuates each year because of the amount of water available in each year. Several factors are considered for water allocation, including what percentage DWR approves of the SWP water contractor allocation requests and the annual hydrological conditions. For example, dry years in Northern California usually result in reductions of water delivery and power generation; therefore, full deliveries cannot be made and less power can be used.

Table 3.6-2 shows energy consumption and water delivery volumes for the most recent 6 years for which data are available (2011 through 2016), and the total water delivered is higher during wet years, and lower during dry or critical years. Over this 6-year period, annual energy use ranged between approximately 2,800 and 8,600 gigawatt hours (GWh) per year. When controlling for fluctuations in the volume of water delivered each year, energy consumption during this period ranged from approximately 1.40 to 2.42 GWh per TAF, with an average of 1.83 GWh per TAF.

Table 3.6-2. Historic SWP Energy Use and Water Delivery 2011 through 2016

Year	Total Energy Consumed (GWh)	Total Water Delivered (TAF)	Average Energy/Water (GWh/TAF)	Hydrological Conditions[1]
2016	6,600	3,338	1.977	Below Normal/Dry
2015	3,490	2,104	1.659	Critical/Critical
2014	2,790	1,992	1.401	Critical/Critical
2013	5,740	3,371	1.703	Dry/Critical
2012	7,410	3,067	2.416	Below Normal/Dry
2011	8,550	4,631	1.846	Wet/Wet
Average	-	-	**1.834**	-

Notes:
GWh = gigawatt-hour(s); TAF = thousand acre-feet; "-" indicates blank cell.
[1]. Hydrological conditions are reported for the Sacramento Valley and San Joaquin Valley respectively, for the corresponding water year. Water years run from October through September.
Sources: DWR 2014; 2015a, 2015b; 2016a; 2017; 2019a, 2019b.

The majority of the energy used by the SWP is needed for pumping plants in the Delta, at the San Luis Reservoir, and along the California Aqueduct. From the Delta through the San Joaquin Valley to Southern California reservoirs, the SWP uses electricity to lift water to elevations as high as 1,926 feet before gravity can foster the rest of its conveyance from north to south. The SWP pumps are operated through an extensive computerized network to maximize efficiency. Pumping is minimized during on-peak hours, when power prices are highest. Maximum pumping is scheduled during off-peak periods (nights, weekends, and holidays), when power costs are lower.

Minor amounts of energy (electricity, natural gas, vehicle fuels, etc.) are also used during construction of individual projects, maintenance activities (such as flood protection, erosion repairs, annual equipment and facilities inspection and maintenance), and business practices (e.g., heating and cooling of DWR buildings, electricity used within buildings, business travel by DWR employees).

3.6.1.3 SWP Energy Generation

The SWP is the third-largest generator of hydroelectricity in California, generating between 4,000 and 7,000 GWh per year (approximately 14% of California's hydropower generation). The SWP includes five hydroelectric power plants and four pumping-generating plants, as summarized in Table 3.6-3. The total capacity of SWP generation facilities is more than 1,500 MW. Energy generation is highly variable due to changes in annual hydrologic conditions. Power generated by the SWP is transmitted by Pacific Gas and Electric Company (PG&E), Southern California Edison, and California Independent System Operator through other facilities (DWR 2019a).

Table 3.6-3. SWP Hydroelectric Generation Facilities

Facility	Installed Capacity (megawatts)
Oroville Facilities	-
Hyatt Pumping-Generating Plant	645
Thermalito Diversion Dam Power Plant	3
Thermalito Pumping-Generating Plant	114
William R. Gianelli (San Luis) Pumping-Generating Plant (SWP share)	222
Alamo Power Plant	15
Mojave Siphon Power Plant	29
Devil Canyon Power Plant	235
Warne Power Plant	67
Castaic Power Plant (joint development with LADWP)	214
TOTAL CAPACITY	**1,544**

Source: DWR 2016b, Clean Energy for the State Water Project (SWP)

Notes:

LAPWD = Los Angeles Department of Water and Power

"-" indicates blank cell

The SWP power generation facilities were developed to meet SWP energy use loads, but do not generate sufficient energy to meet its total operating load. The energy needed to operate the SWP therefore comes from a combination of its own hydroelectric generating plants and power purchased from and exchanged with other utilities. In a normal year, SWP generation facilities supply about two-thirds of the SWP's necessary operating power (DWR 2019a). For example, in 2016, (the most recent year for which data are available), the SWP used 6,600 GWh of energy, approximately 2,600 GWh of which were purchased by DWR (DWR 2019a).

DWR uses a portfolio of energy resources to make up the difference in energy between the electricity that SWP facilities generate and the amount of electricity needed to run the SWP. The composition of the SWP power portfolio varies throughout the year and from year to year, but the SWP power

portfolio's electricity sources generally can be categorized as generation from large hydroelectric facilities, nonrenewable energy facilities, and thermal generation facilities, as well as purchased energy (DWR 2012). Table 3.6-4 summarizes the capacity and types of third-party energy sources under contract to the SWP (DWR 2016b).

Table 3.6-4. Non-SWP-owned Energy Sources

Facility and Fuel Type	Fuel Type	DWR's Share of Capacity (megawatts)	DWR's Share of Energy (gigawatt hours)	Contract Status
Pine Flat	Hydro	165	431	Active
MWD Phase I	Small Hydro	30	128	Active
Reid Gardner	Coal	235	1,024	Terminated in 2013
Lodi Energy Center – Combined Cycle Combustion Turbine	Natural Gas	99	422	Active
NCPA Geothermal 1 & 2; Ameresco Ox Mountain Energy	Geothermal; Landfill Gas	34	182	Active
Dominion – Camelot	Solar	45	130	Active
SPower – Solverde 1	Solar	85	240	Active
SunPower – Pearblossom	Solar	9.5	28	Active
MWD	Small Hydro	51.4	95	Active
TOTAL (Active Contracts)	**-**	**519**	**1,656**	**-**

Notes:

DWR = Department of Water Resources; MWD = Metropolitan Water District of Southern California; NCPA = Northern California Power Agency; "-" indicates blank cell

Source: DWR 2016b, Clean Energy for the State Water Project (SWP)

The SWP also markets energy in excess of the SWP demands to local utilities, such as PG&E and members of the Western Systems Power Pool (WSPP). The SWP has power contracts with electric utilities and the California Independent System Operator that act as exchange agreements with the utility companies for transmission and power sales and purchases.

3.6.1.4 Other Energy Resources for the State Water Project

Other energy supplies have been obtained by DWR from other utilities and energy marketers under agreements that allow DWR to buy, sell, or exchange energy on a short-term hourly basis or a long-term multi-year basis (DWR 2019a). DWR has a long-term purchase agreement with the Kings River Conservation District for approximately 400 million kilowatt-hours of energy from the 165-megawatt hydroelectric Pine Flat Power Plant. DWR also purchases energy from four hydroelectric plants with 29 megawatts of installed capacity that are owned and operated by the Metropolitan Water District of Southern California (DWR 2012).

DWR also purchases energy under short-term purchase agreements from utilities and energy marketers of the WSPP. In addition, the 1988 Coordination Agreement between DWR and the Metropolitan Water District of Southern California enables DWR to purchase and exchange energy. (DWR 2012).

3.6.1.5 SWP Energy Reduction and Efficiency Efforts

Operation of the SWP is responsible for approximately 99% of all GHG emissions by DWR (DWR 2016b). Most of these emissions come from non-hydropower electricity used by the pumping plants to move water from the Sacramento-San Joaquin Delta to other parts of the state. Because energy generation and use are a major component of GHG management, many of the GHG reduction strategies used by DWR focus on:

- minimizing energy use,
- maximizing hydroelectric generation,
- increasing use of renewable energy supplies, and
- using SWP lands for building renewable energy projects.

As discussed in more detail in Section 3.8, "GHG Emissions," DWR developed a Climate Action Plan (CAP) to guide DWR's programs, projects, and activities in response to a changing climate (DWR 2012). The CAP demonstrates how DWR will make substantial reductions in its GHG emissions in the near term (present to 2020), and how it will continue to reduce emissions beyond 2020 to achieve its long-term (2050) GHG emissions reduction goal. Since publication of the CAP, DWR has further reduced its emission reduction targets to 50% below 1990 levels by 2020 and 100% below 1990 levels by 2045 (DWR 2019c). The CAP identifies 11 GHG emissions reduction measures to meet near-term and long-term goals, which include:

- termination of its participation and associated delivery of electricity from a coal-fired power plant,
- efficiency improvements to DWR's existing facilities,
- purchase and development of renewable and high efficiency electricity supplies,
- comprehensive improvements to DWR's construction practices, and
- improvements to DWR's business activities that will reduce GHG emissions.

Some of these measures (e.g., cessation of use of electricity from coal-fired power plants) have already been completed; others (e.g., efficiency improvements to existing facilities, construction practices, and business activities) are ongoing.

3.6.2 DISCUSSION

a) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?

The proposed long-term operation of the SWP would not involve construction of new or modification of existing SWP facilities, and therefore no construction-related energy would be used. SWP energy consumption for operational purposes would continue to vary on an annual basis due to fluctuations in water deliveries due to climatic variability and would remain within the range of energy consumption historically used by the SWP. Over time, the sources of energy used to power the SWP would become more renewable, and the efficiency of energy use would improve through compliance with DWR adopted plans, policies, and legislative mandates requiring increased reliance on renewable resources

and energy efficiency. Therefore, the Proposed Project would not include any changes that would result in wasteful, inefficient, or unnecessary consumption of energy resources that would potentially result in significant environmental impacts. Because there would be an increase in energy efficiency over time, **no impact** would occur.

b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?

The proposed long-term operation of the SWP would be similar in scale and intensity to existing and historic operations. DWR would continue to implement energy efficiency and measures in accordance with the CAP, and long-term operation of the SWP would not hinder the implementation of the CAP. As discussed further in Section 3.8, "Greenhouse Gas Emissions," the CAP is consistent with State and local plans for renewable energy and energy efficiency; therefore, the Proposed Project would not conflict with or obstruct such a plan. **No impact** would occur.

3.7 GEOLOGY AND SOILS

Table 3.7-1. Potential Impacts on Geology and Soils

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
VII. Geology and Soils. Would the project:	-
a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:	-
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? (Refer to California Geological Survey Special Publication 42.)	No Impact
ii) Strong seismic ground shaking?	No Impact
iii) Seismic-related ground failure, including liquefaction?	No Impact
iv) Landslides?	No Impact
b) Result in substantial soil erosion or the loss of topsoil?	No Impact
c) Be located on a geologic unit or soil that is unstable, or that would become unstable because of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	No Impact
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994, as updated), creating substantial direct or indirect risks to life or property?	No Impact
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	No Impact
f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	No Impact

Note:
"-" indicates blank cell

3.7.1 ENVIRONMENTAL SETTING

3.7.1.1 Geology and Paleontology

Central Valley, and San Francisco Bay and Delta Regions

The Central Valley region extends from above Shasta Lake in the north to the Tehachapi Mountains in the south, and includes the Sacramento Valley, San Joaquin Valley, Delta, and Suisun Marsh. This region includes the Sacramento River, Clear Creek, Feather River, American River, Stanislaus River, and San Joaquin River watersheds. The Central Valley is an approximately 400-mile-long, 50-mile-wide valley. The faulted and folded sediments of the Coast Ranges extend eastward beneath most of the Central Valley. The igneous and metamorphic rocks of the Sierra Nevada extend westward beneath the eastern Central Valley. The valley floor is an alluvial plain, composed of late Mesozoic- and Cenozoic-era sediments, deposited by wind and rivers flowing out of the Coast Ranges and the Sierra Nevada.

The Delta is a flat-lying river delta that evolved at the inland margin of the San Francisco Bay Estuary as two overlapping and coalescing geomorphic units: the Sacramento River Delta to the north and the San Joaquin River Delta to the south. During large river-flood events, silts and sands were deposited adjacent to the river channel, which formed as a tidal marsh with few natural levees and was dominated by tidal flows, allowing landward accumulation of sediment behind the bedrock barrier at the Carquinez Strait. The sediment formed marshlands, which consisted of numerous islands that were surrounded by hundreds of miles of channels. Tule marshes became established on peat and organic soils in many portions of the Delta, including Suisun Marsh. Additional peat and other organic soils continue to form from repeated inundation and accumulation of sediment and marsh vegetation. The greater San Francisco Bay Area is located in the Coast Ranges, which are described above.

Table 3.7-2 shows the geologic formations in the Central Valley (Sacramento and San Joaquin Valley regions) and Delta regions. Table 3.7-2 also shows the results of the paleontological sensitivity assessment for these regional geographic areas, based on a review of geologic maps, a literature review, and a paleontological resources records search that was performed at the University of California, Berkeley Museum of Paleontology (UCMP) on April 16, 2019.

In its standard guidelines for assessment and mitigation of adverse impacts on paleontological resources, the Society of Vertebrate Paleontology (SVP 1996) established three categories of sensitivity for paleontological resources: high, low, and undetermined. Areas where fossils have been found previously are considered to have a high sensitivity and a high potential to produce fossils. Areas that are not sedimentary in origin and have not been known to produce fossils in the past typically are considered to have low sensitivity. Areas that have not had any previous paleontological resource surveys or fossil finds are considered to be of undetermined sensitivity until surveys and mapping are performed to determine their sensitivity. In keeping with the SVP significance criteria, all vertebrate fossils generally are categorized as being of potentially significant scientific value.

An individual vertebrate fossil specimen may be considered unique or significant if it is identifiable and well preserved, and it meets one of the following criteria:

- Type specimen (i.e., the individual from which a species or subspecies has been described)
- Member of a rare species
- Species that is part of a diverse assemblage (i.e., a site where more than one fossil has been discovered), wherein other species are also identifiable and important information regarding the life history of individuals can be drawn
- Skeletal element different from, or a specimen more complete than, those now available for its species
- Complete specimen (i.e., all or substantially all of the entire skeleton is present)

Table 3.7-2. Regional Geology and Paleontological Sensitivity

Project Area	Geologic Description	Paleontological Sensitivity
Sacramento Valley Region	-	-
-	**Sacramento River Watershed**	-
Red Bluff to the Delta	Pleistocene alluvial fan and terrace deposits, such as the Modesto and Riverbank formations	High
-	Holocene levee and channel deposits, basin deposits	Low
-	**Feather River Watershed**	-
West of Lake Oroville	Lovejoy Basalt (Miocene extrusive, fine-grained volcanic rocks); Tuscan Formation (Pliocene interbedded lahars, volcanic conglomerate, volcanic sandstone, siltstone, and pumiceous tuff); Laguna Formation (Pliocene interbedded alluvial gravel, sand, and silt); Holocene alluvial deposits; and Historic dredge and mine tailings	Low
-	Chico Formation (Cretaceous marine sandstone and minor siltstone), Ione Formation (Eocene light-colored conglomerate, sandstone, and claystone), Riverbank Formation (Pleistocene weathered reddish gravel, sand, and silt forming alluvial terrace and fan deposits), and Modesto Formation (Pleistocene unconsolidated, unweathered gravel, sand, silt, and clay)	High
Active channels of the Feather, Bear, and Yuba rivers and tributary streams	Holocene alluvial deposits (clay, silt, sand, gravel, cobbles, and boulders in various layers and mixtures), slickens (fine, clay-rich, light yellow-brown powdery residue from hydraulic mining), and Historic floodplain deposits	Low
Delta Region	-	-
Sacramento–San Joaquin Delta	Mesozoic bedrock, Holocene peat and organic soils, alluvium, levee and channel deposits, Bay Mud, and Merritt Sand (Pleistocene beach and dune sand deposits)	Low
-	Pleistocene alluvium (weakly to moderately consolidated, poorly sorted, interbedded clay, stilt, sand, and gravel)	High
Suisun Marsh Region	-	-
Suisun Marsh	Holocene intertidal deposits composed of Bay Mud and medium-grained alluvium	Low
San Joaquin Valley Region	-	-
San Luis Reservoir/O'Neil Forebay	Franciscan Complex (Jurassic chert, metagraywacke), Upper Jurassic-Lower Cretaceous marine sandstone and shale (Coast Ranges)	Low
-	Panoche Formation (Cretaceous marine sandstone and shale), Los Banos alluvium (Pleistocene coarse-grained terrace, pediment, and fan deposits), San Luis Ranch alluvium (Late Holocene-Early Pleistocene unweathered fine- to coarse-grained fan, mudflow, terrace, and floodplain deposits)	High

Note:
"-" indicates blank cell.
Sources: Fraticelli et al. 2012; Saucedo and Wagner 1992; Gutierrez 2011; Helley et al. 1979; Helley and Harwood 1985; UCMP 2019; Jefferson 1991a, 1991b; The Paleontology Portal (undated); Hotz 1971; Irwin 1997, 2009; Wagner et al. 1991; Dundas et al. 1996; Bateman 1992; Marchand and Allwardt 1981; Lettis 1982; Barnosky and Holroyd undated n.d.; Bailey et al. 1964

The value or importance of different fossil groups varies, depending on the age and depositional environment of the rock unit that contains the fossils, their rarity, the extent to which they already have been identified and documented, and the ability to recover similar materials under more controlled conditions (such as for a research project). Marine invertebrates generally are common; the

fossil record is well developed and well documented, and they generally would not be considered a unique paleontological resource. Identifiable vertebrate marine and terrestrial fossils generally are considered scientifically important because they are relatively rare.

As shown in Table 3.7-2, in general, mountainous areas that are composed of bedrock (which formed from magma deep below the earth's surface) and rocks formed from volcanic activity on the Earth's surface do not contain fossils. Metamorphic rocks, which have been altered from their original condition by conditions of high temperature and pressure, contain few fossils, most of which are invertebrates. Therefore, with only a few exceptions (such as the Mehrten Formation, Hosselkus Limestone, and narrow bands of Pleistocene alluvial deposits immediately adjacent to river and stream channels), most of the rocks found in the Klamath Mountains, Coast Ranges, and Sierra Nevada do not contain unique paleontological resources requiring CEQA evaluation.

Most vertebrate fossils are found in sedimentary deposits. Fossils become a part of sedimentary rocks when sediments such as mud, clay, silt, sand, and pebbles cover plant and animal organisms and preserve their characteristics through time. The surface of the Central Valley, and extending in some places to depths of more than 2,000 feet below the surface, is composed of sedimentary deposits. Many of the rock formations that fill the Central Valley are known to have produced numerous vertebrate fossils (e.g., Turlock Lake, Riverbank, and Modesto Formations) or large numbers of plant assemblages (e.g., Ione Formation), and therefore are considered to be of high paleontological sensitivity. Geologic units that are of Holocene age (i.e., 11,700 years Before Present to Present Day) contain only the remains of extant, modern taxa (if any fossil resources are present), which are not considered "unique" paleontological resources.

Central Coast and Southern California Service Areas

The mountains and foothills of Orange County and portions of southern Los Angeles County, western San Diego County, northwestern San Bernardino County, and northern Riverside County in the SWP and CVP service areas are located in the Transverse Ranges. The mountains and valleys of the Transverse Ranges are oriented east-west, in contrast to most of the rest of California (which is oriented north-south). These ranges are being actively uplifted as the Earth's crust is being compressed along the east-west bend in the San Andreas Fault in this area. The geologic structure of the Transverse Ranges consists of Cenozoic sedimentary rocks, underlain by older Paleozoic granitic and metamorphic rocks. Portions of Santa Barbara and San Luis Obispo counties in the SWP and CVP service areas are located in the Coast Ranges. The geologic structure of the Coast Ranges is described above.

Low-lying portions of Los Angeles, Riverside, and San Bernardino counties are located in the Mojave Desert Geomorphic Province. This geomorphic province includes extensive alluvial basins that are filled with non-marine sediments, eroded from the surrounding mountains and foothills. Many isolated ephemeral lakebeds (also known as playas) occur in this region, with tributary streams from isolated mountain ranges. (Reclamation 2019).

Portions of Riverside County in the Coachella Valley are in the Colorado Desert Geomorphic Province (or Salton Trough), characterized by a geographically depressed desert that extends northward from the Gulf of California (at the mouth of the Colorado River) toward the Mojave Desert. Large portions of

this geomorphic province were formed by inundation of an ancient lake and are filled with sediments several miles thick that originated from the historical Colorado River overflows and erosion of upland areas. The Salton Sea is in a trough along an ancient playa. (Reclamation 2019).

Fossilized remains of marine mammals and bony fishes are present in numerous marine sedimentary rocks from the Cenozoic era throughout the Central Coast and Southern California service areas. Vertebrate fossils of land mammals also are present in a variety of Cenozoic-era non-marine formations. Rock formations that are known to have yielded vertebrate fossils in the Central Coast and Southern California service areas include Bautista Beds, La Brea Tar Pits, San Timoteo Formation, Monterey Formation, Pico Formation, Modelo Formation, San Pedro Formation, Manix Formation, Punchbowl Formation, Hector Formation, Bedrock Spring Formation, Mission Valley Formation, Friars Formation, Santiago Formation, San Diego Formation, San Mateo Formation, Monterey Formation, and Caliente Formation, among others.

3.7.1.2 Seismicity

Seismicity in Northern California primarily is controlled by the San Andreas Fault Zone—which runs 150 miles from the Gulf of California through the Coast Ranges and ends offshore, north of Point Reyes—and the Cascadia subduction zone. The Cascadia subduction zone runs from Vancouver Island in Canada to Cape Mendocino in Northern California. The Pacific, North American, and Gorda tectonic plates meet at the Mendocino Triple Junction, located in the Pacific Ocean just west of Cape Mendocino. Along the Cascadia subduction zone, the Gorda Plate is being actively subducted (overridden) and driven underneath the North American Plate. The San Andreas Fault Zone is along portions of the active tectonic plate boundary (described above) and the historic tectonic plate boundary where the Farallon Plate became subducted underneath the North American Plate millions of years ago.

Over time, as subduction continues to occur, more of the Pacific Plate comes into contact with the North American Plate, resulting in strain along the rock strata. In some cases, this strain is relieved by very slow movement of the rocks past one another (known as fault creep). Periodically, the strain buildup becomes great enough so that an earthquake occurs. In recent years, scientists with the California Geological Survey (CGS) and U.S. Geological Survey (USGS) have determined that many of the faults along the Northern California coast that were once thought to operate independently of one another actually are interconnected strands of the San Andreas Fault Zone (Field and the 2014 Working Group on California Earthquake Probabilities 2015).

Surface fault rupture is fault movement that breaks to the surface of the Earth, either suddenly during earthquakes or slowly because of fault creep, and is from tectonic movement that originates deep in the Earth. “Active” or “Holocene-active” faults (i.e., faults showing evidence of displacement during the last 11,700 years) are more likely to result in both surface fault rupture and strong seismic ground shaking than pre-Holocene faults. Surface fault rupture and strong seismic ground shaking can severely damage buildings, roads, bridges, and underground pipelines. Strong seismic ground shaking also can trigger potentially damaging landslides (in areas of steep or unstable slopes) and liquefaction (in areas composed of young, unconsolidated, water-saturated sediments such as Bay mud).

Northern California's active faults are along the west coast because of ongoing strain from the interaction of the Pacific and North American continental plates. Active faults in the Sierra Nevada, on the other hand, are less common, primarily because most of the strain of tectonic plate movement today is relieved by faults in the Coast Ranges, which are closer to the boundary where the tectonic plates make contact with one another. With the exception of the region south of Bakersfield, the Central Valley generally does not contain active faults, and therefore is subject to a very low level of seismic activity. Therefore, most of the Central Valley and Sierra Nevada foothills generally are not subject to seismic hazards.

3.7.1.3 Soils

The types of soils in the project area vary, depending on the parent material. Soils in mountainous areas generally consist of a thin veneer overtop of bedrock. Soils in the foothills are somewhat more developed, but generally reflect volcanic and metamorphic origins, have lower fertility, and consist primarily of grasslands. Soils in the valley bottomlands are rich in organic matter and are very fertile. The Central Valley is one of the most productive agricultural areas in the world; more than half of the fruits, vegetables, and nuts grown in the U.S. come from the Central Valley. Soils in the Delta are rich in peat and decaying plant matter.

The different soil types all have different characteristics related to wind and water erosion, permeability, drainage, clay content, stormwater runoff potential, salinity, pH, and suitability for agricultural crops. Descriptions of the soil characteristics for all of the soil types in the project area are beyond the scope of this analysis. However, Table 3.7-3 shows a generalized description of soils in the project regions.

Table 3.7-3. Generalized Description of Soils

Project Region	Description of Soils
Central Valley (Sacramento and San Joaquin Valleys)	Foothill soils include serpentine soils (which include magnesium, nickel, cobalt, chromium, iron, and asbestos); sedimentary sandstones; shales; conglomerates; and sandy loam, loam, and clay loam soils above bedrock.
Central Valley (Sacramento and San Joaquin Valleys)	Terrace lands include brownish loam, silt loam, and/or clayey loam soils. The soils generally are loamy along the Sacramento Valley terraces and more clayey along the San Joaquin Valley terraces. Along the eastern boundaries of Sacramento and San Joaquin valleys, the terraces primarily are red silica–iron-cemented hardpan and clays, sometimes with calcium carbonate.
Central Valley (Sacramento and San Joaquin Valleys)	Surface soils of the Central Valley include alluvial and aeolian soils. The alluvial soils include calcic brown and noncalcic brown alluvial soils on deep alluvial fans and floodplains. The calcic brown soil primarily is made of calcium carbonate and is alkaline (also known as "calcareous" soils). The noncalcic brown soils do not contain calcium carbonate and are either slightly acidic or neutral in chemical properties. Aeolian soils (i.e., sand and silt-sized particles) are more susceptible to wind erosion than alluvial soils. Non-irrigated soils that have been disturbed by cultivation or other activities throughout the Central Valley are more susceptible to wind erosion and subsequent blowing dust than soils with more soil moisture.

Project Region	Description of Soils
Central Valley (Sacramento and San Joaquin Valleys)	Basin soils occur in the San Joaquin Valley and portions of the Delta. These soils include organic soils, imperfectly drained soils, and saline alkali soils. The organic soils are typically dark, acidic, and high in organic matter, and generally include peat. The organic soils occur in the Delta, as discussed below, and along the lower San Joaquin River adjacent to the Delta. The poorly drained soils contain dark clays and occur in areas with high groundwater in the San Joaquin Valley trough and as lake bed deposits. Selenium salts and other salts occur naturally in the western and central San Joaquin Valley soils that are derived from marine sedimentary rocks of the Coast Ranges.
Bay–Delta/Suisun Marsh	Basin floor/basin rim soils consist of organic-rich saline soils and poorly drained clays, clay loams, silty clay loams, and muck along the San Francisco Bay shoreline. Well-drained sands and loamy sands and poorly drained silty loams, clay loams, and clays occur on gently sloping alluvial fans of the Bay–Delta that surround the floodplain and valley lands. Drained loams, silty loams, silty clay loams, and clay loams interbedded with sedimentary rock and some igneous rock occur in the foothills. Terrace loams are along the southeastern edge of the Bay–Delta above the valley land. Soils in the Suisun Marsh consist of peaty and clayey muck, which are composed of fine-grained sediments that are poorly drained.
Central Coast	Near the ocean, soils range from sands and loamy sands in areas near the shoreline to shaley loams, clay loams, and clays in the terraces and foothills. Inland area soils range from sands, sandy loams, loams, shaley loams, to clay loams in the alluvial soils and along the shoreline. The terrace deposits include silty clays, clay loams, and clays.
Southern California	Soils include gravelly loams and gravelly sands, sands, sandy loams and loamy sands, and silty loams along the Pacific Coast shorelines and on alluvial plains. The mountains and foothills of the region include silty loams, cobbly silty loam, gravelly loam, sandy clay loams, clay loams, silty clays, and clays. The inland region in Riverside and San Bernardino counties has sand, silty clays, cobbles, and boulders on the alluvial fans, valley floor, terraces, mountains, and dry lake beds.

Source: U.S. Bureau of Reclamation 2019
Delta=Sacramento–San Joaquin Delta

3.7.2 DISCUSSION

a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:

i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? (Refer to California Geological Survey Special Publication 42.)

The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or other land disturbance. Thus, the project would not directly or indirectly cause an increased risk of loss, injury, or death from surface fault rupture. **No impact** would occur.

ii) Strong seismic ground shaking?

The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance. Thus, the project would not directly or indirectly cause an increased risk of loss, injury, or death from strong seismic ground shaking. **No impact** would occur.

iii) Seismic-related ground failure, including liquefaction?

The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance. Thus, the project would not directly or indirectly cause an increased risk of loss, injury, or death from seismic-related ground failure, including liquefaction. **No impact** would occur.

iv) Landslides?

The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance. Thus, the project would not directly or indirectly cause an increased risk of loss, injury, or death from seismically induced landslides. **No impact** would occur.

b) Result in substantial soil erosion or the loss of topsoil?

The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance. Furthermore, no changes in land use (i.e., conversion from agricultural land to non-agricultural land) are anticipated because of the Proposed Project. Therefore, **no impact** would occur.

c) Be located on a geologic unit or soil that is unstable, or that would become unstable because of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?

The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance. Therefore, unstable geologic units or soils would not result in damages to new facilities. **No impact** would occur.

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994, as updated), creating direct or indirect substantial risks to life or property?

The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance. Therefore, the Proposed Project would not be located on expansive soil that could create direct or indirect substantial risks to life or property. **No impact** would occur.

e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

The proposed long-term operation of the SWP would not require the use of septic systems or alternative waste water disposal systems. **No impact** would occur.

f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance. Thus, the Proposed Project would not directly or indirectly destroy a unique paleontological resource or site. Thus, the Proposed Project would not directly or indirectly destroy a unique geologic feature. **No impact** would occur.

3.8 GREENHOUSE GAS EMISSIONS

Table 3.8-1. Potential Impacts on Greenhouse Gas Emissions

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
VII. Greenhouse Gas Emissions. Would the project:	-
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	No Impact
b) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	No Impact

Note:
"-" indicates blank cell

3.8.1 ENVIRONMENTAL SETTING

Greenhouse gas (GHG) emissions and their climate-related impacts are not limited to specific geographic locations but occur on global or regional scales. Whereas many pollutants with localized air-quality effects have relatively short atmospheric lifetimes of one or several days, GHGs have long atmospheric lifetimes and may persist for years. Greenhouse gas emissions contribute cumulatively to the overall heat-trapping capability of the atmosphere, and the effects of global warming, also known as climate change, are manifested in different ways across the globe. Therefore, from the standpoint of CEQA, the impacts of GHG emissions on global climate change are inherently cumulative.

Increases in GHG concentrations in the Earth's atmosphere are thought to be the main cause of human-induced climate change. Greenhouse gases naturally trap heat by impeding the release of solar radiation that is reflected back into space after hitting Earth. Some GHGs occur naturally and are necessary for keeping the Earth's surface inhabitable. However, increases in the concentrations of these gases in the atmosphere during the last 100 years have decreased the amount of solar radiation that is reflected back into space, intensifying the natural greenhouse effect and resulting in the increase in the average global temperature (DWR 2010).

The atmospheric concentration of GHGs is believed to be affecting the intensity of global warming, and the current levels are already leading to increases in global temperatures. The primary man-made processes that release these GHGs include the burning of fossil fuels for transportation, heating, and electricity generation; agricultural practices that release methane (CH_4), such as livestock grazing and crop residue decomposition; and industrial processes that release smaller amounts of gases with a high global warming potential, such as sulfur hexafluoride (SF_6), perfluorinated chemicals (PFCs), and hydrofluorocarbons (HFCs) (DWR 2010). Deforestation and land cover conversion have also been identified as contributing to climate change by reducing the Earth's capacity to remove carbon dioxide (CO_2) from the air and altering the Earth's albedo, or surface reflectance, allowing more solar radiation to be absorbed.

Scientific methods to rapidly reduce the impacts of climate change emphasize the need to immediately reduce emissions of short-lived climate pollutants, which include black carbon (soot), CH_4, and fluorinated gases (F-gases, including HFCs). About 40% of current net climate forcing can be attributed

to these pollutants. Action to reduce these powerful super pollutants would provide immediate benefits by enabling reductions in long-lived GHGs to further unfold (CARB 2017).

3.8.1.1 Potential Effects of Climate Change in California

Warming of the atmosphere has broad implications for the environment. In California, one of the effects of climate change could be increases in temperature that could affect the timing and quantity of precipitation. California receives most of its precipitation in the winter months, and a warming environment would raise the elevation of snowpack and result in reduced spring snowmelt and more winter runoff. These effects on precipitation and water storage in the snowpack could have broad implications for the environment in California.

The following potential effects of a warming climate in California (California Climate Change Portal 2007) are some of the changes that may occur in the future:

- Loss of snowpack storage would cause increased winter runoff that generally would not be captured and stored because of the need to reserve flood capacity in reservoirs during the winter.
- Less spring runoff would mean lower early summer storage at major reservoirs, which would result in less hydroelectric power production.
- Higher temperatures and reduced snowmelt would compound the problem of providing suitable cold water habitat for salmonid species. Lower reservoir levels would also contribute to this problem and would reduce the flexibility of cold water releases.
- Sea level rise would affect the Delta, worsening existing levee problems, causing more saltwater intrusion, and adversely affecting many coastal marshes and wildlife reserves. Release of water to streams to meet water quality requirements could further reduce storage levels.
- Increased temperatures would increase the agricultural demand for water and increase the level of stress on native vegetation, potentially allowing for an increase in pest and insect epidemics and a higher frequency of large, damaging wildfires.

For calculating emissions, the California Air Resources Board (CARB) uses a metric developed by the Intergovernmental Panel on Climate Change (IPCC) to account for these differences and to provide a standard basis for calculations (CARB 2018). The metric, called the global warming potential (GWP), is used to compare the future climate impacts of emissions of various long-lived GHGs. The GWP of each GHG is indexed to the heat-trapping capability of CO_2 and allows comparison of the global warming influence of each GHG relative to CO_2. The GWP is used to translate emissions of each GHG to emissions of carbon dioxide equivalents, or carbon dioxide equivalents (CO_2e). In this way, emissions of various GHGs can be summed, and total GHG emissions can be inventoried in common units of metric tons per year of CO_2e. Most international inventories, including the United States inventory, use GWP values from the IPCC Fourth Assessment Report, per international consensus (IPCC 2007; EPA 2012).

The California Global Warming Solutions Act of 2006 (California Assembly Bill [AB] 32) requires California to reduce statewide emissions to 1990 levels by 2020. Executive Order (EO) B-30-15, signed by Governor Jerry Brown in 2015, established a goal for 2030 of reducing GHG emissions by 40% below 1990 levels.

In December 2007, in accordance with AB 32, CARB adopted an emission limit for 2020 of 427 metric tons per year of CO_2e. Increases in the statewide renewable energy portfolio and reductions in importation of coal-based electrical power contributed to meeting California's near-term GHG emission reduction goals. The CARB estimates that a reduction of 82 million metric tons net CO_2e emissions below the business-as-usual levels would be required by 2020 to meet the 1990 levels (CARB 2018). This amounts to approximately a 16% reduction from projected business-as-usual levels in 2020. California met this goal in 2016.

Building on the achievement of SB 32, SB 1383 (Lara, Chapter 395, Statutes of 2016) requires the Board to implement SB 605 (Lara, Chapter 523, Statutes of 2014), which requires CARB to develop a plan to specifically target and reduce emissions of short-loved climate pollutants (SLCPs). Senate Bill 1383 also sets targets for statewide reductions in SLCP emissions of 40% below 2013 levels by 2030 for methane and HFCs, and SLCP emissions of 50% below 2013 levels by 2030 for anthropogenic black carbon. Senate Bill 1393 also provides specific direction for reductions from dairy and livestock operations and from landfills by diverting organic materials (CARB 2017).

At a September 2008 meeting, the World Climate Research Programme Working Group on Coupled Modelling (WGCM), agreed to promote a new set of coordinated climate model experiments. These experiments comprise the fifth phase of the Coupled Model Intercomparison Project (CMIP5) (WCRP 2019). The objective of CMIP5 is to better understand past, present, and future climate changes arising from natural, unforced variability or in response to changes in radiative forcing in a multi-model context. Because it is the latest CMIP model version available for use at this time, CMIP5 is being used to characterize and estimate changes associated with future climate change in this document.

3.8.1.2 DWR Climate Action Plan

DWR developed a Climate Action Plan (CAP) to guide DWR's programs, projects, and activities in response to a changing climate (DWR 2012). The CAP demonstrates how DWR will make substantial reductions in its GHG emissions in the near term (present to 2020), and how it will continue to reduce emissions beyond 2020 to achieve its long-term (2050) GHG emissions reduction goal. Since publication of the CAP, DWR has further reduced its emission reduction targets to 50% below 1990 levels by 2020 and 100% below 1990 levels by 2045 (DWR 2019). The CAP identifies 11 GHG emissions reduction measures to meet near-term and long-term goals, which include:

- termination of its participation and associated delivery of electricity from a coal-fired power plant,
- efficiency improvements to DWR's existing facilities,
- purchase and development of renewable and high-efficiency electricity supplies,
- comprehensive improvements to DWR's construction practices, and
- improvements to DWR's business activities that will reduce GHG emissions.

3.8.1.3 Greenhouse Gas Emissions

The majority of DWR GHG emissions are emitted by non-hydroelectric generation facilities that are needed to convey water through the SWP system, including power used for contract water deliveries,

environmental water deliveries, and water transfers (DWR 2012). Typically, the SWP power supply portfolio constitutes about 98% of all GHG emissions from DWR activities.[3]

Construction activities, initiated and completed as individual projects, represent approximately 1% of SWP total GHG emissions. Although the GHG emissions from an individual construction project can be considered to be limited and short-term, the combined GHG emissions from all DWR construction activities also are similar to a long-term source of annual emissions (DWR 2012).

DWR's maintenance activities contribute approximately 0.5% of SWP total GHG emissions. Maintenance activities support flood protection maintenance, which includes routine maintenance activities, small erosion repairs, and sediment removal projects, and SWP maintenance, which includes landscaping and weed control, annual equipment and facilities inspection and maintenance, additional routine activities performed annually as needed, and weir operations and maintenance (DWR 2012).

Business practices contribute approximately 0.5% of SWP total GHG emissions. Business practices include all emissions attributable to the day-to-day administrative and personnel operations of DWR, including the heating and cooling of buildings used by DWR, electricity purchases to run buildings used by DWR, and business travel by DWR employees (DWR 2012).

Table 3.8-2 shows the 1990 and 2007 to 2010 total annual emissions for operational activities, construction activities, maintenance, and business practices, and quantifies the emissions reductions required to meet 2020 and 2050 emissions reduction goals.

Table 3.8-2. DWR Greenhouse Gas Emissions and Reduction Goals ($mtCO_2e$)[1]

Emissions	Operational	Construction	Maintenance	Business Practices	Total Annual Emissions
Estimated 1990 Emissions	2,692,000	28,200	8,200	17,500	2,746,000
Estimated 2007-2010 Emissions	2,410,000	23,600	8,200	17,500	2,459,000 (10% below 1990 levels)
2020 Emissions Reduction Goal	N/A	N/A	N/A	N/A	1,373,000 50% below 1990 levels 44% below 2007–2010 levels

Source: DWR 2012

Notes: $mtCO_2e$ = metric ton of carbon dioxide equivalent

1. The estimates and projections were developed using observed data from historical operations, assumptions about past and future conditions, expert judgment, and complex operational models (DWR 2012: Appendix G).

For 2016, GHG emissions from operational activities, construction activities, maintenance, and business practices totaled approximately 1,045,605 metric tons of carbon dioxide equivalent ($mtCO_2e$), which was 59% below 1990 levels and 45% below 2010 levels (DWR 2016). Furthermore, 2016 GHG emissions were 327,395 $mtCO_2e$, or 24% below the 2020 reduction goal (1,373,000 CO_2e).

[3] DWR uses a portfolio of energy resources to make up the difference in energy between the electricity that SWP facilities generate and the amount of electricity needed to run the SWP. The composition of the SWP power portfolio varies throughout the year and from year to year, but SWP power portfolio's electricity sources generally can be categorized as generation from large hydroelectric facilities, non-renewable energy facilities, and thermal generation facilities, as well as purchased energy (DWR 2012).

3.8.2 DISCUSSION

a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

The long-term operation of the SWP would not generate new sources of GHGs that would significantly impact the environment because the Proposed Project would not construct new facilities or physically alter existing facilities. The long-term operation of the SWP would continue to be in compliance with the CAP goals established by DWR. Thus, **no impact** would occur.

b) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

The Proposed Project would not conflict with any adopted plan, policy, or regulation addressing GHGs because it would not include construction of new facilities or modifications to existing facilities. **No impact** would occur.

3.9 HAZARDS AND HAZARDOUS MATERIALS

Table 3.9-1. Potential Impacts on Hazards and Hazardous Materials

ENVIRONMENTAL ISSUES		ENVIRONMENTAL IMPACT SIGNIFICANCE
IX.	**Hazards and Hazardous Materials. Would the project:**	-
a)	Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	No Impact
b)	Create a significant hazard to the public or the environment through reasonably foreseeable upset and/or accident conditions involving the release of hazardous materials into the environment?	No Impact
c)	Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	No Impact
d)	Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, therefore, would it create a significant hazard to the public or the environment?	No Impact
e)	For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?	No Impact
f)	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	No Impact
g)	Expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires?	No Impact

Note:
"-" indicates blank cell

3.9.1 ENVIRONMENTAL SETTING

3.9.1.1 Hazardous Materials Transport, Handling, and Cleanup

The EPA regulates the generation, transportation, treatment, storage, and disposal of hazardous substances under the federal Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984. The California Environmental Protection Agency (CalEPA) is authorized by EPA to enforce and implement federal hazardous materials laws and regulations at the state level. The California Department of Toxic Substances Control (DTSC), which is part of CalEPA, protects Californians from exposure to hazardous waste, primarily under the authority of RCRA and the California Health and Safety Code.

The California Hazardous Materials Release Response Plans and Inventory Law of 1985 (Business Plan Act), administered by DTSC, requires preparation of hazardous materials business plans and disclosure of hazardous materials inventories. A business plan must include an inventory of hazardous materials handled, facility floor plans showing where hazardous materials are stored, an emergency response plan, and provisions for employee training in safety and emergency response procedures (California Health and Safety Code, Division 20, Chapter 6.95, Article 1). Statewide, DTSC has primary regulatory

responsibility for management of hazardous materials, with delegation of authority to local jurisdictions that enter into agreements with the State.

The California Occupational Safety and Health Administration (Cal/OSHA) assumes primary responsibility for developing and enforcing workplace safety regulations in California. Cal/OSHA regulations pertaining to the use of hazardous materials in the workplace (California Code of Regulations [CCR], Title 8) include requirements for safety training, availability of safety equipment, accident and illness prevention programs, hazardous substance exposure warnings, and preparation of emergency action and fire prevention plans. Cal/OSHA enforces hazards communication program regulations that contain training and information requirements, including procedures for identifying and labeling hazardous substances, communicating hazard information related to hazardous substances and their handling, and preparation of health and safety plans to protect workers and employees at hazardous waste sites.

The U.S. Department of Transportation regulates transportation of hazardous materials between states. State agencies with primary responsibility for enforcing federal and State regulations and responding to hazardous materials transportation emergencies are the California Highway Patrol (CHP) and California Department of Transportation (Caltrans). Together, these agencies determine container types to be used and license hazardous waste haulers for transportation of hazardous waste on public roads.

Cleanup of hazardous material spills is regulated by CalEPA, DTSC, the SWRCB, Caltrans, the Governor's Office of Emergency Service, and the local Certified Unified Program Agency.

3.9.1.2 Cortese-Listed Hazardous Materials Sites

The provisions of Government Code Section 65962.5 commonly are referred to as the "Cortese List" (after the legislator who authored the legislation that enacted it). The Cortese List is a planning document that is used by the State and local agencies to comply with CEQA requirements in providing information about the location of hazardous materials release sites. Government Code Section 65962.5 requires CalEPA to develop an updated Cortese List annually, at minimum. The SWRCB and DTSC are responsible for a portion of the information contained in the Cortese List. Other State and local government agencies are required to provide additional hazardous material release information for the Cortese List.

Cortese-listed sites in the Northern California portion of the project area are located in major urban centers, such as Redding, Red Bluff, Chico, Yuba City/Marysville, Sacramento, Stockton, Modesto, Merced, and throughout the Bay Area. Similarly, Cortese-listed sites in the Central Coast and Southern California service areas primarily are located in major urban areas, such as such as San Luis Obispo, Lancaster, Los Angeles, San Bernardino, Palm Springs, and San Diego.

3.9.1.3 Hazards Associated with Agricultural Land Uses

Parts of the project area, particularly the Central Valley, historically have been and currently are being used mainly for agricultural purposes. Agricultural land use typically involves the application of pesticides and herbicides as well as the use of fuels, lubricants, and other fluids associated with

operation and maintenance of agricultural equipment, the residues of which may remain in soils for years. Other agricultural hazards include underground storage tanks for chemicals and fuels, wells, and underground piping that can contain asbestos.

3.9.1.4 Wildfires

In general, wildfire is a serious hazard in undeveloped land with extensive areas of non-irrigated vegetation. In accordance with California Public Resources Code Sections 4201–4204 and Government Code Sections 51175–51189, the California Department of Forestry and Fire Prevention (CAL FIRE) has mapped areas of significant fire hazards, based on fuels, terrain, weather, and other relevant factors. The zones are referred to as Fire Hazard Severity Zones and represent the risks associated with wildland fires. Urban development within very high fire-hazard risk zones must comply with specific building and vegetation requirements that are intended to reduce property damage and loss of life within these areas.

CAL FIRE manages the State Responsibility Areas, and local fire districts manage Local Responsibility Areas. First responders typically are the local fire districts. The U.S. Forest Service provides wildfire protection, both independently and cooperatively with CAL FIRE. In addition, the National Park Service and Bureau of Land Management (BLM) provide resource management and fire protection on portions of federal lands.

Firefighting actions frequently involve helicopter transport of water from reservoirs located close to wildfires in the project area, including reservoirs owned by the U.S. Bureau of Reclamation and DWR. See Section 3.20, “Wildfire,” for additional details.

3.9.1.5 Handling of Hazardous Materials Near Schools

The California Education Code contains various provisions governing the siting of new public kindergarten through 12th grade (K–12) schools (e.g., California Education Code Sections 17211, 17212, and 17212.5). In addition, the California Department of Education’s (CDE) School Facilities and Planning Division has developed screening and ranking procedures based on criteria commonly affecting school selection (California Education Code Section 17251[b], 5 CCR Section 14001[c]).

The foremost consideration in the selection of school sites is safety, including proximity to airports, proximity to high-voltage power transmission lines, presence of toxic and hazardous substances, hazardous air emissions, and facilities handling hazardous materials within 0.25 mile, and proximity to railroads. Certain health and safety requirements are governed by State statutes and CDE regulations.

School-aged children (i.e., grades K–12) are considered to be particularly sensitive to adverse effects resulting from exposure to hazardous materials, substances, or waste. For this reason, California public Resources Code (PRC) Section 21151.4 requires that lead agencies evaluate projects proposed within 0.25 mile of a school to determine whether release of hazardous air emissions or handling of hazardous substances associated with project implementation would pose a human health or safety hazard.

In general, K–12 schools in the Northern California portion of the project area are concentrated in urban centers. However several schools are on the southwestern side of Lake Oroville. A few schools

are located along rivers in the Sacramento and San Joaquin Valley and foothills, in rural portions of the central Sacramento and San Joaquin Valleys, and in the interior of the Delta. Similarly, in the Central Coast and Southern California portions of the project area, schools primarily are located in larger urban areas and incorporated cities, such as San Luis Obispo, Lancaster, Los Angeles, San Bernardino, Palm Springs, and San Diego.

3.9.2 DISCUSSION

a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

Because the proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance, no construction-related hazards from routine transport, use, or disposal of hazardous materials would occur. Continued operation of SWP facilities would involve the storage, use, and transport of limited amounts of hazardous materials (e.g., fuel, lubricants, paint, pesticides). Transportation of hazardous materials on area roadways is regulated by the CHP and Caltrans, and use of these materials is regulated by DTSC, as outlined in Title 22 of the California Code of Regulations. **No impact** would occur.

b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and/or accident conditions involving the release of hazardous materials into the environment?

Because the proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance, no construction-related hazards from accidental release of hazardous materials would occur. Continued operation of SWP facilities would involve the ongoing use of minor amounts of hazardous materials (e.g., fuel, lubricants, paint). In addition, as described in Chapter 2, "Description of the Proposed Project," DWR is proposing to treat the existing aquatic weed assemblage and harmful algal blooms at the Clifton Court Forebay with multiple aquatic herbicides (listed in Table 2.5-4).

Control of aquatic vegetation would improve fish salvage efficiency at the John E. Skinner Delta Fish Protective Facility and decrease debris management issues, both of which would promote salmonid survival. None of these materials would be acutely hazardous.

The storage and use of these chemicals is regulated at the federal and State level by agencies, including EPA, the Occupational Safety and Health Administration, Cal/OSHA, CalEPA, DTSC, and the SWRCB. Regulations promulgated and enforced by these agencies are designed to safeguard human health, protect water quality and aquatic life, prevent accidental spills, and regulate clean-up of accidental spills if they do occur. Therefore, proposed long-term operation of the SWP would not create a substantial hazard through accidental release of hazardous materials into the environment. **No impact** would occur.

c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

Because the proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance, no construction-related hazards from accidental release of hazardous materials would occur. Continued operation of SWP facilities would involve the ongoing use of minor amounts of hazardous materials, such as fuel, lubricants, pesticides and paint. None of these materials would be acutely hazardous, and minor operation of existing facilities and equipment would not generate emissions to a level that would result in adverse health effects on workers or nearby school children. **No impact** would occur.

d) Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, therefore, would it create a significant hazard to the public or the environment?

The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or other types of construction or land disturbance. **No impact** would occur.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?

The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or other types of construction or land disturbance that would place new buildings in proximity to airport hazards. Continued operation of the SWP would not increase the amount of bird habitat, and therefore would not increase the potential for wildlife-aircraft strikes, and the Proposed Project would not involve any activities that would cause other safety hazards to aircraft or to SWP personnel on the ground. **No impact** would occur.

f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance that would place new buildings or result in roadway closures that could impede emergency response or evacuation plans. Continued operation of the SWP would not involve any activities that would impede emergency response or evacuation plans. SWP water storage facilities, such as Lake Oroville, include emergency plans in the event of potential emergencies, which are designed to protect the public and the environment. **No impact** would occur.

g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires?

The Proposed Project would not involve any new construction of water facilities, infrastructure, or land disturbance that would place new buildings in high fire hazard areas. Some SWP facilities are located in rural areas where a high fire hazard risk exists because of the surrounding terrain and the amount of vegetation. As previously stated, CAL FIRE manages the State Responsibility Areas, and the U.S. Forest Service provides wildfire protection, both independently and cooperatively with CAL FIRE. In addition, the U.S. Forest Service and BLM provide resource management and fire protection on portions of

federal lands. The proposed long-term operation of the SWP would not include any actions that would increase wildland fire probability. **No impact** would occur.

3.10 HYDROLOGY AND WATER QUALITY

Table 3.10-1. Potential Impacts on Hydrology and Water Quality

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
IX. Hydrology and Water Quality. Would the project**:**	-
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality?	Potentially Significant Impact
b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	No Impact
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner that would: i) result in substantial on- or off-site erosion or siltation on- or off-site? ii) substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site; iii) create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or	No Impact
d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	No Impact
e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	No Impact

Note:
"-" indicates blank cell

3.10.1 ENVIRONMENTAL SETTING

This section describes the surface water resources and water supplies managed by the SWP, and potential changes to surface water resources that could occur through implementing the Proposed Project. Implementation of the Proposed Project could affect these resources through potential changes in operation of the SWP.

Tributaries to the Sacramento and San Joaquin rivers that are not affected by SWP operations also are briefly discussed in this section because they contribute to conditions in the Delta. Baseline CalSim II results of flow conditions are presented for reservoirs and rivers that are affected by SWP operations.

For the San Francisco Bay Area, Central Coast, San Joaquin Valley, and Southern California water service areas, surface water streams generally are not used to convey SWP water supplies. The streams downstream from SWP water supply reservoirs generally receive either reservoir overflows in storm conditions or minimum instream flows related to water rights or aquatic resources beneficial uses, or both. After the minimum instream flow requirements are fulfilled, the remaining volumes of water are provided to contracted water users or others. Changes in SWP water operations will not affect the need to meet minimum instream flows or high flows during storm conditions.

3.10.1.1 Sacramento River

The Sacramento River flows about 351 miles from the north near Mount Shasta to the confluence with the San Joaquin River at Collinsville in the western Delta (Reclamation 2013a). The Sacramento River receives contributing flows from numerous major and minor streams and rivers that drain the basin. The Sacramento River also receives imported flows from the Trinity River watershed, as previously discussed.

Waterways in the Sacramento Valley that could be affected by the proposed long-term operation of the SWP include the following:

- Feather River, downstream from Oroville Reservoir to the confluence with the Sacramento River
- Yuba River, from New Bullards Bar Reservoir to the confluence with the Feather River
- Bear River, from Camp Far West Reservoir to the confluence with the Feather River

Flows from other tributaries to the Sacramento, Cosumnes, and Mokelumne rivers in the Sacramento Valley can affect SWP operations, particularly by contributing additional flows to the Delta. However, flows in these rivers would not be affected by changes in SWP operations. Therefore, the hydrologic conditions on these water bodies are not described further in this IS.

3.10.1.2 Feather River

The Feather River is the largest tributary to the Sacramento River in the Sacramento Valley (Reclamation 1997; DWR 2007). The Feather River enters the Sacramento River at Verona. At this location, the total flow of the Feather River includes water from the Yuba and Bear rivers.

Lake Oroville, the primary SWP water storage facility, has a capacity of 3,500 TAF and is located on the Feather River. Lake Oroville stores winter and spring runoff, which is released into the Feather River to meet SWP water demands. Long-term and critically dry-year average water storage volumes for Lake Oroville are shown in Figures 3.10-1 and 3.10-2.

A maximum 17,400 cubic feet per second (cfs) can be released from Lake Oroville through the Edward Hyatt Powerplant, and from the Thermalito Power Canal into the Thermalito Diversion Pool. Water continues through the Thermalito Diversion Pool into the Feather River Fish Hatchery and the 11,768 AF Thermalito Forebay, which was formed by the Thermalito Diversion Dam. Water is then released from the Thermalito Forebay through the Thermalito Powerplant into the Thermalito Afterbay and the low-flow channel of the Feather River. Water from Thermalito Afterbay flows into the Feather River. Long-term and critically dry-year average flows in the Feather River are shown in Figures 3.10-3 and 3.10-4.

Operations at Oroville Dam are performed in accordance with a FERC license, Project No. 2100, which defines maximum allowable Feather River low-flow channel ramp-down release requirements to prevent rapid reductions in water levels that potentially could cause redd dewatering and stranding of juvenile salmonids and other aquatic organisms. Water releases from Lake Oroville also are affected by temperature criteria (Reclamation 2015a).

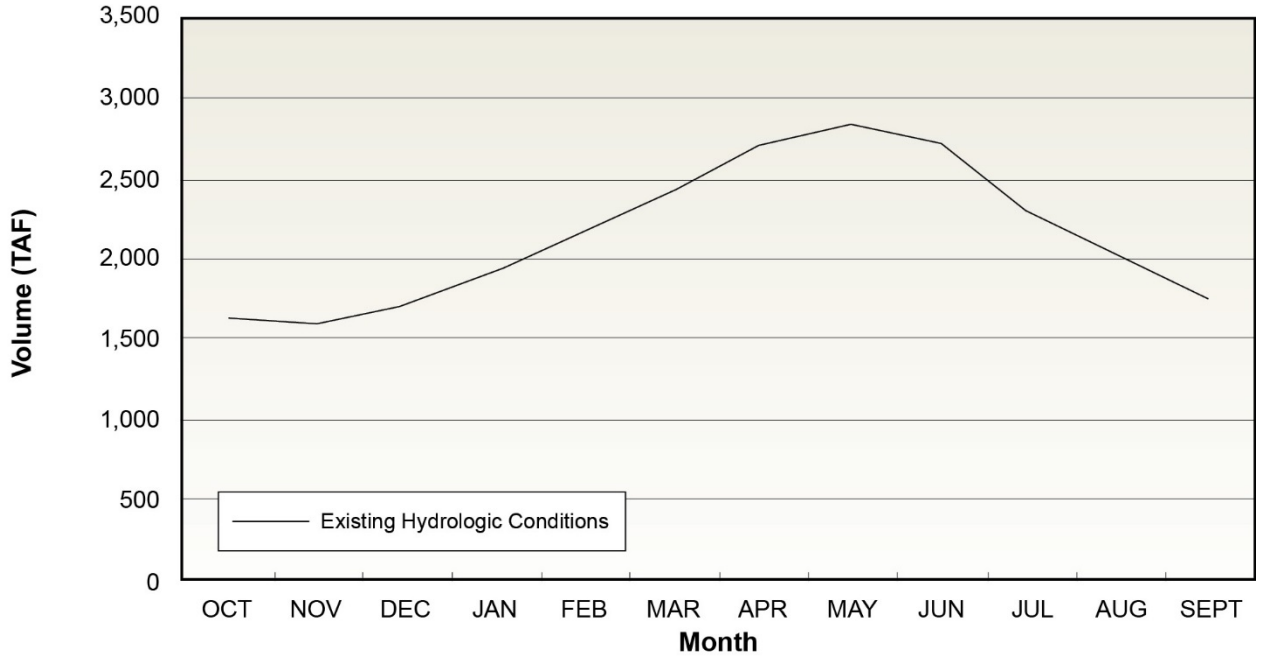

Figure 3.10-1. Lake Oroville, Long-Term Average Storage

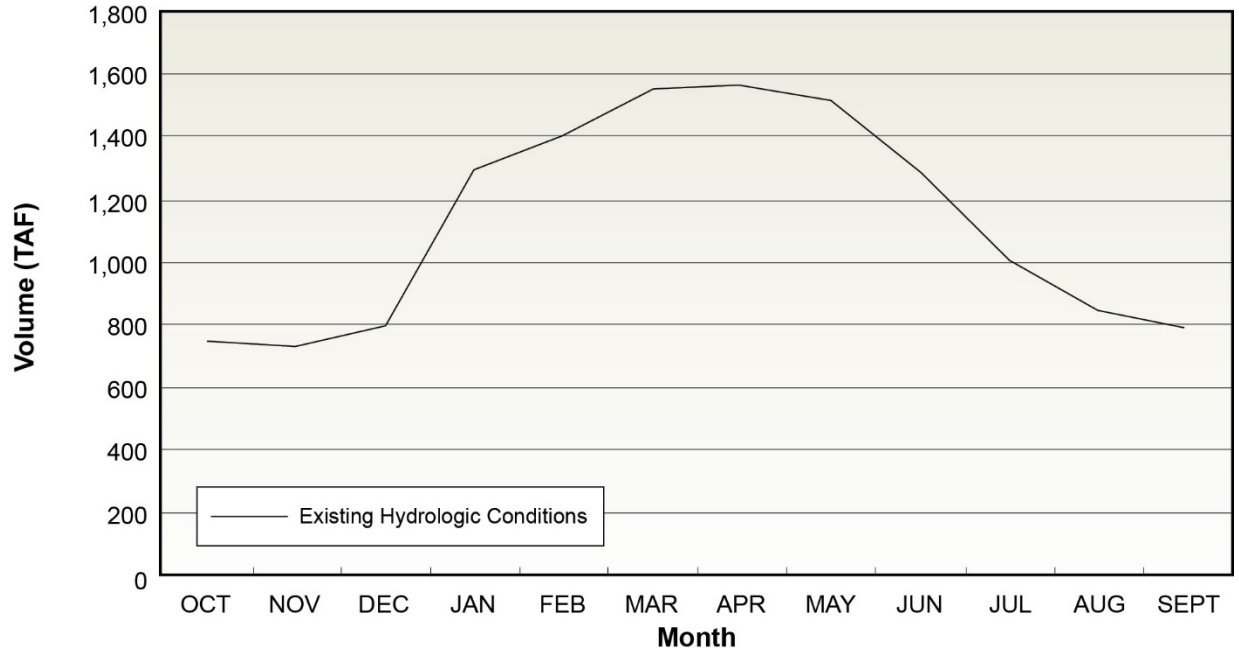

Figure 3.10-2. Lake Oroville, Critically Dry-Year Average Storage

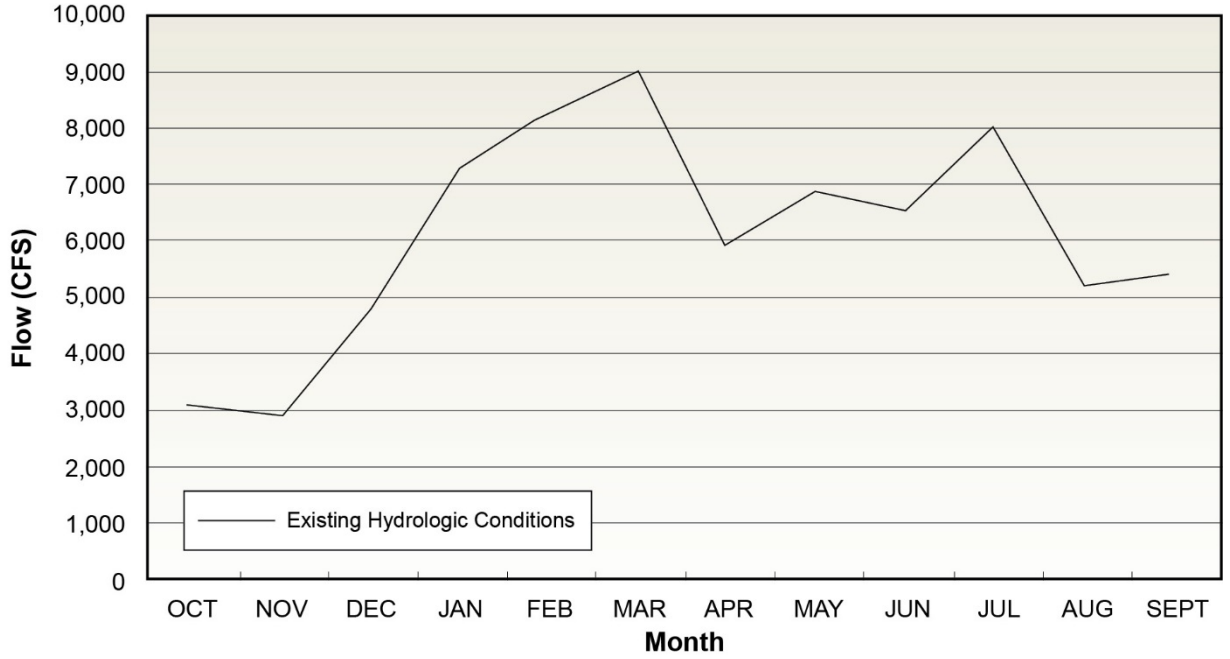

Figure 3.10-3. Feather River near Gridley, Long-Term Average Flow

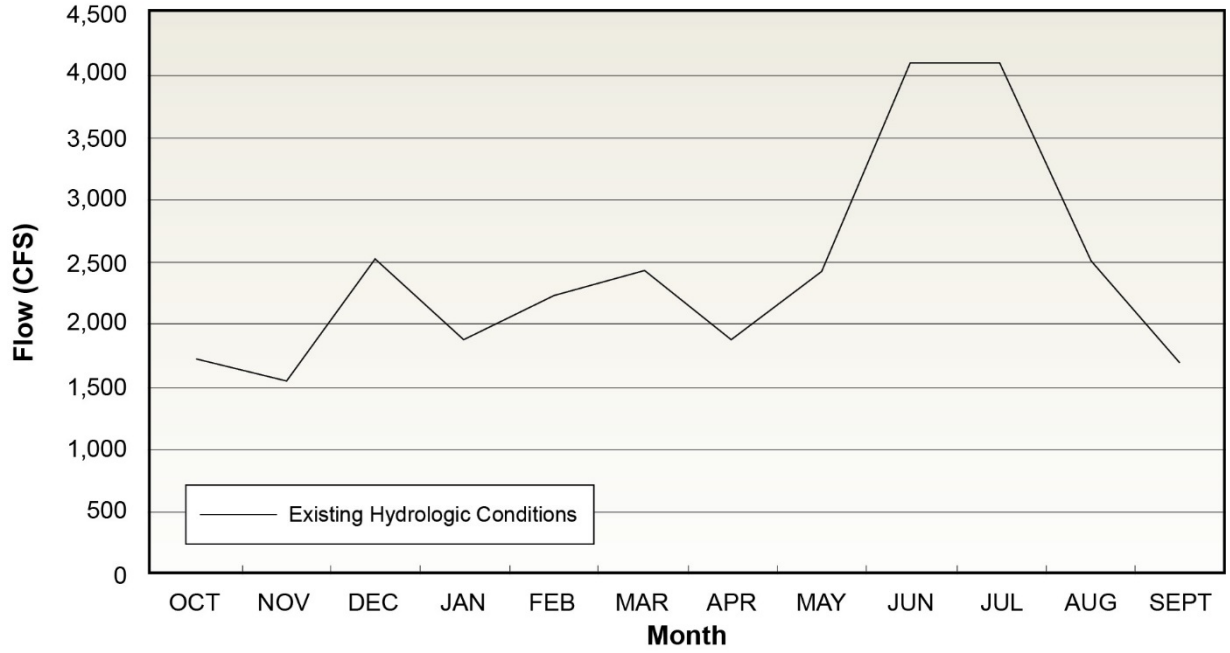

Figure 3.10-4. Feather River near Gridley, Critically Dry-Year Average Flow

3.10.1.3 Delta and Suisun Marsh

The Delta and Suisun Marsh encompass about 1,315 square miles and convey about 40% of the water draining from the state (DWR 2013). The Delta and Suisun Marsh are a complex of channels and islands located at the confluence of the Sacramento and San Joaquin rivers. The SWP use the Delta to convey water to State pumps in the South Delta.

Inflows to the Delta occur primarily from the Sacramento River system, the San Joaquin River, and other eastside tributaries, including the Mokelumne, Calaveras, and Cosumnes rivers. About 77% of the water enters the Delta from the Sacramento River, about 15% enters from the San Joaquin River, and about 8% enters from the eastside tributaries (DWR 1994). The daily, seasonal, and year-to-year differences in freshwater flows from the Sacramento and San Joaquin rivers and other Delta tributaries affect the Delta's water quality, particularly with regard to salinity (DWR et al. 2013).

The Sacramento River is the primary contributor to Delta freshwater inflows. North Delta channels convey Sacramento River and Yolo Bypass flows southerly and westerly. The Delta Cross Channel (DCC) gates divert flows from the Sacramento River to Snodgrass Slough, and then to the Mokelumne River, where the river flows into the Central Delta and South Delta. Circulation of water in the North Delta and Central Delta primarily is determined by flows in the Sacramento River; however, operations of the SWP alter the direction of the natural flow in the Central Delta, resulting in an altered flow path toward the South Delta pumps.

The San Joaquin River, the second largest contributor to Delta freshwater inflows, enters the Delta from the south. Although the natural direction of the flow is toward the north and west, channel flows in the South Delta are sensitive to SWP and CVP export operations (DWR et al. 2013).

Tidal flows have a major influence on Delta surface water circulation. Flow in the Delta channels can change direction because of tidal exchange, ebbing and flooding with the two tides per day. On average, tidal inflows to the Delta are approximately equal to tidal outflows. The tidal range can vary by about 30% between spring tide and neap tide conditions. Tidal flows at Martinez can be as high as 600,000 cfs. Because the Delta is tidally influenced; water surface elevations can vary from less than 1 foot in the east Delta to more than 5 feet in the west Delta (DWR 2013) on a daily basis.

Tidal flows enter and leave the Delta along the combined Sacramento and San Joaquin rivers at Chipps Island. Farther upstream in the Delta (e.g., in Old River near Bacon Island), tidal flows can be as high as 16,000 cfs, and in relatively upstream locations such as at Freeport or Vernalis, riverine conditions dominate the tidal effects.

The SWP pumping plant can affect the direction of flow of water in the Delta channels, particularly during periods of low freshwater inflow and large exports. Normally, net flows in the Delta travel westerly toward Suisun Bay and the San Francisco Bay. Diversion rates at the SWP South Delta intakes influence Delta hydraulics, changing the direction of the flow in some South Delta waterways. The most influential effects occur on Old and Middle rivers, where flows are reversed during periods of South Delta pumping. Reverse flows also occur in the False River in the west Delta and Turner Cut in the San Joaquin River, causing more saline water to move farther inland (DWR et al. 2013).

Temporary Agricultural Barriers

The DWR South Delta Temporary Barrier Project (TBP) was initiated in 1991 to seasonally construct and demolish four rock barriers across several South Delta channels. These barriers are intended to maintain water levels in South Delta waterways and promote San Joaquin River salmon migration through the South Delta. The TBP consists of installing and removing temporary rock barriers at the following locations:

- Middle River near Victoria Canal, about 0.5 mile south from the confluence of Middle River, Trapper Slough, and North Canal
- Old River near Tracy, about 0.5 mile east of the Delta–Mendota Canal (DMC) intake
- Grant Line Canal near Tracy Boulevard Bridge, about 400 feet east of Tracy Boulevard Bridge
- The Head of Old River Barrier (HORB) at the confluence of Old River and the San Joaquin River

The temporary barriers on the Middle River, the Old River near Tracy, and the Grant Line Canal are designed to improve water levels for agricultural diversions and are installed during the irrigation season. The HORB has been installed only from early September to November 30, when requested by CDFW if improvement of dissolved oxygen in the San Joaquin River is necessary. The HORB also has been installed in the spring months to improve outmigrating conditions for juvenile salmonids.

The agricultural barriers at Old and Middle rivers can be installed as early as March 1 if the HORB is installed. They can be operated fully as early as April 1 if the HORB is installed or as early as May 15 if the HORB is not installed. From May 15 to May 31 (if the HORB is removed), the Middle River and Old River barrier gates are opened. After May 31, the Middle River, Old River, and Grant Line Canal barriers are permitted to be operational until they are removed completely by November 30.

SWP Barker Slough Pumping Plant

The SWP Barker Slough Pumping Plant (BSPP) diverts water from Barker Slough into the SWP North Bay Aqueduct (NBA) for delivery to the Solano County Water Agency and the Napa County Flood Control and Water Conservation District. The 162.5-cfs NBA intake has a positive barrier fish screen and is about 10 miles from the Sacramento River at the end of Barker Slough.

The NBA was designed to convey up to 175 cfs. However, the ability of the BSPP to deliver water is limited because a bio-film growth has developed on its interior, restricting water conveyance to about 142 cfs. In addition, water quality in Barker Slough often is degraded during winter and spring rainfall events with elevated levels of coliform bacteria, organic matter, turbidity, and other pollutants. This degradation limits the amount of time that the BSPP can be operated.

The 2008 USFWS Biological Opinion reduced the total BSPP annual diversion to 71 TAF. In 2009, CDFW issued an ITP for the preservation of Longfin Smelt that restricted pumping rates during dry and critical dry years from January 15 to March 31.

South Delta Water Diversions

Delta channels have been modified to allow transport of Delta inflow to South Delta diversions, which reduces the effects of pumping on Delta water circulation and salinity intrusion. The water conveyance from the Sacramento River southward through the Delta to the South Delta intakes is aided by the DCC.

SWP's Clifton Court Forebay and the Banks Pumping Plant

The SWP facilities in the South Delta include the 31-TAF Clifton Court Forebay (CCF), about 10 miles northwest of the city of Tracy, and the Harvey O. Banks Pumping Plant (Banks Pumping Plant). Water is diverted from the Old River into the CCF to provide storage for off-peak withdrawals from the CCF, moderating the effects of the pumps on flow and stage fluctuations in adjacent Delta channels and collecting sediment before entering the Banks Pumping Plant and the California Aqueduct.

The California Aqueduct transports water to the O'Neill Forebay, where the water can be released either to the San Luis Canal, a portion of the California Aqueduct jointly owned by the SWP and CVP, or pumped into the San Luis Reservoir. Water from the San Luis Reservoir subsequently is released to the San Luis Canal, which terminates near Kettleman City. From this location, the California Aqueduct continues to Southern California.

The capacity of the Banks Pumping Plant is 10,300 cfs. Permits issued by U.S. Army Corps of Engineers (USACE) regulate the rate of diversion of water into the CCF. The diversion rate is normally restricted to 6,680 cfs as a 3-day average inflow to the CCF and 6,993 cfs as a 1-day average inflow. CCF diversions may be greater than these rates between December 15 and March 15, when the inflow into the CCF may be augmented by one-third of the San Joaquin River flow at Vernalis if those flows are equal to or greater than 1,000 cfs.

In 2000, the maximum diversion rate was increased during the months of July, August, and September to recover export reductions resulting from actions taken to protect fisheries resources. The expanded maximum allowable daily diversion rate into the CCF was increased from 13,870 to 14,860 AF; 3-day average diversions were increased from 13,250 to 14,240 AF (500 cfs per day equals 990 AF per day). Implementation of this action is contingent on meeting the following conditions:

- The increased diversion rate will not result in greater annual SWP water supply allocations than would occur in the absence of the increased diversion rate. Water pumped because of the increased capacity would be used only to offset reduced diversions that occurred or will occur because of actions taken to benefit fisheries.
- Use of the increased diversion rate will be in accordance with all terms and conditions of existing BiOps governing SWP operations.
- All three temporary agricultural barriers (i.e., Middle River, Old River near Tracy and Grant Line Canal) must be in place and operating when SWP diversions are increased.

Between July 1 and September 30, if the salvage of special-status fish species reaches a level of concern, the relevant fish regulatory agencies would determine whether the 500-cfs increased diversion may continue or be stopped.

The Banks Pumping Plant is operated to minimize its impact on power loads to the California electrical grid to the extent practicable. Generally, more pump units are operated during off-peak periods and fewer during peak periods, with water stored temporarily in the CCF. Because the installed capacity of the pumping plant is 10,300 cfs, the Banks Pumping Plant can be operated to reduce power grid impacts by running all available pumps at night and running fewer during the higher energy-demand hours. Long-term, dry-year, and critically dry-year average total Delta exports (sum of the Jones Pumping Plant and Banks Pumping Plant) are shown in Figures 3.10-5 through 3.10-7.

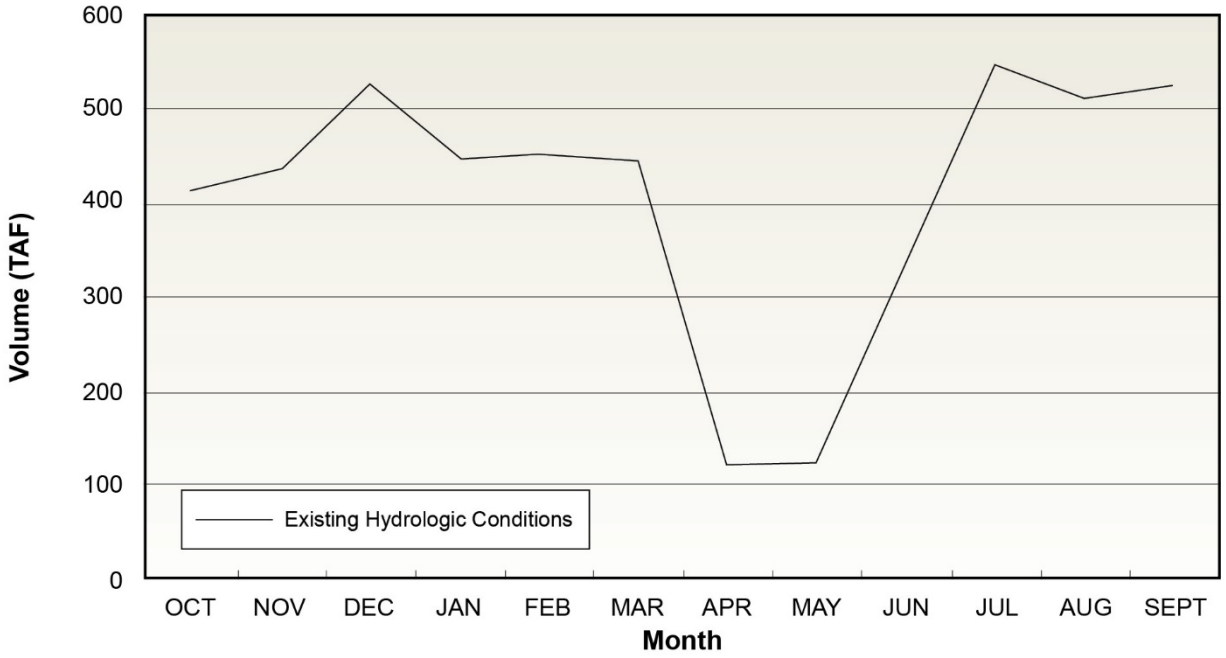

Figure 3.10-5. Total Delta Exports, Long-Term Average Delivery

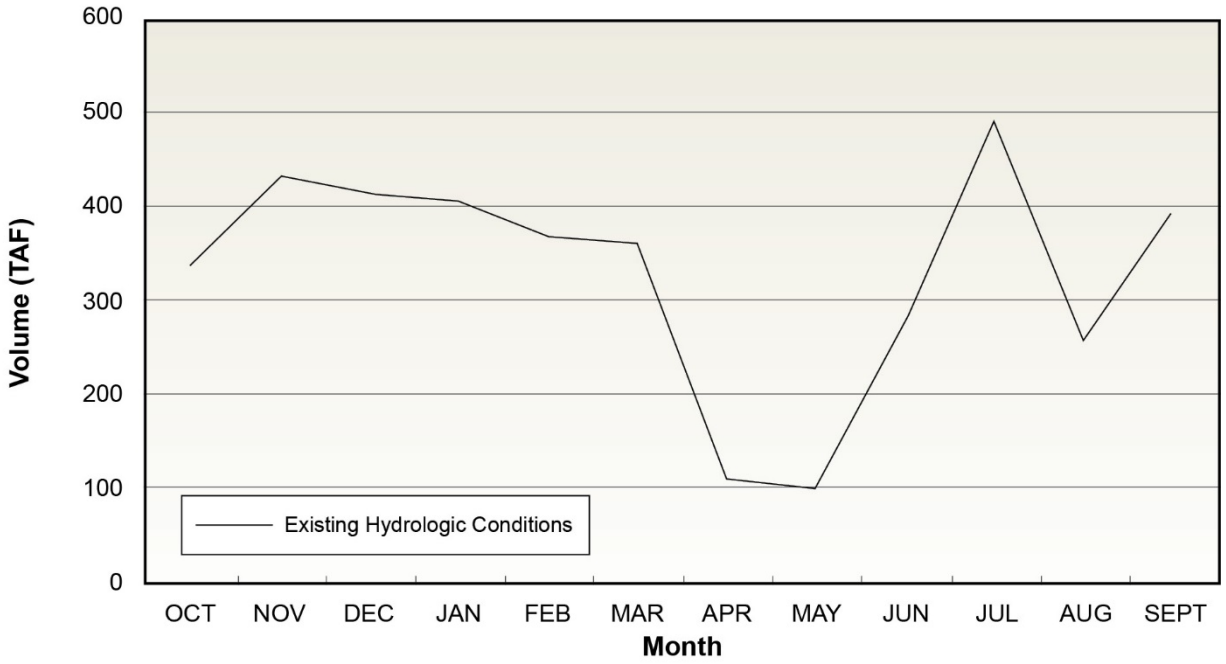

Figure 3.10-6. Total Delta Exports, Dry-Year Average Delivery

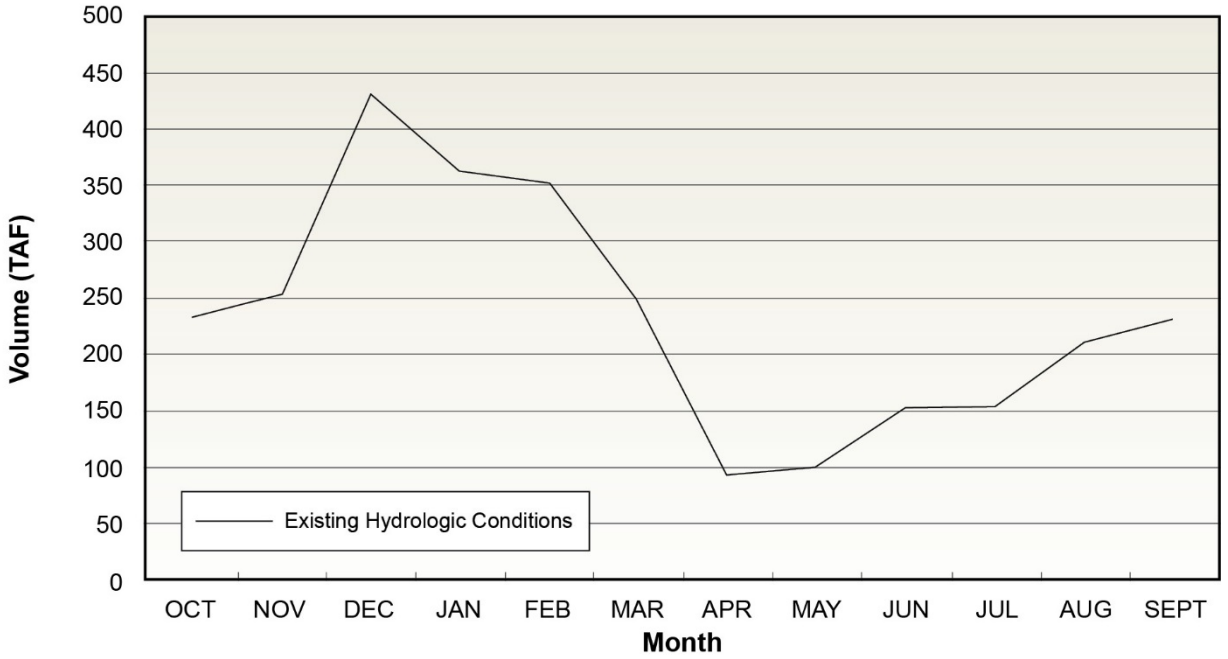

Figure 3.10-7. Total Delta Exports, Critically Dry-Year Average Delivery

Joint Facilities in Suisun Marsh

The SMPA requires DWR and Reclamation to meet salinity standards, sets a timeline for implementing the Plan of Protection, and delineates monitoring and mitigation requirements in accordance with D-1641 to implement and operate physical facilities in the Suisun Marsh.

Suisun Marsh Salinity Control Gates

The SMSCG are on Montezuma Slough near Collinsville. The objective of SMSCG operation is to decrease the salinity of the water in Montezuma Slough by restricting the flow of higher salinity water from Grizzly Bay into Montezuma Slough during incoming tides and retaining lower salinity Sacramento River water from the previous ebb tide. This operation lowers salinity in Suisun Marsh channels and results in a net movement of water from east to west.

When Delta outflow is low to moderate and the gates are not operating, tidal flow past the gate is about 5,000 to 6,000 cfs, while the net downstream flow is near zero. When operated, flood tide flows are arrested while ebb tide flows remain in the range of 5,000 to 6,000 cfs. The net downstream flow in Montezuma Slough becomes about 2,500 to 2,800 cfs.

The 2,800 cfs net downstream flow associated with SMSCG operation is effective at moving higher salinity concentrations downstream in Montezuma Slough. Salinity is reduced by roughly 100% at Belden's Landing and by lesser amounts farther west along Montezuma Slough. At the same time, the salinity field in Suisun Bay moves upstream as net Delta outflow is reduced by gate operation. Net outflow through Carquinez Strait is not affected.

The USACE permit for the SMSCG requires that it be operated between October and May only when needed to meet Suisun Marsh salinity standards. Historically, the gate has been operated as early as October 1, although in some years (e.g., 1996) the gate was not operated at all. When the channel

water salinity decreases sufficiently below the salinity standards or at the end of the control season, unrestricted flow is allowed through Montezuma Slough.

Roaring River Distribution System

The RRDS was constructed in 1979 and 1980 to provide lower salinity water to 5,000 acres of private wetlands and 3,000 acres of CDFW-managed wetlands on Simmons, Hammond, Van Sickle, Wheeler, and Grizzly islands.

The RRDS includes a 40-acre intake pond that supplies water to Roaring River Slough. Motorized slide gates in Montezuma Slough and flap gates in the pond control flows through culverts into the pond. A flap gate and flashboard riser are at the confluence of Roaring River and Montezuma Slough to enable drainage back into Montezuma Slough for controlling water levels in the distribution system and flood protection.

Water is diverted into the Roaring River intake pond during high tides to raise the water surface elevation in the RRDS above the adjacent managed wetlands. Managed wetlands north and south of the RRDS receive water, as needed.

Morrow Island Distribution System

The MIDS was constructed in southwestern Suisun Marsh in 1979 and 1980 to channel drainage water from the adjacent managed wetlands for discharge into Suisun Slough and Grizzly Bay. The MIDS increases circulation and reduces salinity in Goodyear Slough.

The MIDS is used year-round, but most intensively from September through June. When managed wetlands are filling and circulating, water is tidally diverted from Goodyear Slough just south of Pierce Harbor. Water is discharged into Grizzly Bay by way of the C-Line Outfall and into the mouth of Suisun Slough by way of the M-Line Outfall, rather than back into Goodyear Slough. This additional supply minimizes salinity increases that are caused by drainage water discharges into Goodyear Slough.

3.10.1.4 Delta–Mendota Canal/California Aqueduct Intertie

The connection between the DMC and the California Aqueduct allows water to flow between the SWP and CVP conveyance facilities. The DMC/California Aqueduct Intertie achieves multiple benefits, including meeting current water supply demands, allowing the maintenance and repair of the CVP Delta export and conveyance facilities, and providing operational flexibility to respond to emergencies.

3.10.1.5 San Luis Reservoir

The 2.027-MAF San Luis Reservoir, formed by Sisk Dam, is operated jointly by Reclamation and DWR, with about 0.965 MAF stored by the CVP and 1.062 MAF stored by the SWP. Water generally is diverted into the San Luis Reservoir in late fall through early spring, when irrigation water demands are lower and are being met directly by Delta exports.

By April or May, demands from both agricultural and M&I SWP water service contractors usually exceed the pumping rate at the Banks Pumping Plant, and releases from the San Luis Reservoir to the

SWP facilities are needed to supplement the Delta pumping at the Banks Pumping Plant to meet SWP contractor demands.

3.10.1.6 Joint Point of Diversion

D-1641 authorized the SWP and CVP to jointly use the Jones and Banks pumping plants in the South Delta (referred to as the Joint Point of Diversion [JPOD]), with conditional limitations and required response coordination plans. Use of the JPOD is based on staged implementation.

Each stage of the JPOD has regulatory terms and conditions that must be satisfied to implement the JPOD. All stages require a response plan to ensure water elevations in the South Delta will not be lowered that would injure local riparian water users and a response plan to ensure that the water quality in the South and Central Delta will not be degraded significantly by operation of the JPOD such that the water would cause injury to water users in the South Delta and Central Delta.

3.10.1.7 SWP Conveyance Facilities Downstream from San Luis Reservoir

Water from the San Luis Reservoir is released into the California Aqueduct, which conveys water supplies southward to Lake Perris in Riverside County. The first segment of the California Aqueduct downstream from San Luis Reservoir is called the San Luis Canal. This canal is owned jointly by the SWP and CVP and extends from the San Luis Reservoir to Kettleman City. Near Kettleman City, water is diverted into the SWP Coastal Branch Aqueduct to serve agricultural areas west of the California Aqueduct and communities in San Luis Obispo and Santa Barbara counties.

The California Aqueduct continues into Southern California through the Edmonston Pumping Plant, at the foot of the Tehachapi Mountains, which raises the water into Antelope Valley. At that location, the California Aqueduct divides into two branches—the East Branch and the West Branch. The East Branch conveys water into Silverwood Lake in the San Bernardino Mountains, with a capacity of 73,000 AF. From Silverwood Lake, water flows through the San Bernardino Tunnel to Lake Perris. Lake Perris, near the city of Riverside, provides up to 131,500 AF of storage and serves as a regulatory and emergency water supply facility for the East Branch. The East Branch Extension conveys water to the San Gorgonio Pass Water Agency and the eastern portion of the San Bernardino Valley Municipal Water District. The West Branch conveys water to Pyramid Lake in Los Angeles County. Water from Pyramid Lake is conveyed to the 324,000-acre-foot Castaic Lake.

3.10.1.8 Water Supplies Used by State Water Project Water Users

The SWP water supplies are the only water supplies available to some water users, including some communities served by the Antelope Valley–East Kern Water Agency. Other SWP water users rely on other surface water supplies and groundwater. However, when the SWP water supplies are limited because of lack of precipitation, the other surface water supplies also are limited.

Several SWP water users also rely on other imported water supplies, including water from the Solano Project, used by the Solano County Water Agency; the Hetch Hetchy Water Project, used by Alameda County Water District, Santa Clara Valley Water District, and Zone 7 Water Agency; the Mokelumne River, used by East Bay Municipal Utility District; and the Colorado River, used by portions of the

service area of the Metropolitan Water District of Southern California and Coachella Valley Water District.

These surface water supplies also are subject to reductions because of hydrologic conditions. In the case of water users that rely on Colorado River water supplies, Delta water is used to dilute the salts and trace elements (e.g., selenium) found in the Colorado River water supply and to provide direct water supplies (Reclamation 2012).

In response to recent reductions in SWP water supply reliability, water agencies have been making improvements to regional and local water supplies through enhanced water conservation efforts, wastewater effluent and stormwater recycling, construction of local surface water and groundwater storage facilities, and construction of desalination treatment plants for brackish water sources and ocean water sources. In addition, many agencies have constructed conveyance facilities to allow sharing of water supplies between communities, including the recent Bay Area Regional Water Supply Reliability project, which provided conveyance opportunities between several SWP and CVP water users in the San Francisco Bay Area Region.

An exceedance plot of total SWP deliveries is shown in Figure 3.10-8.

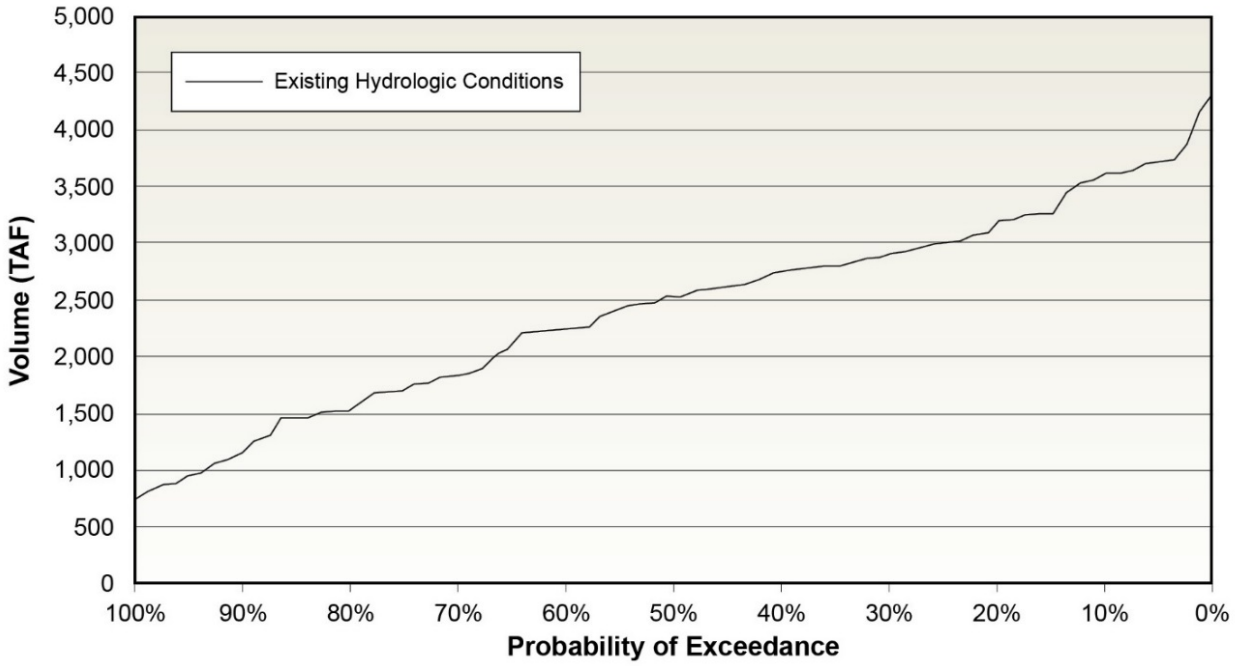

Figure 3.10-8. Exceedance Plot of Total SWP Deliveries

3.10.1.9 Water Transfers

Water transfers also are an integral part of water management. Historically, water transfers primarily were limited to in-basin transfers (e.g., Sacramento Valley to Sacramento Valley water users) (Reclamation 2013b; DWR et al. 2013). However, between 2001 and 2012, water transfers from the Sacramento Valley to areas south of the Delta increased to 298,806 AF, not including water transfers under the CALFED Bay-Delta Program's Environmental Water Account Program (DWR et al. 2013). These transfers occurred in drier years when water supplies were needed and capacity at the South Delta pumps was available.

In 2008, one of the first long-term water transfer agreements was approved by the SWRCB for the Lower Yuba River Accord. The plan was designed to protect and enhance fisheries resources in the Lower Yuba River, increase local water supply reliability, provide DWR with increased operational flexibility for protection of Delta fisheries, and provide additional dry-year water supplies to SWP and CVP water users.

In 2013, Reclamation approved an overall program for a 25-year period (2014–2038), to transfer up to 150,000 acre-feet per year of water from the San Joaquin River Exchange Contractors Water Authority to the U.S. Department of the Interior for refuge water supplies or SWP or CVP water users (Reclamation 2013b). Reclamation also approved a long-term water transfer program (2015–2024) from water sellers in the Sacramento Valley to water users in the San Francisco Bay Area and south of the Delta (Reclamation 2014).

3.10.1.10 Surface Water Quality

Environment Setting

Historical water quality conditions in the project area are described in this section. These conditions are compared with federal and State laws and regulations that protect identified beneficial uses.

Regulatory Framework

Many of the current water quality criteria were developed in accordance with the federal Water Pollution Control Act Amendments of 1972, also known as the Clean Water Act (CWA), as amended. The CWA established the institutional structure for EPA to regulate discharges of pollutants into waters of the United States, establish water quality standards to protect designated beneficial uses, conduct planning studies, and provide funding for specific grant projects. In California, EPA designated the SWRCB to act as the EPA agent to develop and enforce water quality objectives and implement water quality control plans (basin plans). The SWRCB designated Regional Water Quality Control Boards (RWQCBs) to develop basin plans and designate the beneficial uses of waters within each basin along with water quality objectives to protect those beneficial uses, pursuant to Section 303 of the CWA.

The Bay Delta Water Quality Control Plan for the Sacramento River and San Joaquin River basins designated drinking water municipal and domestic supply beneficial use for most waters in the Central Valley, including the Delta. The Bay–Delta Water Quality Control Plan includes narrative objectives for chemical constituents, taste and odor, sediment, suspended material, toxicity, and numeric objectives for chemical constituents and salinity; the plan incorporates by reference the primary and secondary maximum contaminant levels specified in Title 22 of the California Code of Regulations for waters designated for municipal uses.

In 2013, the Central Valley RWQCB adopted Resolution No. R5-2013-0098, an amendment to the Basin Plan to establish a drinking water policy for surface waters of the Delta and its upstream tributaries. The amendment, approved in 2014 by the SWRCB, California Office of Administrative Law, and EPA, included narrative water quality objectives for *Cryptosporidium*, *Giardia*, and organic carbon; established a Drinking Water Policy to maintain high quality of water; and included toxics standards for inland surface waters, enclosed bays, and estuaries.

The State of California adopted several California-based water quality policies, including the California Toxics Rule (CTR) and the Policy for Implementing Toxic Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (State Implementation Policy). The State also expanded waste discharge requirements to include discharges to groundwater to address the critical need to protect this drinking water source from contaminants.

The RWQCBs evaluate potential changes in flow patterns and water quality in each basin from changes in discharges into the water bodies, land use practices that effect drainage into the water bodies, or water diversion operations. Based on this information, the RWQCBs prepare lists of impaired water bodies in each basin (per Section 303[d] of the CWA) that do not comply with applicable water quality standards. The RWQCBs also develop Total Maximum Daily Load (TMDL, or the greatest pollutant load that a water body can receive and still meet water quality standards to protect designated beneficial uses.

Beneficial Uses in the Study Area

The Delta has high levels of naturally occurring and human-made water quality constituents. Some of the naturally occurring constituents, such as salinity and nutrients (including organic carbon), are important components of the Delta ecosystem and vary with the tidal cycles of the estuary. Human-made constituents, such as pathogens and contaminants, result from point and non-point source discharges into the Sacramento and San Joaquin rivers and the Delta.

Water quality criteria have been adopted by the SWRCB and Central Valley RWQCB to protect water users and ecological resources in the Sacramento and San Joaquin rivers and the Delta. Beneficial uses for water bodies in the study area are summarized in Table 3.10-2.

Table 3.10-2. Designated Beneficial Uses in the Study Area

Designated Beneficial Uses	Sacramento River: Feather River to Delta	Feather River: Oroville Dam to Sacramento River	Yolo Bypass	Sacramento-San Joaquin River Delta	San Luis Reservoir	California Aqueduct
Municipal and Domestic Supply	X	X	-	X	X	X
Agricultural Supply	X	X	X	X	X	X
Industrial Service Supply	X	-	-	X	X	X
Industrial Process Supply	-	-	-	X	-	X
Groundwater Recharge	-	-	-	X	-	-
Navigation	-	-	-	X	-	-
Hydropower Generation	-	-	-	-	X	X
Water Contact Recreation	X	X	X	X	X	X
Non-Contact Water Recreation	X	X	X	X	X	X
Commercial and Sport Fishing	-	-	-	X	-	-
Warm Freshwater Habitat	X	X	X	X	X	-
Cold Freshwater Habitat	X	X	X	X	-	-
Wildlife Habitat	X	X	X	X	X	X
Rare, Threatened, or Endangered Species	-	-	-	X	-	-

Designated Beneficial Uses	Sacramento River: Feather River to Delta	Feather River: Oroville Dam to Sacramento River	Yolo Bypass	Sacramento-San Joaquin River Delta	San Luis Reservoir	California Aqueduct
Migration of Aquatic Organisms	X	X	X	X	-	-
Spawning, Reproduction, and/or Early Development	X	X	X	X	-	-
Shellfish Harvesting	-	-	-	X	-	-
Estuarine Habitat	-	-	-	X	-	-

Note:
X indicates designated beneficial use; "-" indicates blank cell
Sources: CV RWQCB 2004, 2011; SFB RWQCB 2013; SWRCB 2006

TMDLs adopted or being developed to protect the beneficial uses of these waterways are summarized in Table 3.10-3.

Table 3.10-3. Total Maximum Daily Load Status in the Study Area

Water Body	Mercury	Toxicity	Pesticides	Other Constituents
Sacramento River from Feather River to the Delta	TMDL being developed	N/A	Dieldrin TMDL by 2022	N/A
Lake Oroville and Feather River to Sacramento River	TMDL by 2022	TMDL by 2019	Group A TMDL being developed Chlorpyrifos TMDL by 2019	PCB TMDL by 2022
San Luis Reservoir	TMDL by 2021	N/A	N/A	N/A
Delta	TMDL approved 2008	TMDL by 2019	Chlordane and Dieldrin in the northern Delta TMDL being developed Chlorpyrifos, DDT, Diazinon, Dioxin, Furan compounds, and Group A TMDLs being developed	PCB TMDL being developed Selenium TMDL being developed Invasive species TMDL by 2019

Source: SWRCB 2011a
Notes:
DDT = dichlorodiphenyltrichloroethane
N/A = not applicable
PCB = polychlorinated biphenyl
TMDL = Total Maximum Daily Load

Major Constituents that Could Adversely Affect Water Quality for Beneficial Uses

Implementing the proposed long-term operation of the SWP may have effects on salinity, chloride, mercury, and nutrients caused by altering the hydrology of the surface waters. Existing conditions of these constituents in the study area are discussed next.

Salinity

Salinity (a measure of dissolved salts in water) in the tidally influenced Delta can cause adverse effects on domestic supply, agriculture, industry, and wildlife (CALFED 2007). Salinity concentrations tend to increase from the North Delta to the South Delta, and from the east Delta to the west Delta. Salinity concentrations in the Delta follow predictable patterns, as influenced by the higher saline water from

the San Joaquin River and less saline water from the Sacramento River and eastside streams in an ever-changing balance with marine tidal influence and the diversion from the South Delta SWP and CVP pumps.

The highest salinity concentrations occur during the late summer months, when the flows from the Sacramento and San Joaquin rivers are the lowest and the greatest level of sea water intrusion occurs. The lower Sacramento River at Collinsville experiences strong tidal influence during dry periods but is flushed with freshwater during the higher winter flow events.

Salinity concentrations are reported in multiple ways, including chlorides, total dissolved solids, and electrical conductivity (EC). EC is linked to salinity, and salinity is an important variable in the tidally influenced Delta to a variety of aquatic resources and water users (CV RWQCB 2011; CALFED 2007).

The Sacramento River has not been placed on the 303(d) impaired waterways list, approved by EPA for salinity. Delta waterways were placed on the Section 303(d) list as impaired by EC. Suisun Marsh was placed on the 303(d) list for impairment by salinity. Suisun Marsh is also impaired by chlorides and total dissolved solids. (SWRCB 2011a)

Water quality objectives for EC were established in the SWRCB Bay–Delta Water Quality Control Plan, to protect the beneficial uses of Delta waterways, including the agricultural water supply (SWRCB 2006). The Delta plan includes objectives for the Delta for agricultural as well as fish and wildlife beneficial use protection, which vary by month and water-year type. The objectives for agricultural protection are designed primarily to control salinity conditions in the interior and southern Delta channels, and San Joaquin River inflow to the Delta at Vernalis.

The salinity water quality objectives in the project area are shown in Table 3.10-4.

Table 3.10-4. Major Salinity Water Quality Objectives in the Study Area

Location of Water Quality Objective	Parameter	Description	Water Year per Time Period or Values
Contra Costa Canal at Pumping Plant #1 or San Joaquin River Antioch Water Works Intake	Chloride	Maximum mean daily 150 milligrams per liter (mg/L) chloride for at least the number of days shown during the calendar year. Must be provided in intervals of not less than 2 weeks duration.	Wet: Less than 150 to 240 days Above Normal: Less than 150 to 190 days Below Normal: Less than 150 to 175 days Dry: Less than 150 to 165 days Critical: Less than 150 to 155 days
Contra Costa Canal at Pumping Plant #1 and West Canal at gates of Clifton Court Forebay and Jones Pumping Plant and Cache Slough at City of Vallejo Intake and Barker Slough at North Bay Aqueduct Intake	Chloride	Maximum mean daily, in mg/L	All Water Year Types (Wet, Above Normal, Below Normal, Dry, Critical): 250 for all year

Location of Water Quality Objective	Parameter	Description	Water Year per Time Period or Values
Sacramento River at Emmaton	Electrical Conductivity (EC)	Maximum 14-day running average of mean daily EC millimhos per centimeter (mmhos/cm)	Wet: 0.45 from April 1 to August 15 Above Normal: 0.45 from April 1 to June 30 and 0.63 from July 1 to August 15 Below Normal: 0.45 from April 1 to June 19 and 1.14 from June 20 to August 15 Dry: 0.45 from April 1 to June 14 and 1.67 from June 15 to August 15 Critical: 2.78 from April 1 to August 15
San Joaquin River at Jersey Point	Electrical Conductivity	Maximum 14-day running average of mean daily EC (mmhos/cm)	Wet: 0.45 from April 1 to August 15 Above Normal: 0.45 from April 1 to August 15 Below Normal: 0.45 from April 1 to June 19 and 0.74 from June 20 to August 15 Dry: 0.45 from April 1 to June 14 and 1.35 from June 15 to August 15 Critical: 2.20 April 1 to until August 15
South Fork Mokelumne River at Terminus	Electrical Conductivity	Maximum 14-day running average of mean daily EC (mmhos/cm)	Wet, Above Normal, Below Normal, Dry: 0.45 from April 1 to August 15 Critical: 0.54 from April 1 to August 15
San Joaquin River at San Andreas Landing	Electrical Conductivity	Maximum 14-day running average of mean daily EC (mmhos/cm)	Wet, Above Normal, Below Normal: 0.45 from April 1 to August 15 Dry: 0.45 from April 1 to June 24 and 0.58 from June 25 to August 15 Critical: 0.87 from April 1 to August 15
San Joaquin River at and between Prisoners Point and Jersey Point	Electrical Conductivity	Fish and Wildlife Beneficial Use Objective Maximum 14-day running average of mean daily EC (mmhos/cm)	All Water Year Types (Wet, Above Normal, Below Normal, Dry, Critical): 0.44 from April 1 to May 31
San Joaquin River at Airport Way Bridge, Vernalis and San Joaquin River at Brandt Bridge Site, and Old River near Middle River and Old River at Tracy Road Bridge	Electrical Conductivity	Maximum 30-day running average of mean daily EC (mmhos/cm)	All Water Year Types (Wet, Above Normal, Below Normal, Dry, Critical): 0.7 from April 1 through August 31 and 1.0 from September 1through March 31
West Canal at mouth of Clifton Court Forebay and Delta-Mendota Canal at Jones Pumping Plant	Electrical Conductivity	Maximum monthly average of mean daily EC (mmhos/cm)	All Water Year Types (Wet, Above Normal, Below Normal, Dry, Critical):1.0 for all year

Source: SWRCB 2006

The water quality objectives for municipal and industrial water use are designed primarily to control salinity conditions in the central and southern Delta. The most restrictive salinity water quality criteria are intended to maintain a mean daily salinity of 150 mg/L as chloride for at least 150 days per year for the Contra Costa Canal Pumping Plant #1 (at Rock Slough). This facility serves the Contra Costa Water District or the City of Antioch Water Works Intake.

In addition, a maximum of 250 mg/L of salinity as chloride is maintained for the following locations: Contra Costa Canal Pumping Plant #1 (at Rock Slough), West Canal at the Clifton Court Forebay intake gates, Jones Pumping Plant approach channel, Cache Slough at the City of Vallejo intake, and Barker Slough at the North Bay Aqueduct Intake.

High salinity in irrigation water inhibits water and nutrients intake by plants, resulting in crop yield reduction. To protect salt-sensitive crops during the irrigation season, EC objectives are set in the lower Sacramento River at Emmaton; the San Joaquin River at Jersey Point, San Andreas Landing, Airport Way Bridge, and Vernalis; the Old River near Middle River and at Tracy Road Bridge; the South Fork Mokelumne River at Terminus; West Canal at the Clifton Court Forebay gates; and Delta Mendota Canal at Jones Pumping Plant.

Salinity also affects fish and wildlife habitat in the western Delta. Salinity effects are evaluated with respect to the location of "X2," the distance from the Golden Gate Bridge upstream toward the Delta, where the tidally averaged near-bottom salinity concentration of 2 ppt occurs. The X2 standard was established to improve shallow water estuarine habitat from February through June (USFWS 2008).

X2 is a constantly fluctuating position caused by the Delta freshwater (with salinity less than 2 ppt from upstream sources) and the marine tidal influence from downstream sources (with salinity greater than 2 ppt). The location of X2 is used in several water quality criteria in the Delta, including the following:

- The 2000 SWRCB Water Rights Decision 1641 (D-1641) provides the water quality objectives or the operations of the SWP and CVP includes "spring X2" criteria that require upstream reservoir releases from February through June to maintain freshwater and estuarine conditions in the western Delta to protect aquatic life.
- The 2008 USFWS Biological Opinion (USFWS 2008) includes meeting a Delta salinity requirement from September through November in wet and above-normal water years (referred to as Fall X2). Under this provision in September and October, X2 is maintained at 74 kilometer (km) in wet years, and at 81 km in above-normal water years when the preceding year was wet or above-normal based on the Sacramento Basin 40-30-30 index in the SWRCB D-1641. In November of these years, no specific X2 requirement exists; however, a requirement exists for inflow into SWP and CVP upstream reservoirs to be conveyed downstream to augment Delta outflow to maintain X2 at the same locations as in September and October. If storage increases during November under this action, the increased storage volume is to be released in December, in addition to the requirements under the SWRCB D-1641 net Delta Outflow Index.
- The X2 salinity objective for Suisun Bay was established as part of the Water Quality Control Plan of 1995 (SWRCB 1995).

Mercury

Mercury is a constituent of concern throughout California, both as total mercury and as biologically formed methylmercury. Methylation of mercury is an important step in the entrance of mercury into the food chain (EPA 2001) and can occur in both sediment and the water column. Methylmercury is absorbed more quickly by aquatic organisms than inorganic mercury, and it increases the concentration in predatory fish from eating smaller contaminated fish and invertebrates. Consumption

of contaminated fish is the major pathway for human and avian exposure to methylmercury (EPA 2001). Current statewide water quality criteria for mercury were established in the CTR in 2000 (EPA 2000). These limits were set for the protection of human health, wherein total recoverable mercury limits were set for consumption of water as well as consumption of organisms.

The Sacramento River from Verona through the Delta and the lower Feather River are on the 303(d) impaired waterways list for mercury contamination (SWRCB 2011a). Mercury concentrations found in these waterways can be attributed to gold mine tailings from the upper Sacramento River, Feather River, Yuba River, and American River, from areas where mercury was used to extract gold in the nineteenth century (SWRCB 2011b). Singer et al. (2013) predicted that mercury-laden sediment will continue to be transported to the Sacramento River for the next 10,000 years. The Feather River transports to the Sacramento River much of the mercury that was released in the Sierra Nevada during gold mining operations (CV RWQCB 2010a). A portion of the contaminated sediments is deposited in Lake Oroville, preventing further transport downstream.

The Yolo Bypass conveys a significant amount of methylmercury and total mercury to the Delta. Although the Sacramento River is the primary source of mercury transported to the Delta in dry years, mercury loading from the Yolo Bypass increases in wet years and is comparable to that of the Sacramento River. Although only two-thirds of the Yolo Bypass floodplain are within the legal Delta, the entire floodplain was evaluated as part of the Delta Methylmercury TMDL (CV RWQCB 2010a). Compounding the issue of mercury contamination in the Yolo Bypass, the study noted that the Yolo Bypass has conditions conducive to the production of methylmercury, including stagnant waters and marshes with an abundance of sulfate and organic carbon (USGS 2002).

A major source of mercury transport to the Yolo Bypass is from Cache Creek. Existing mercury mine wastes have contributed relatively large mercury loading and high mercury concentrations in suspended sediment, making this area a priority for mercury reduction as part of the Delta Methylmercury TMDL (CV RWQCB 2010a).

Elevated methylmercury concentrations in the Colusa Basin Drain also are a concern (USGS 2002). The Cache Creek Settling Basin (CCSB) captures sediment and mercury transported by Cache Creek; however, sediment that is not captured is transported to the Yolo Bypass (approximately half of the sediment transported by Cache Creek). The CTR mercury criterion of 0.050 micrograms per liter for drinking water is exceeded in outflow from the CCSB (and possibly in other tributaries to Yolo Bypass); thus, when the Yolo Bypass is dominated by flows from Cache Creek, it also is expected to exceed the CTR criterion (CV RWQCB 2010a).

Mercury also is a constituent of concern for Suisun Bay and Suisun Marsh, which were placed on the 303(d) impaired waterways list (SWRCB 2011a). For Suisun Bay, a TMDL was specified in the San Francisco Bay Mercury TMDL (SFB RWQCB 2013), which was approved by EPA in February 2008, and the implementation plan is expected to attain the water quality standard by about 2028. For Suisun Marsh, a TMDL was specified in the Sacramento–San Joaquin Delta Methylmercury TMDL (CV RWQCB 2010a) and was completed in September 2012 (SFB RWQCB 2012).

The objective to control mercury concentrations in fish in the Delta has spawned the Mercury Exposure Reduction Program (MERP) Strategy, developed by the Central Valley RWQCB with the goal of pooling the resources of mercury dischargers to reduce human exposure from consuming Delta fish with high levels of mercury (Delta Conservancy 2016). MERP was included as part of an amendment to Basin Plan for the Sacramento River and San Joaquin River Basins in 2011 (CV RWQCB 2011), and is applicable to people eating one meal of specific fish per week (32 grams per day).

The two-phase program was put into effect on October 20, 2011, and will be completed in 2030. Phase 1 consists of implementing programs to minimize pollution, implementing interim mass limits for point sources, and controlling potentially methylated, sediment-bound mercury in the Delta and the Yolo Bypass. Phase 1 also includes developing a program to control mercury in tributaries upstream. Phase 2 includes implementing control programs and monitoring compliance. In addition to the Delta Control Mercury Program, the Central Valley RWQCB designated load and waste load allocations for point sources within and to the Delta, as specified in the Basin Plan.

Nutrients

The Delta was not placed on the 303(d) impaired waterways list for nutrients (SWRCB 2011a). However, nutrients are a cause of concern in the Delta (CV RWQCB 2010b) and have been the subject of considerable discussion.

Nutrients (e.g., nitrogen and phosphorus) come from natural sources, such as weathering of rocks and soil, and from the ocean when nutrients are mixed in the water current, as well as from animal manure, atmospheric deposition, and nutrient recycling in sediment (NOAA 2014; EPA 1998). Nutrients are essential to maintaining a healthy water system. However, overenrichment of nitrogen and phosphorus can contribute to a process known as eutrophication, in which an excessive growth of macrophytes, phytoplankton, or potentially toxic algal blooms occurs. Eutrophication also may lead to a decrease of dissolved oxygen, typically at night, when plants stop producing oxygen through photosynthesis but continue to use oxygen. Severely low dissolved oxygen conditions are referred to as anoxic and may enhance methylmercury production (SFB RWQCB 2012).

A decline in pelagic fish species in the Delta, including the endangered Delta Smelt, is known as the Pelagic Organism Decline (POD), which may be related to effects from nutrients, among other stressors (Baxter et al. 2010; Sommer et al. 2007). However, unlike most water bodies where nutrients cause too much primary production, the problem affecting beneficial uses in parts of the Delta is the limited primary production needed to support fish populations.

Nutrient effects associated with the POD are also influenced by flow and other factors, including temperature, turbidity, and the presence of invasive species.

The Delta is a major source of human-made ammonium loading to Suisun Bay, which exchanges nutrients with Suisun Marsh (Senn and Novick 2014; Tetra Tech and WWR 2013). Primary sources of human-made ammonium are erosion, agricultural runoff, urban runoff, and treated effluent from wastewater treatment facilities. The Sacramento Regional Wastewater Treatment Plant (SRWTP) is the largest major point source of ammonium in the Delta, contributing 90% of the ammonium in the river from 1986 to 2005 (Jassby 2008).

Nitrogen inputs to the Delta will change because the SRWTP National Pollutant Discharge Elimination System (NPDES) Permit (No. CA0077682) includes effluent limits for nitrogen, requiring the addition of nitrification and denitrification treatment to be installed and operational by 2020. Another source of ammonium loading already has changed because the Stockton Regional Wastewater Control Facility (which discharges to the San Joaquin River) began implementing nitrification and denitrification treatment of wastewater in 2007 (SWRCB 2012).

Suisun Marsh is a water body in the San Francisco Bay that was placed on the Section 303(d) list, approved by EPA as impaired by nutrients (SWRCB 2011a). According to the Final California 2010 Integrated Report (303[d] list / 305[b] Report) Supporting Information, nutrients in Suisun Marsh can be attributed to flow regulation and modification and urban runoff and storm sewers (SWRCB 2011c). More specific sources of nutrients to Suisun Marsh include agricultural, urban, and livestock grazing drainage through tributaries, the Sacramento River and San Joaquin River through the Delta, nutrient exchange with Suisun Bay, atmospheric deposition, and discharge from the Fairfield Suisun Sewer District wastewater treatment plant (Tetra Tech and WWR 2013).

Suisun Marsh was placed on the 303(d) list, approved by EPA in 2010 for organic enrichment (SWRCB 2011a). Organic enrichment enhances microbial production and activity, such as the methylation of mercury, and the decomposition of organic matter can cause low dissolved oxygen levels (Tetra Tech and WWR 2013). Nutrients, primarily nitrogen and phosphorous, may trigger excessive growth of algae or toxic blue-green cyanobacteria. However, within the Delta, nutrients generally are recognized as being too high in concentration to be limiting (e.g., as compared to light) (Jassby et al. 2002). The secondary effects of nutrient enrichment and associated oxygen depletion most often are found in the Central Delta and South Delta near Stockton, rather than in the Sacramento River.

The Stockton Ship Channel in the Delta waterways was placed on the Section 303(d) impaired waterways list for organic enrichment and pathogens (SWRCB 2011a).

Other Discharges of Pollutants

Municipal discharges and agricultural return flows to the Sacramento and San Joaquin river watersheds and the Delta contribute other pollutants and constituents of concern that potentially could degrade water quality. Nutrients (e.g., nitrogen and phosphorus) originate from natural sources and from human-made sources, including point and non-point source discharges. Overenrichment of nitrogen and phosphorus can contribute to eutrophication and toxicity. Eutrophication also results in elevated levels of total organic carbon (TOC), a disinfection byproducts precursor. The SWRCB Policy with Respect to Maintaining High Quality of Water in California (Resolution No. 68-16) incorporates the federal antidegradation policy and restricts reductions in water quality, even if beneficial uses are protected.

Point and non-point source discharges into Delta waters have the potential to introduce and elevate the levels of other contaminants. *Cryptosporidium* and *Giardia* are two main constituents of concern that are the focus of the drinking water regulatory requirements promulgated by EPA.

Nutrient concerns for the San Luis Reservoir are of concern to the Santa Clara Valley Water District and San Benito County Water District public water supplies. These districts withdraw their CVP supplies

from the Upper Pacheco Intake at the San Luis Reservoir. This supply is at risk when water elevations in the reservoir decline to very low levels during late summer and early fall. High temperatures combined with low water levels foster algae growth, which can be as much as 35 feet thick on the water surface.

Algae captured in the intake and conveyed to these water users is not suitable for municipal water treatment or agricultural drip irrigation systems. As water levels continue to decline below the level of the intake, water supply to these water users ceases. The Santa Clara Valley Water District has partnered with Reclamation and the San Luis and Delta–Mendota Water Authority to complete the San Luis Low Point Improvement Project. The purpose of the Proposed Project is to identify a feasible alternative to address the uncertainty of CVP delivery schedules and the water supply reliability problems associated with the low-point issues.

3.10.2 DISCUSSION

Would the Proposed Project:

a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality?

The proposed long-term operation of the SWP would alter surface water flows in the Delta. The modified Delta surface flows would have the potential to alter Delta water quality for several constituents, including EC, salinity, and organic carbon. Changes in these constituents may exceed the applicable water quality limits established by various regulatory actions. Such exceedances may result in violating applicable water quality standards. An exceedance of applicable water quality standards would be a **potentially significant** impact. Because the proposed long-term operation of the SWP may result in a potential significant impact on water quality, both surface water hydrology and water quality will be discussed further in the EIR.

b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?

The proposed long-term operation of the SWP would only modify surface water hydrology to a limited extent that would remain within the range of historical operations. This limited change to surface water hydrology would not result in decreasing groundwater supplies, interfere with groundwater recharge, or impede sustainable groundwater management in the SWP project area. **No impact** would occur.

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner that would:

i) result in substantial on- or off-site erosion or siltation on- or off-site?

The proposed long-term operation of the SWP would not include construction of new or modification of existing SWP facilities. Therefore, the Proposed Project would not alter existing drainage or river courses, nor create additional impervious surfaces that would induce or accelerate erosion or siltation.

The proposed long-term operation of the SWP would only modify surface water hydrology to a limited extent, and therefore the water hydrology would remain within the range of historical operations. Therefore, the Proposed Project would not create substantially different flow conditions that would induce or accelerate erosion or siltation. **No impact** would occur.

d) Substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or offsite?

The proposed long-term operation of the SWP does not include construction of new or modification of existing SWP facilities. Therefore, the Proposed Project would not increase the rate or amount of surface runoff that subsequently would result in flooding.

The proposed long-term operation of the SWP would modify only surface water hydrology to a limited extent, and therefore the water hydrology would remain within the range of historical operations. This limited change to surface water hydrology would not result in flooding to areas in the SWP project area. **No impact** would occur.

e) Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

The proposed long-term operation of the SWP would not include construction of new or modification of existing SWP facilities, and therefore would not exceed the capacity of existing or planned stormwater systems or substantial sources of polluted runoff. **No impact** would occur.

f) Risk release of pollutants in flood hazard, tsunami, or seiche zones due to project inundation?

The proposed long-term operation of the SWP would not include construction of new or modification of existing SWP facilities, and therefore would not result in increased flood hazard, tsunami risk, or risk of release of pollutants because of inundation. Surface water flow resulting from the Proposed Project would remain within the range of historical conditions and no change would occur. **No impact** would occur.

g) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

As previously discussed under item a, the proposed long-term operation of the SWP would alter surface water flows in the Delta. The modified Delta surface flows potentially could alter Delta water quality for several constituents, including EC and salinity. Changes in these constituents may exceed the applicable water quality limits established by various regulatory actions. Operation of the SWP would not result in conflict with an applicable water quality control plan. **No impact** would occur because of a conflict with an applicable water quality control plan. However, because the proposed long-term operation of the SWP would have the potential to alter both surface water hydrology and water quality, these topics will be discussed further in the EIR.

3.11 LAND USE AND PLANNING

Table 3.11-1. Potential Impacts on Land Use and Planning

ENVIRONMENTAL ISSUES		ENVIRONMENTAL IMPACT SIGNIFICANCE
X.	**Land Use and Planning. Would the project:**	-
a)	Physically divide an established community?	No Impact
b)	Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	No Impact

Note:
"-" indicates blank cell

3.11.1 ENVIRONMENTAL SETTING

3.11.1.1 Existing Land Uses

A wide range of land uses occur in the project area. These land uses include forestry, agriculture, water, urban (including industrial, commercial, and residential), rural residential, parks and recreation, and public open spaces. The following discussion briefly describes the land uses found in each region in the project area.

Sacramento Valley Region

The Sacramento Valley Region includes Butte, Colusa, El Dorado, Glenn, Nevada, Placer, Plumas, Shasta, Sutter, Tehama, and Yuba counties (Table 3.11-2). Only Butte and Yuba counties receive SWP water supplies.

Table 3.11-2. Sacramento Valley Region Land Use and Area of Potential Effect

County	Size (approx. square mile)	Major Communities	Predominant Land Use	Potential Areas of Effect from Long-Term Operation
Butte	1,680	Biggs, Chico, Gridley, Oroville, and Paradise	• Lands within national forests (Plumas and Lassen) and the Sacramento National Wildlife Refuge • 60% agriculture uses • 12% U.S. Forest Service managed land • 1.5% BLM managed land	Wildlife refuges, SWP facilities, CVP facilities, and areas along the Feather River
Yuba	644	Marysville and Wheatland	• 46% agricultural land use • Federally owned lands including Tahoe and Plumas National Forests, and Beale Air Force Base	Areas within Yuba County Water Agency facilities that provide water for environmental and water supply purposes within the Central Valley

Notes:
BLM = Bureau of Land Management
CVP = Central Valley Project
SWP = State Water Project

San Joaquin Valley Region

The San Joaquin Valley Region includes Fresno, Kern, Kings, Madera, Merced, Stanislaus, and Tulare counties (Table 3.11-3).

Table 3.11-3. San Joaquin Valley Region Land Use and Area of Potential Effect

County	Size (approx. square mile)	Major Communities	Predominant Land Use	Potential Areas of Effect from Long-Term Operation
Kern	8,202	Bakersfield, Delano, Oildale, Ridgecrest, Wasco, Arvin, Rosamond, Shafter, and Lamont	• 85% unincorporated lands designated for agricultural uses • <6% unincorporated lands designated residential uses	SWP water service areas
Kings	1,280	Avenal, Corcoran, Hanford, and Lemoore	• 90% agricultural uses • <1% residential uses in unincorporated areas and special districts	SWP water service areas

Notes: SWP = State Water Project

Sacramento-San Joaquin Delta Region

The Delta includes Contra Costa, Sacramento, San Joaquin, Solano, and Yolo counties (Table 3.11-4).

Table 3.11-4. Delta Region Land Use and Area of Potential Effect

County	Size (approx. square mile)	Major Communities	Predominant Land Use	Potential Areas of Effect from Long-Term Operation
San Joaquin	1,426	Stockton, Tracy, Manteca, Lodi, Lathrop, Ripon, and Garden Acres	• 75% agriculture uses • 4.4% residential • 10% incorporated cities • <1% federally owned land	SWP facilities (including facilities associated with the Rock Slough Pumping Plant, the Jones Pumping Plant, the Clifton Court Forebay, and the Harvey O. Banks Pumping Plant), areas along the Delta channels that use the surface waters
Solano	910	Benicia, Dixon, Fairfield, Rio Vista, Suisun City, Vacaville, and Vallejo	• 56.5% agriculture uses • 14% incorporated cities • 1% Travis Air Force Base	SWP facilities (North Bay Aqueduct intakes at Barker Slough), areas in the Yolo Bypass and along the Delta channels that use the surface waters, and SWP water service areas

Notes: SWP = State Water Project

San Francisco Bay Area Region

The San Francisco Bay Area Region in this analysis includes Alameda, Napa, San Benito, and Santa Clara counties (Table 3.11-5).

Table 3.11-5. San Francisco Bay Area Region Predominate Land Use and Area of Potential Effect

County	Size (approx. square mile)	Major Communities	Predominant Land Use	Potential Area of Effect from Reoperation
Alameda	738	Oakland, Fremont, Hayward, Berkeley, San Leandro, Livermore, Alameda, Pleasanton, Union City, and Castro Valley	• 59% unincorporated area • Agricultural and open space uses	SWP facilities (including the SWP South Bay Aqueduct), reservoirs that store CVP or SWP water, and SWP water service areas
Napa	793	American Canyon, Calistoga, Napa, and St. Helena, and the town of Yountville	• 95% unincorporated cities • 13% federally owned land • 8% state-owned land, including Lake Berryessa and the State Cedar Rough Wilderness and Wildlife Area	SWP water service areas
San Benito	1,386	Hollister and San Juan Bautista	• 99.5% unincorporated area • 84% agricultural uses • 4% federally owned and state-owned lands, including Pinnacles National Monument, Hollister Hills State Vehicular Recreation Area, and San Juan Bautista State Historic Park	SWP facilities (including San Justo Reservoir and other facilities to convey water from San Luis Reservoir)
Santa Clara	1,306	San Jose, Sunnyvale, Santa Clara, Mountain View, Milpitas, Palo Alto, Cupertino, Gilroy, Campbell, Morgan Hill, and Saratoga	• 83% incorporated cities • < 10% federally owned and state-owned lands, including Henry W. Coe State Park	SWP facilities (including the SWP South Bay Aqueduct and CVP facilities that convey water from San Luis Reservoir) and SWP water service areas

Notes:
CVP = Central Valley Project
SWP = State Water Project

Central Coast Region

The Central Coast Region includes San Luis Obispo and Santa Barbara counties (Table 3.11-6).

Table 3.11-6. Central Coast Region Land Use and Area of Potential Effect

County	Size (approx. square mile)	Location	Predominant Land Use	Potential Areas of Effect from Long-Term Operation
San Luis Obispo	3,594	Central California. Bound on the north by Monterey County, on the east by Kern County, on the south by Santa Barbara County, and on the west by the Pacific Ocean	• 83% rural and agricultural uses • 10% surface waters	SWP facilities (including facilities associated with the Central Coast Water Authority) and SWP water service areas
Santa Barbara	2,744	Central California. Bound on the north by San Luis Obispo, on the east by Ventura County, and on the south and west by the Pacific Ocean	• 82% agricultural uses • < 3% incorporated cities	SWP facilities (including facilities associated with the Central Coast Water Authority), recreation facilities at Cachuma Lake, which stores SWP water, and SWP water service areas

Notes: SWP = State Water Project

Southern California Region

The Southern California Region includes portions of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties (Table 3.11-7).

Table 3.11-7. Southern California Region Predominate Land Use and Area of Potential Effect

County	Size (approx. square mile)	Major Communities	Predominant Land Use	Potential Area of Effect from Reoperation
Los Angeles	4,083	Los Angeles, Long Beach, Glendale, Santa Clarita, Lancaster, Palmdale, Pomona, Torrance, Pasadena, East Long Angeles, and El Monte	• 50% unincorporated land designated natural resources including Los Padres and Angeles National Forests • 39% rural • 3% residential	SWP facilities and SWP water service areas
Orange	948	Anaheim, Brea, Buena Park, Costa Mesa, Garden Grove, Orange, and Santa Ana	• 70% incorporated cities • 25% open space, including federally owned lands such as the Cleveland National Forest	SWP facilities and SWP water service areas
Riverside	7,295	Riverside, Moreno Valley, Corona, Murrieta, Temecula, Hemet, Menifee, Indio, Perris, and Eastvale	• 25% residential • 28% open space, recreation land, agriculture, and wildland preservation	SWP facilities, reservoirs that store SWP water (including Diamond Valley Lake and Lake Skinner), and SWP water service areas
San Bernardino	20,106	San Bernardino, Fontana, Rancho Cucamonga, Ontario, Victorville, Rialto, Hesperia, Chino, Chino Hills, Upland, and Apple Valley	• 81% federally owned and state-owned lands including 28 BLM wilderness areas, and San Bernardino and Angeles National Forests	SWP water service areas
San Diego	4,525	San Diego, Chula Vista, Oceanside, Escondido, Carlsbad, El Cajon, Vista, San Marcos, Encinitas, and National City	• 54.4% public agency lands • 33% private lands • 5.7% tribal lands	SWP facilities, non-SWP reservoirs that store SWP water (including Dixon Lake, San Vicente, Lower Otay, and Sweetwater Reservoir)
Ventura	1,873	Oxnard, Thousand Oaks, Simi Valley, Ventura, Camarillo, Moorpark, Santa Paula, Port Hueneme, and Fillmore	• 45% federally owned and state-owned lands including Los Padres National Forest, Chumash and Sespe wilderness area, Point Mugu Naval Air Station, California State University Channel Islands, and state beach parks	Lake Piru, which stores SWP water, and SWP water service areas

Notes:
BLM = Bureau of Land Management
SWP = State Water Project

3.11.1.2 Applicable Plans

Delta Stewardship Council Delta Plan

The Delta Reform Act of 2009 created the Delta Stewardship Council (DSC), with a primary responsibility to develop and implement a legally enforceable, long-term management plan for the Delta. The California Legislature required the Delta Plan to advance the co-equal goals of protecting and enhancing the Delta ecosystem and providing for a more reliable water supply for California, and to do so in a manner to protect and enhance the Delta as an evolving place (DSC 2013).

The Delta Plan is a comprehensive, long-term management plan to achieve these goals for the Delta. The Delta Plan generally covers five topic areas and goals:

- Increased water supply reliability
- Restoration of the Delta ecosystem
- Improved water quality
- Reduced risk of flooding in the Delta
- Protection and enhancement of the Delta

The DSC does not propose to construct, own, or operate any facilities related to these five topic areas. Rather, the Delta Plan sets forth regulatory policies and recommendations that seek to influence the actions, activities, and projects of cities, counties, and other federal, State, regional, and local agencies toward meeting the goals in the five topic areas.

Delta Protection Commission Land Use and Resource Management Plan

The Delta Protection Act of 1992 created the Delta Protection Commission (DPC), to guide conservation of the Delta while focusing on agriculture, recreation, and natural resources. The act also requires the DPC to develop and implement a Land Use and Resource Management Plan for the Primary Zone of the Delta (DPC 2010).

The Land Use and Resource Management Plan provides goals and policies for land use, agriculture, natural resources, recreation and accessibility, water, levees, and utilities and infrastructure. In addition, general plans and projects in the Delta counties must be consistent with the management plan and are subject to review by the DPC.

3.11.2 DISCUSSION

a) Physically divide an established community?

The long-term operation of the SWP would not involve construction of new facilities or modification of existing facilities. No changes to land use would occur. Therefore, the proposed long-term operation would not divide an established community. **No impact** would occur.

b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan,

local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

The long-term operation of the SWP would not involve construction of new facilities or modification of existing facilities. No changes to land use would occur. Thus, the long-term operation would not conflict with an applicable land use plan, policy, or regulation.

Because the Proposed Project would result in only minor revision to SWP facility operations and would not result in conflict with flow objectives established by the SWRCB Bay-Delta Water Quality Control Plan, the Proposed Project would be consistent with the Delta Plan pursuant to 23 CCR Section 5005. **No impact** would occur.

3.12 MINERAL RESOURCES

Table 3.12-1. Potential Impacts on Mineral Resources

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
XII. Mineral Resources. Would the project:	-
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	No Impact
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	No Impact

Note:
"-" indicates blank cell

3.12.1 ENVIRONMENTAL SETTING

3.12.1.1 Construction Aggregate

The loss of access to regionally important mineral deposits because of land uses that preclude mining is one of the problems that the California Surface Mining and Reclamation Act of 1975 (SMARA) was framed to address. SMARA mandates a two-phased mineral resource conservation process called classification-designation. Under SMARA, the State Mining and Geology Board (SMGB) may designate certain mineral deposits as being regionally significant to satisfy future needs. The SMGB decision to designate an area is based on a classification report prepared by the California Geological Survey (CGS) and on input from agencies and the public.

Mineral land classification studies have been prepared for most geographic regions. Mineral land classification studies identify known and potential deposits of Portland cement concrete-grade (construction) aggregate, precious metals, and other economically valuable minerals, such as kaolin clay. The primary focus of mineral land classification is on sand, gravel, and crushed rock, which are the most important mineral commodities classed as "Construction Materials." These commodities, collectively referred to as aggregates, provide bulk and strength to Portland cement concrete, asphaltic concrete, and plaster or stucco. Aggregates also are used as road base, subbase, and fill. Aggregates normally provide from 80% to 100% of the material by volume in the above uses. Table 3.12-2 shows the mineral resource zone classification system established by CGS to indicate the location and significance of key extractive resources. Table 3.12-3 shows an overview of mineral resources in the Northern California project area, in the vicinity of SWP and CVP facilities or water bodies.

Table 3.12-2. California Geological Survey Mineral Land Classification System

Classification	Description
MRZ-1	Areas where adequate information indicates that no significant mineral deposits are present or where it is judged that little likelihood exists for their presence
MRZ-2	Areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists
MRZ-3	Areas containing mineral deposits, the significance of which cannot be evaluated from existing data
MRZ-4	Areas where available data are inadequate for placement in any other mineral resource zone

Source: Dupras 1977

Note: MRZ = Mineral Resource Zone

Table 3.12-3. Mineral Resources in the Northern California Project Area

Project Region	Description of Mineral Resources	MRZ Classification
Bay–Delta Region	-	-
Sacramento River Sacramento County	Classification extending along the Sacramento River from the I Street bridge to Collinsville for concrete-grade aggregate	MRZ-1
San Joaquin River Sacramento County	Classification extending along the San Joaquin River from the Cosumnes River to Collinsville for concrete-grade aggregate	MRZ-1
Delta	Known aggregate deposits in Antioch, Pittsburg, Martinez, and Benicia	MRZ-2
San Joaquin Valley Region	-	-
San Luis Reservoir	Classification includes San Luis Reservoir and O'Neil Forebay	MRZ-3

Notes: MRZ = Mineral Resource Zone; "-" indicates blank cell

Sources: The Diggings 2019; Dupras 1997, 1999; Foster 2001; Shumway 1997; Butte County 2012; Stinson et al. 1987a, 1987b; Jensen and Silva 1988; Rapp et al. 1997; Higgins 1997; Clinkenbeard 1999; Cole and Fuller 1988

Aggregate mineral resources are found in various locations throughout the Central Coast and Southern California SWP service areas (CGS 2019). Rock formations that are most likely to yield economically valuable deposits of aggregate resources consist of sedimentary deposits with interbedded layers of gravel, cobble, sand, and conglomerate. In particular, the streambeds of major rivers and large streams historically have served as excellent sources of aggregate resources throughout the state.

3.12.1.2 Oil and Gas

Oil and gas also represent an economically valuable form of naturally occurring deposits in Northern California. Natural gas well fields are concentrated primarily in the center of the Sacramento and San Joaquin valleys between Redding and Modesto, along the Sacramento River, and in the Delta (DOGGR 2019).

Oil production in California began in the 1860s, starting with the McKittrick field in western Kern County, at the western edge of the San Joaquin Valley. Today, oil resources in California are concentrated primarily in Kings and Kern counties, the most important being the McKittrick, Coalinga, Kern River, Midway–Sunset, Elk Hills, and Kettleman Hills oil fields (California Department of Conservation undated). None of these oil fields is in the vicinity of SWP facilities or water bodies.

In the Central Coast and Southern California SWP service area, the Los Angeles area was a major oil producing region from the late 1800s through the 1940s. Several large oil fields also were operated in Ventura County during this period. Today, most of the oil produced in the state comes from Kern and Kings counties. Natural gas commonly is associated with oil deposits. From the late 1800s through the 1940s, natural gas was provided to major urban centers in the Central Coast and Southern California SWP service area from supplies that were produced by the oil fields. In the 1930s, exploration began for additional sources of natural gas that were independent of the oil fields.

Most of the natural gas produced in California is found in the Sacramento and northern San Joaquin valleys. Today, most of the California's natural gas needs are met by importing this commodity from other states (California Department of Conservation n.d.).

3.12.2 DISCUSSION

a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance. Thus, no new sources of development could result in the loss of availability of economically valuable state-designated mineral resource deposits (i.e., areas designed as MRZ-2). The proposed long-term operation of the SWP would not affect the ability to recover mineral resources in any of the areas designated as MRZ-2 that are adjacent to streams or rivers considered in this analysis because such mining activities would occur either on the land side of flood protection levees or behind raised berms, or at locations that are higher in elevation and set back from the stream. **No impac**t would occur.

b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

For the same reasons described in (a) above, the proposed long-term operation of the SWP would not result in the loss of availability of a locally important mineral resource recovery site. **No impact** would occur.

3.13 NOISE

Table 3.13-1. Potential Impacts on Noise

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
XII. Noise. Would the project result in:	-
a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	No Impact
b) Generation of excessive vibration or ground-borne noise levels?	No Impact
c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	No Impact

Note:
"-" indicates blank cell

3.13.1 ENVIRONMENTAL SETTING

The SWP includes numerous storage facilities, reservoirs, lakes, and pumping plants; four pumping-generating plants; five hydroelectric power plants; and approximately 700 miles of open canals and pipelines. Noise sources associated with operation of SWP facilities include pumping plants, lift stations, and other conveyance facilities.

3.13.1.1 Sound, Noise, and Acoustics

Sound is the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air). Noise is defined as sound that is unwanted (i.e., loud, unexpected, or annoying). Acoustics is the physics of sound.

The amplitude of pressure waves generated by a sound source determines the perceived loudness of that source. A logarithmic scale is used to describe sound pressure level in terms of decibels (dB). The threshold of human hearing (near-total silence) is approximately 0 dB. A doubling of sound energy corresponds to an increase of 3 dB. In other words, when two sources at a given location are each producing sound of the same loudness, the resulting sound level at a given distance from that location is approximately 3 dB higher than the sound level produced by only one of the sources. For example, if one automobile produces a sound pressure level of 70 dB when it passes an observer, two cars passing simultaneously do not produce 140 dB; rather, they combine to produce 73 dB.

The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. As a consequence, when assessing potential noise impacts, sound is measured using an electronic filter that de-emphasizes the frequencies below 1,000 hertz (Hz) and above 5,000 Hz in a manner corresponding to the human ears' decreased sensitivity to low and extremely high frequencies instead of the frequency mid-range. This method of frequency weighting is referred to as A-weighting and is expressed in units of A-weighted decibels (dBA). All noise levels reported in this section are in terms of A-weighting. A strong correlation exists between A-weighted sound levels and community response to

noise. As discussed above, doubling sound energy results in a 3-dB increase in sound. In typical noisy environments, noise-level changes of 1 to 2 dB generally are not perceptible by the healthy human ear; however, people can begin to detect 3-dB increases in noise levels. An increase of 5 dB generally is perceived as distinctly noticeable, and a 10-dB increase generally is perceived as a doubling of loudness. The following are the sound level descriptors commonly used in environmental noise analysis:

- Equivalent sound level (L_{eq}): An average of the sound energy occurring over a specified time period. In effect, the L_{eq} is the steady-state sound level containing the same acoustical energy as the time-varying sound that actually occurs during the same period. The 1-hour, A-weighted equivalent sound level is the energy average of A-weighted sound levels occurring during a 1-hour period.
- Maximum sound level (L_{max}): The highest instantaneous sound level measured during a specified period.
- L_{dn} (day-night noise level): The 24-hour L_{eq} with a 10 dB "penalty" applied during nighttime noise-sensitive hours, 10 p.m. through 7 a.m. The L_{dn} attempts to account for the fact that noise during this specific period of time is a potential source of disturbance with respect to normal sleeping hours.
- L_n (Statistical Descriptor): The noise level exceeded n% of a specific period of time, generally accepted as an hourly statistic. An L_{10} would be the noise level exceeded 10% of the measurement period.

Sound from a localized source (i.e., point source) propagates uniformly outward in a spherical pattern, and the sound level attenuates (decreases) at a rate of 6 dB for each doubling of distance from a point/stationary source. Roadways and highways and, to some extent, moving trains consist of several localized noise sources on a defined path; these are treated as "line" sources, which approximate the effect of several point sources. Sound levels attenuate at a rate of 3 dB for each doubling of distance from a line source. Therefore, noise from a line source attenuates less with distance than noise from a point source with increased distance.

3.13.1.2 Existing Noise Environment

Background noise levels in the project area vary between rural and urban settings. Based on historical measured noise levels taken at representative rural and urban settings (EPA 1971), existing 1-hour L_{eq} noise levels at the remote rural sites are assumed to be in the range of 35 to 50 dBA during the day and 30 to 40 dBA at night. Daytime noise levels at sites in small towns are assumed to be 50 to 55 dBA. Daytime noise levels at sites within 100 feet of high-volume freeways or highways are assumed to be 55 to 65 dBA (Caltrans 2013). Sources of ambient noise in the project area include traffic, agricultural equipment, boats, and aircraft. Some locations in the project area are within airport land use planning or influence areas and may experience ambient noise from aircraft arrivals and departures. Rail transportation corridors in the project area are a source of rail noise and vibration from freight and commuter trains. The influence of these sources of noise on ambient levels depends on the proximity of receivers to highways, rail corridors, airports, and developed areas.

Existing ground-borne vibration levels generally are not discernible at locations beyond the road shoulders of highways or freeways. Proposed project activities are not expected to result in perceptible levels of vibration in sensitive buildings.

3.13.1.3 Noise-Sensitive Land Uses

Noise-sensitive land uses generally are defined as locations where people reside or where the presence of elevated noise emissions could significantly affect the use of the land. Noise-sensitive land use may be near access roads that are used for substantial haul truck traffic. Typical sensitive receptors include residences, schools, hospitals, and places of worship. Noise-sensitive receptors also can include parks, where quiet conditions are important for normal conversation between park users, and outdoor use areas at businesses, such as outdoor dining areas at restaurants.

3.13.2 DISCUSSION

a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Because the Proposed Project would not require any construction activities, introduce new land uses, or result in population increases in the project area, no new sources of noise would be introduced as part of the proposed long-term operation of the SWP. Noise levels from existing SWP facilities would remain the same as with existing conditions. The proposed long-term operation of the SWP would not generate noise levels that would conflict with applicable general plan noise elements or noise ordinances for other counties or cities in the project area. **No impact** would occur.

b) Generation of excessive vibration or ground-borne noise levels?

Because the proposed long-term operation of the SWP would not result in new construction activities, changes to land uses, or increase the population in the area, the project would not generate any excessive vibration or ground-borne noise. Therefore, **no impact** would occur.

c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

The proposed long-term operation of the SWP would not introduce new land uses or increase the population in the area. Therefore, the project would not expose people residing or working in the project area to excessive noise associated with public or public use airports. **No impact** would occur.

3.14 POPULATION AND HOUSING

Table 3.14-1. Potential Impacts on Population and Housing

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
XIII. Population and Housing. Would the project:	-
a) Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	No Impact
b) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?	No Impact

Note:
"-" indicates blank cell

3.14.1 ENVIRONMENTAL SETTING

3.14.1.1 Population

Numerous communities with populations ranging from thousands (e.g., Pittsburg) to a few hundred (e.g., Locke) are located throughout the project area. Most of the population resides in or near the peripheral urban areas. The following discussion briefly describes each project area segment and presents population data for 2008 and 2018, and projected population data for each region.

Sacramento-San Joaquin Delta

The Delta includes Sacramento, Yolo, Solano, San Joaquin, and Contra Costa counties (Table 3.14-2). Among the counties evaluated in the Delta, Yolo and San Joaquin counties had the highest population growth over the last 10 years (2008 to 2018), with an average annual growth rate of 1.2%, and Solano County had the lowest population growth, with an average annual growth rate of 0.6%. Between 2008 and 2018, the Delta had an average annual growth rate of 1.7%. Population growth in the Delta Region is projected to continue through 2035.

Table 3.14-2. Population Characteristics in the Delta Region

County	Population in 2008		Population in 2018	Annual Average Growth Rate (percent) [2]	Projected Population in 2035
Contra Costa County	1,015,672		1,149,363	1.1%	1,356,101
Sacramento County	1,380,172		1,529,501	0.9%	1,850,265
San Joaquin County	665,304		758,744	1.2%	941,975
Solano County	411,998		439,793	0.6%	524,285
Yolo County	192,826		221,270	1.2%	276,308
Delta Region[1]	**3,665,972**		**4,098,671**	**1.7%**	**4,948,934**

Source: DOF 2015, 2018, 2019a

Notes:

[1] Calculated sum of population for all Sacramento Valley Region counties.

[2] Calculated annual average from 2007 to 2018.

San Francisco Bay Area Region

The San Francisco Bay Area Region includes Alameda, Napa, Santa Clara, and San Benito counties in the SWP service area (Table 3.14-3). Alameda and Santa Clara counties have experienced the greatest population growth over the past decades, with an average annual growth rate of 1.1%. San Benito County had the lowest population growth, with an average annual growth rate of 0.3%. Between 2008 and 2018, the San Francisco Bay Area Region had an average annual growth rate of 1.8%. All counties in the San Francisco Bay Area Region are projected to experience population growth through 2035.

Table 3.14-3. Population Characteristics in the San Francisco Bay Area Region

County	Population in 2008	Population in 2018	Annual Average Growth Rate (percent) [2]	Projected Population in 2035
Alameda County	1,470,622	1,660,202	1.1%	1,939,941
Santa Clara County	1,725,066	1,956,598	1.1%	2,298,794
San Benito County	54,948	57,088	0.3%	72,719
Napa County	132,537	141,294	0.6%	153,636
San Francisco Bay Area Region [1]	**3,383,173**	**3,815,182**	**1.8%**	**4,465,090**

Source: DOF 2015, 2018, 2019a

Notes:

[1] Calculated sum of population for all San Francisco Bay Area Region counties.

[2] Calculated annual average from 2007 to 2018.

Central Coast Region

The Central Coast Region includes San Luis Obispo and Santa Barbara counties (Table 3.14-4). Between 2008 and 2018, Santa Barbara County had the greatest population growth, with an annual average growth rate of 0.8%. Between 2008 and 2018, the Central Coast Region had an average annual growth rate of 1.2%. Both counties are projected to have positive population growth through 2035.

Table 3.14-4. Population Characteristics in the Central Coast Region

County	Population in 2008	Population in 2018	Annual Average Growth Rate (percent) [2]	Projected Population in 2035
San Luis Obispo County	262,982	280,101	0.6%	302,046
Santa Barbara County	414,750	453,457	0.8%	503,058
Central Coast Region[1]	**677,732**	**733,558**	**1.2%**	**805,104**

Source: DOF 2015, 2018, 2019a

Notes:

[1] Calculated sum of population for all Central Coast Region counties.

[2] Calculated annual average from 2007 to 2018.

Southern California Region

The Southern California Region includes Ventura, Los Angeles, Orange, San Diego, Riverside, and San Bernardino counties (Table 3.14-5). Among these counties, between 2008 and 2018, Riverside County had the highest population growth, with an average annual growth rate of 0.8%, and Los Angeles County had the lowest population growth, with an average annual growth rate of 0.6%. Between 2008

and 2018, the Southern California Region had an average annual growth rate of 1.2%. All the counties are projected to have positive population growth through 2035.

Table 3.14-5. Population Characteristics in the Southern California Region

County	Population in 2008	Population in 2018	Annual Average Growth Rate (percent) [2]	Projected Population in 2035
Ventura County	803,572	859,073	0.6%	932,262
Los Angeles County	9,780,808	10,283,729	0.5%	10,915,099
Orange County	2,960,659	3,221,103	0.8%	3,501,088
San Diego County	2,998,477	3,337,456	1.0%	3,706,919
Riverside County	2,049,902	2,415,955	1.5%	3,001,065
San Bernardino County	1,989,690	2,174,938	0.8%	2,594,824
Southern California Region[1]	**20,583,108**	**22,292,254**	**1.2%**	**24,651,257**

Source: DOF 2015, 2018, 2019a

Notes:

[1] Calculated sum of population for all Southern California Region counties.

[2] Calculated annual average from 2007 to 2018.

3.14.1.2 Housing

Housing density in the project area varies greatly, corresponding to the variation in population density. The following subsections present housing unit numbers for 2010 and 2018, for each project area segment.

Sacramento-San Joaquin Delta Region

Among the counties evaluated in the Delta region, Yolo, San Joaquin, and Solano counties had the highest housing unit growth between 2010 and 2018, with an average annual growth rate of 0.4%, and Sacramento and Contra Costa counties had the lowest growth, with an average annual growth rate of 0.3%. Between 2010 and 2018, the Delta region had an average annual growth rate of 0.3% (Table 3.14-6).

Table 3.14-6. Housing Characteristics in the Delta Region

County	Housing Units in 2010	Housing Units in 2018	Annual Average Growth Rate (percent) [2]
Contra Costa County	400,263	413,923	0.3%
Sacramento County	555,932	570,305	0.3%
San Joaquin County	233,755	243,420	0.4%
Solano County	152,698	158,786	0.4%
Yolo County	73,908	77,138	0.4%
Delta Region[1]	1,416,556	1,463,572	0.3%

Source: DOF 2019b

Notes:

[1] Calculated sum of population for all Sacramento Valley Region counties.

[2] Calculated annual average from 2010 to 2018.

San Francisco Bay Area Region

Among the counties evaluated in the San Francisco Bay Area Region, Santa Clara and San Benito counties had the highest housing unit growth between 2010 and 2018, with an average annual growth rate of 0.6%, and Napa County had the lowest growth, with an average annual growth rate of 0.1%. Between 2010 and 2018, the San Francisco Bay Area Region had an average annual growth rate of 0.5% (Table 3.14-7).

Table 3.14-7. Housing Characteristics in the San Francisco Bay Area Region

County	Housing Units in 2010	Housing Units in 2018	Annual Average Growth Rate (percent) [2]
Alameda County	581,372	601,967	0.4%
Santa Clara County	631,920	667,970	0.6%
San Benito County	17,870	18,935	0.6%
Napa County	54,759	55,157	0.1%
San Francisco Bay Area Region [1]	1,285,921	1,344,029	0.5%

Source: DOF 2019b

Notes:

[1] Calculated sum of population for all San Francisco Bay Area Region counties.

[2] Calculated annual average from 2010 to 2018.

Central Coast Region

Between 2010 and 2018, San Luis Obispo and Santa Barbara counties had approximately the same annual average growth rate of 0.4%. Between 2010 and 2018, the Central Coast Region had an average annual growth rate of 0.4% (Table 3.14-8).

Table 3.14-8. Housing Characteristics in the Central Coast Region

County	Housing Units in 2010	Housing Units in 2018	Annual Average Growth Rate (percent) [2]
San Luis Obispo County	117,315	121,661	0.4%
Santa Barbara County	152,834	158,622	0.4%
Central Coast Region[1]	270,149	280,283	0.4%

Source: DOF 2019b

Notes:

[1] Calculated sum of population for all Central Coast Region counties.

[2] Calculated annual average from 2010 to 2018.

Southern California Region

Among the counties in the Southern California Region, Orange and Riverside counties had the highest housing unit growth, with an average annual growth rate of 0.5%. Ventura County had the lowest housing unit growth between 2010 and 2018, with an average annual growth rate of 0.2%. Between 2010 and 2018, the Southern California Region had an average annual growth rate of 0.4% (Table 3.14-9).

Table 3.14-9. Housing Characteristics in the Southern California Region

County	Housing Units in 2010	Housing Units in 2018	Annual Average Growth Rate (percent) [2]
Ventura County	281,695	288,579	0.2%
Los Angeles County	3,443,087	3,546,864	0.3%
Orange County	1,046,118	1,094,254	0.5%
San Diego County	1,164,028	1,210,138	0.4%
Riverside County	800,707	840,904	0.5%
San Bernardino County	699,637	719,911	0.3%
Southern California Region[1]	7,435,272	7,700,650	0.4%

Source: DOF 2019b

Notes:

[1] Calculated sum of population for all Southern California Region counties.

[2] Calculated annual average from 2010 to 2018.

3.14.2 DISCUSSION

a) Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

The proposed long-term operation of the SWP would not result in substantial unplanned population growth in an area, either directly or indirectly. Therefore, **no impact** would occur.

b) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?

The proposed long-term operation of the SWP would not result in the displacement of substantial numbers of existing people or housing that would necessitate construction of replacement housing elsewhere. Therefore, **no impact** would occur.

3.15 PUBLIC SERVICES

Table 3.15-1. Potential Impacts on Public Services

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
XIV. Public Services. Would the project:	-
a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:	-
Fire protection?	No Impact
Police protection?	No Impact
Schools?	No Impact
Parks?	No Impact
Other public facilities?	No Impact

Note:
"-" indicates blank cell

3.15.1 ENVIRONMENTAL SETTING

Law enforcement in the project area is provided by city police departments in incorporated areas and by county sheriff departments in unincorporated areas. While the overarching responsibility of these agencies is to prevent and respond to criminal activity and apprehend suspects, they provide specialized services to communities, such as special weapons and tactical teams, canine units, marine patrols, and swift water rescues. The State of California (State) provides assistance to the project area through the California Department of Fish and Wildlife and the California Highway Patrol (CHP). The CHP provides traffic regulation enforcement, emergency management, and assistance on California highways, interstate highways, and other major roadways.

Fire protection in the project area is provided by a variety of public and private entities. Communities within the project area are provided fire protection, rescue, and emergency services by a combination of fire protection entities, including cities, counties, fire protection districts, and volunteer fire departments, and they also receive supplemental services from the State.

Densely populated areas are served by municipal fire departments, and rural and unincorporated areas are served largely by fire protection districts and volunteer fire departments. Rural and unincorporated areas also receive supplemental services from the State. Mutual aid agreements exist between many of these departments to ensure that sufficient personnel and equipment are available to respond to emergencies no matter where the emergency occurs.

Portions of the project area receive wildfire protection services from the California Department of Forestry and Fire Protection (CAL FIRE) (see Section 3.20, "Wildfire," for further discussion). This State agency provides emergency services (such as fire, medical, rescue, and disaster relief services) throughout California (CAL FIRE 2019).

In addition, numerous private and public schools, public parks, and libraries exist throughout the project area, which are administered and managed by a variety of federal, state, and local entities.

3.15.2 DISCUSSION

a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:

Fire protection?

The proposed long-term operation of the SWP would not involve construction of new facilities or modification of existing facilities that would affect existing response times, service ratios, or other performance objectives of local fire protection services. **No impact** would occur.

Police protection?

The proposed long-term operation of the SWP would not involve construction of new facilities or modification of existing facilities that would affect existing response times, service ratios, or other performance objectives of local police protection services. **No impact** would occur.

Schools?

The proposed long-term operation of the SWP would not involve construction of new facilities or modification of existing facilities that would affect existing school services or result in increased demand or need for additional school services. **No impact** would occur.

Parks?

The proposed long-term operation of the SWP would not involve construction of new facilities or modification of existing facilities that would affect existing parks. Furthermore, the proposed long-term SWP operation would not create additional demand for parks and recreation beyond existing levels. **No impact** would occur.

Other public facilities?

The proposed long-term operation of the SWP would not affect other public facilities, services, or demand levels. **No impact** would occur.

3.16 RECREATION

Table 3.16-1. Potential Impacts on Recreation

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
XV. Recreation. Would the project:	-
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	No Impact
b) Include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment?	No Impact

Note:
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3.16.1 ENVIRONMENTAL SETTING

3.16.1.1 Reservoirs

The 12,700-acre San Luis Reservoir is jointly managed by DWR and Reclamation and serves both the SWP and CVP. San Luis Reservoir is part of the San Luis Joint-Use Complex, which also includes O'Neill Forebay and Los Banos Creek Reservoir. San Luis Reservoir is fed by the California Aqueduct and the Delta Mendota Canal via O'Neill Forebay. Recreational opportunities at the reservoir and forebay include camping, picnicking, hiking, fishing, swimming, and boating. No designated swimming areas or beaches are available at San Luis Reservoir, but O'Neill Forebay offers swimming, boating, fishing, and camping sites. Two adjacent wildlife areas provide hunting and hiking opportunities, and an off-highway vehicle area near O'Neill Forebay provides motorized recreational opportunities.

3.16.1.2 Waterways

The lower Feather River runs through the Oroville Wildlife Area and the communities of Gridley, Live Oak, Yuba City, and Marysville before joining the Sacramento River approximately 70 miles below Lake Oroville at Verona. Recreation activities along the lower Feather River include fishing, boating, hunting, camping, swimming, wildlife viewing, and picnicking. The several miles of river near Oroville and the Oroville Wildlife Area are renowned for trout and salmon fishing. Recreation facilities along this stretch of the Feather River include public and private launch ramps, day-use facilities, camping sites, and trails.

3.16.1.3 Delta Recreational Opportunities

The Delta contains numerous parks; extensive public lands; and a complex of interconnected rivers, sloughs, and other waterways, which are affected by both freshwater inflows and tidal action and which offer a variety of water-dependent and water-enhanced recreational opportunities. Privately owned commercial marinas and resorts allow access to the waterways and other recreational opportunities and services. Private lands also provide recreational opportunities, particularly hunting.

Boating is the most popular activity in the Delta, while popular land-based recreation activities include hunting, camping, picnicking, walking for pleasure, bicycling, and viewing and photographing wildlife.

Boating and related facilities are located throughout the Delta and include launch ramps, marinas, boat rental facilities, swimming areas, camping sites, dining and lodging facilities, and marine supply stores.

One of the larger bodies of water in the Delta is the Clifton Court Forebay (CCF). Fishing is the only recreation activity that occurs in the CCF because public access is restricted. Two marinas are near the CCF. Rivers End Marina and Storage is at the north end of Lindeman Road. Lazy M Marina is just east of Byron Highway, approximately 0.75 mile west of the intake canal that leads to the Harvey O. Banks Pumping Plant.

Suisun Marsh

Suisun Marsh provides water-related activities, including waterfowl hunting, boating, kayaking, hiking, wildlife viewing, fishing, and hunting. Water-related recreation occurs in the two major channels (Montezuma and Suisun sloughs) and in several moderately sized channels (Cordelia, Denverton, Nurse, and Hill sloughs). Duck hunting generates the most frequent recreation-related visits to Suisun Marsh.

Fishing in the Delta

The Delta supports regionally important recreational fisheries consisting of a variety of resident and migratory fish. Sport fish species known to occur in the Delta attract anglers to this location, and the species include White Sturgeon, White Catfish, Striped Bass, Largemouth Bass, and Chinook Salmon.

The majority of recreation-related fishing in the San Francisco Bay Estuary is sturgeon fishing, especially in San Pablo and Suisun bays. Fishing for White Sturgeon is limited to three sturgeons per person each year, with a daily bag limit of one fish per day and a size limit of 40 to 60 inches (from the nose tip to the fork in the tail) (CDFW 2019a). White Sturgeon fishing is not allowed in the San Francisco Bay from March 16 through December 31. Because of their life history, geographic distribution, and large size, white sturgeon have a lower vulnerability to entrainment into water diversions than many of the other fish inhabiting the Delta. Green Sturgeon fishing is not allowed at any time.

Striped Bass angling occurs throughout the year; however, fishing localities vary seasonally in accordance with the Striped Bass migratory pattern. In winter, Striped Bass are found from the San Francisco Bay throughout the Delta. By March, the bulk of the population is spread throughout the Delta and as far north as Colusa and Princeton on the Sacramento River. In summer and fall, Striped Bass fishing reaches its peak in the San Francisco Bay (CDFW 2018). Charter boat operators and private boaters fish for Striped Bass in the San Francisco, San Pablo, and Suisun bays; in the Delta; and in the upper Sacramento River. Shoreline fishing is popular along the Sacramento River from Courtland to Colusa in spring and along the San Joaquin River near Stockton in spring and fall. Striped Bass is limited to two fish per day per person, with a minimum size limit of 18 inches (CDFW 2019a).

Black Bass angling is possible all year, but is limited to five fish per day per person, with a minimum size limit of 12 inches (CDFW 2019b). In addition, the Delta is one of the most productive trophy bass fisheries in the nation, and numerous bass tournaments are held in the Delta throughout the year, including several corporate-sponsored tournaments. In 2018, 131 fishing contests with a total of

approximately 8,400 participants were held in the Delta (CDFW 2019c). Approximately 18,000 Black Bass were caught during these contests (CDFW 2019c).

Section 3.4, "Biological Resources," describes these fish populations and their habitat found in the Delta in further detail.

3.16.1.4 Salmon Fishing along the Northern California Coast

Chinook Salmon, Coho Salmon, and steelhead are the primary recreation-related fish species found along the Pacific Coast of Northern California. Pacific salmon fisheries are managed by the Pacific Fishery Management Council (PFMC) from 3 to 200 nautical miles offshore (PFMC 2019). Along the California coast, salmon fisheries are managed by the California Department of Fish and Wildlife (CDFW) from 0 to 3 nautical miles offshore, governed by regulations that generally are similar to those applied by the PFMC. The PFMC analyzes the status of the fisheries each year and defines the length of the fishing season and minimum fish sizes allowed to be caught for commercial, recreational, and tribal salmon fishing activities. In general, recreation-related fishing for ocean salmon is open from May through October. The daily bag and possession limit is two salmon of any species, except Coho Salmon, with a minimum size limit of 20 inches (CDFW 2019a).

3.16.2 DISCUSSION

a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

The proposed long-term operation of the SWP would not affect existing recreational facilities or cause substantial physical deterioration of recreational facilities. The Proposed Project would not introduce new land uses or increase the population of the project area, and would not increase the use of existing regional parks or other recreational facilities.

The proposed long-term operation of the SWP would not result in a shift in use of the area's recreational facilities to other existing regional recreational facilities. The proposed long-term operation of the SWP would not include construction activities that could affect recreation experiences by impairing access, generating noise, or creating negative visual effects.

As discussed in Section 3.10, "Hydrology and Water Quality," the proposed long-term operation of the SWP would remain within the historical range of past SWP operations. These changes would not result in a notable difference in Oroville Lake surface elevations or flows in the Sacramento River downstream from the Feather River confluence. Hydrodynamic conditions in the Delta would not be altered by the proposed long-term operation of the SWP in a manner that would reduce existing recreational opportunities. Therefore, proposed long-term operation of the SWP would not affect water-based recreational opportunities, including fishing, swimming, and boating, from occurring on Oroville Lake, the lower Sacramento River, or the Delta.

DWR proposes to continue implementation of predator control in the CCF. Predator control could result in mortality of recreationally important fish species (i.e., Striped Bass and Black Bass), but these controls would be limited to the CCF and would not result in the loss of individuals elsewhere in the

Delta or affect recreational fishing on a regional or Delta-wide basis. CDFW would continue to maintain regulations to promote sport fishing and would allow reasonable public angling opportunities. These regulations would remain in effect and would continue to provide protection of game fish found in the Delta.

Section 3.4, "Biological Resources," concludes that the proposed long-term operation of the SWP could affect migratory habitat for special-status anadromous species and could increase the entrainment potential of special-status or commercially or recreationally important migratory or resident fish species.

These changes potentially could substantially affect habitat conditions, and the increased entrainment potential could affect individuals and populations substantially and directly. However, the numbers of recreationally important fish species, such as Striped Bass, are abundant and are not showing adverse effects associated with the operations of the SWP. Therefore, potential effects on special-status and commercially and recreationally important fish species, including Striped Bass, Largemouth Bass, Smallmouth Bass, Spotted Bass, and American Shad, will not be discussed further.

The proposed long-term operation of the SWP would not substantially affect recreational fishing opportunities for these species. **No impact** would occur.

b) Include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

The proposed long-term operation of the SWP would not involve construction of new or expansion of existing recreational facilities. In addition, the project would not increase the population of the project area by introducing new housing or employment opportunities that would result in construction or expansion of recreational facilities. Therefore, **no impact** would occur.

3.17 TRANSPORTATION/TRAFFIC

Table 3.17-1. Potential Impacts on Transportation and Traffic

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
XVII. Transportation. Would the project:	-
a) Conflict with a program plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?	No Impact
b) Would the project conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?	No Impact
c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	No Impact
d) Result in inadequate emergency access?	No Impact

Note:
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3.17.1 ENVIRONMENTAL SETTING

This section describes the environmental and regulatory setting and analyzes the Proposed Project's effects on transportation and circulation.

The roadway system in the project area contains numerous local streets as well as State and federal highways and freeways, all with varying capabilities and service levels. The U.S. Interstate Highway and U.S. Highway System are assigned at the national level. The evenly numbered highways run east to west, and the odd numbered highways run north to south. California has 21 Interstate highways and seven U.S. highways. Several major Interstate highways either cross or are in close proximity to the project area, including the following:

- **U.S. Route 101:** U.S. 101 was established in 1926 and stretches 1,540 miles, from Los Angeles north to Olympia, Washington. From Southern California to the San Francisco Bay Area, it follows much of the route of El Camino Real, the "royal road" of California's Spanish and Mexican-era missions, while north of San Francisco it becomes the famed Redwood Highway (Caltrans 2011).
- **Interstate 5:** I-5 travels north to south through the Central Valley, parallel to the Delta's Mendota Canal and the California Aqueduct. The entire length of I-5 is 796.8 miles.
- **Interstate 80:** I-80, connects San Francisco through Sacramento over the Sierra Nevada. It was the first California freeway opened under the Federal Highway Act (Caltrans 2011)

The California State Route System is managed by the California Department of Transportation (Caltrans) and designated by the California State Legislature. State Route (SR) 70, SR 99, SR 138, SR 152, and SR 299 are the major highways that either cross or are closely located to the project area, and are described as follows:

- **State Route 70:** SR 70 begins north of Sacramento and runs north through Sutter, Yuba, Butte, Plumas and Lassen counties. SR 70 has a portion that is a State Scenic Highway, where it turns northeast from Sacramento into the mountains, eventually running east out of California.
- **State Route 99:** SR 99 is a north-south state highway stretching almost the entire length of the Central Valley for 425 miles.
- **State Route 138:** SR 138 is an east-west state highway that follows the northern foothills of the San Gabriel Mountains. It was constructed in 1934 and is approximately 105 miles long.
- **State Route 152:** SR 152 is an east-west state highway and is approximately 104 miles long. It begins west of Highway 1 in Watsonville and ends at SR 99 in the Central Valley.
- **State Route 299:** SR 299 is an east-west route in northern California that is approximately 306 miles long. A part of SR 299 is known as the Trinity Scenic Byway.

The roadway systems in the project vicinity are regulated by federal and State agencies, as follows:

- The Federal Highway Administration (FHWA) coordinates the highway transportation program in cooperation with states and other partners to enhance the country's safety, economic vitality, quality of life, and environment. FHWA has programs that provide federal financial assistance to states for construction and improvement of the National Highway System, including urban and rural roads and bridges. This program provides funds for general improvements and development of safe highways and roads (FHWA 2018).
- Caltrans is responsible for operating and maintaining the State highway system. In the vicinity of the project area, several of the major highways and freeways, exit and entrance ramps, and intersections fall under the jurisdiction of Caltrans (Caltrans 2018).
- The California Transportation Commission (CTC) is responsible for the programming and allocating of funds for construction of highway, passenger rail, and transit improvements throughout California. The CTC also advises and assists the Secretary of the California State Transportation Agency and Legislature in formulating and evaluating State policies and plans for California's transportation programs. Furthermore, the CTC is an active participant in the initiation and development of State and federal legislation that seeks to secure financial stability for the State's transportation needs (CTC 2019).

Numerous regional agencies work with local jurisdictions to address regional transportation issues, including the Council of Governments, Association of Governments, and regional transportation commissions and authorities. These regional agencies often are responsible for developing policies, planning, and securing funding for transportation and transit facilities.

Generally, State agencies that are involved with the location or construction of facilities for the production, generation, storage, treatment, or transmission of water are not subject to local regulations. Inconsistency with local transportation regulations is not considered to be an adverse effect on the environment. The project area covers multiple counties with multiple cities throughout California. All of these counties and cities have General Plans that contain transportation and circulation elements, including policies to facilitate their respective Congestion Management Plans as well as local and regional transportation planning.

3.17.2 DISCUSSION

a) Conflict with a program plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?

The proposed long-term operation of the SWP would not involve construction of new or modification of existing SWP facilities that would require construction employees or result in the need for additional operations and maintenance employees. Therefore, the project would not conflict with any program plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities. **No impact** would occur.

b) Would the project conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?

The proposed long-term operation of the SWP would not involve construction of new or modification of existing SWP facilities that would conflict or be inconsistent with Section 15064.3(b) of the State CEQA Guidelines. This new CEQA guideline codifies a switch from Level of Service to Vehicles Miles Traveled as the metric for transportation impact analysis. **No impact** would occur.

c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

The proposed long-term operation of the SWP would not involve construction of new or modification of existing SWP facilities. Therefore, the project would not include any change to roadway design in the area or introduce incompatible uses. **No impact** would occur.

d) Result in inadequate emergency access?

The proposed long-term operation of the SWP would not require any construction activities or changes in land uses that would affect emergency response access or response time. Therefore, no impact would occur.

3.18 TRIBAL CULTURAL RESOURCES

Table 3.18-1. Potential Impacts on Tribal Cultural Resources

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
XVIII. Tribal Cultural Resources. Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:	-
a) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	No Impact
b) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	No Impact

Note:
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3.18.1 ENVIRONMENTAL SETTING

Assembly Bill 52 requires the lead agency to begin consultation with any California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project if (1) the California Native American tribe requested to the lead agency, in writing, to be informed by the lead agency through formal notification of proposed projects in the geographic area that is traditionally and culturally affiliated with the tribe and (2) the California Native American tribe responds, in writing, within 30 days of receipt of the formal notification and requests the consultation (Public Resources Code Section 21080.3.1[d]).

3.18.1.1 Native American Consultation

Letters were sent by certified mail, return receipt, on May 3, 2019, to 16 California Native American Tribes that had requested formal notification of proposed projects from DWR under Assembly Bill 52: Barona Band of Mission Indians, Big Pine Paiute Tribe of the Owens Valley, Fernandeño Tataviam Band of Mission Indians, Ione band of Miwok Indians, Karuk Tribe, Mechoopda Indian Tribe of Chico Rancheria, Middletown Rancheria of Pomo Indians of California, Pit River Tribe, San Luis Rey Band of Mission Indians, San Manuel Band of Mission Indians, Shasta Indian Nation, Tongva Ancestral Territorial Tribal Nation, United Auburn Indian Community of the Auburn Rancheria, Wilton Rancheria, Wintu Tribe of Northern California and Toyon-Wintu Center, and Yocha Dehe Wintun Nation.

Green receipts were received from 15 of the Tribes. The letter to the Wintu Tribe of Northern California was sent twice and returned twice, even though a phone call following the initial return of the letter confirmed that the address was correct. Six Tribes responded to DWR's letter with a letter or email. Five of the Tribes (Fernandeño Tataviam Band of Mission Indians, Karuk Tribe, United Auburn

Indian Community of the Auburn Rancheria, Wilton Rancheria, and Yocha Dehe Wintun Nation) requested consultation on the Proposed Project, while the sixth Tribe, San Manuel Band of Mission Indians, indicated no concerns and that they did not require additional consultation pursuant to CEQA.

DWR met with Wilton Rancheria on June 17, 2019. Letters acknowledging requests for consultation were sent on June 28, 2019, to the Fernandeño Tataviam Band of Mission Indians, Karuk Tribe, United Auburn Indian Community of the Auburn Rancheria, and Yocha Dehe Wintun Nation. DWR met with the Yocha Dehe Wintun Nation on September 6, 2019. DWR is currently reaching out to the Fernandeño Tataviam Band of Mission Indians, Karuk Tribe, and United Auburn Indian Community of the Auburn Rancheria.

3.18.2 DISCUSSION

a) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or

b) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.

On the basis of consultations with California Native American Tribes, it is determined that proposed long-term operation of the SWP will not cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe. Therefore, **no impacts on tribal cultural resources would occur**.

3.19 UTILITIES AND SERVICE SYSTEMS

Table 3.19-1. Potential Impacts on Utilities and Service Systems

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
XIX. Utilities and Service Systems. Would the project:	-
a) Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	No Impact
b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years?	No Impact
c) Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand, in addition to the provider's existing commitments?	No Impact
d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	No Impact
e) Comply with federal, State, and local management and reduction statutes and regulations related to solid waste?	No Impact

Note:
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3.19.1 ENVIRONMENTAL SETTING

3.19.1.1 Water Supply

Water service providers in the project area include cities and counties, special districts, and private utilities. These water service providers range in size from those with a few service connections to others with thousands of connections. These providers obtain their water from surface water and groundwater, or a combination of these sources. The amount of water available to these providers is defined by water rights, water contract agreements, groundwater pumping limitations, and the infrastructure required to treat, pump, and deliver water.

3.19.1.2 Wastewater Collection, Conveyance, and Treatment

Wastewater generated in the project area is handled by sanitary sewer systems, treatment plants, and individual septic systems. Municipal and industrial wastewater typically is transported to a treatment facility and treated, and then the treated effluent is discharged into a receiving water body (i.e., rivers, streams, creeks, and sloughs). In some rural areas where sewer service is unavailable, residents and businesses use on-site septic systems. Treatment plants for individual non-industrial developments also exist in some areas to treat local wastewater from residential developments, mobile home parks, apartment complexes, and resorts. Methods of disposal include evaporation and percolation ponds or application to irrigated agricultural lands. Recycled effluent also is used for industrial purposes or agricultural irrigation during the summer months. In some cases, municipalities may provide

wastewater collection infrastructure and services that discharge to regional facilities owned and operated by another municipality.

3.19.1.3 Solid Waste

Municipal governments in the project area collect solid waste or contract with private franchisers for collection and transport to transfer stations and landfills. Cities and counties are responsible for maintaining their own solid waste facilities, including transfer stations, disposal sites, and resource recovery facilities. They may own and/or operate them, contract with each other, or contract with a private company to provide or operate facilities. A solid waste facility, site, or operation may include one or more waste handling activities (units). Cities and counties must routinely inspect active and closed solid waste facilities to ensure compliance with applicable State minimum standards and permit conditions. The California Department of Resources Recycling and Recovery (CalRecycle) administers and provides oversight for all State-managed, non-hazardous waste handling and recycling programs. CalRecycle regulates and inspects California's active and closed solid waste landfills, as well as materials recovery facilities, solid waste transfer stations, and compost facilities.

3.19.1.4 Electrical, Natural Gas, and Communications

Power transmission facilities were developed in response to population growth in communities surrounding the project area segments. Electricity is generated through a combination of energy sources, including natural gas-fired plants, hydroelectric facilities, renewable resources (i.e., biomass, solar, wind, and geothermal), and coal.

Electrical service providers in the project area consist of investor-owned providers, publicly owned providers, joint utility agencies, rural cooperatives, and self-generators. In addition, the Western Area Power Agency markets and transmits wholesale electricity throughout the project area from multi-use water projects and hydroelectric power plants operated by Reclamation and the U.S. Army Corps of Engineers (see Section 3.6, "Energy," for further discussion of hydroelectric facilities).

Natural gas service providers in the project area consist of investor-owned providers, publicly owned providers, and private producers. Natural gas pipelines distribute natural gas to communities throughout the project area.

Communication infrastructure in the region includes underground cable and fiber optic lines, and communication and transmission towers.

3.19.2 DISCUSSION

a) Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?

The proposed long-term operation of the SWP would not involve construction of any new water facilities or infrastructure. The Proposed Project would not involve housing development or other

activities that would create a need for new or expanded water, wastewater treatment, or stormwater drainage, electric power, natural gas, or telecommunications facilities. **No impact** would occur.

b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?

The proposed long-term operation of the SWP would not involve housing development or other activities that would result in water use. No changes in land use (i.e., conversion from agricultural land to non-agricultural land) are anticipated because of the Proposed Project. The continued operation and maintenance of SWP facilities would not increase demand for water supplies. **No impact** would occur.

c) Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand, in addition to the provider's existing commitments?

The proposed long-term operation of the SWP would not involve housing development or other activities that would generate wastewater. Therefore, the Proposed Project would not use any provider's existing wastewater capacity or require construction of new wastewater plants or sewer lines to serve the Proposed Project. **No impact** would occur.

d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?

The proposed long-term operation of the SWP would not involve any activities that would generate solid waste. Therefore, the Proposed Project would not generate solid waste in excess of State or local standards or use any existing landfill capacity. **No impact** would occur.

e) Comply with federal, State, and local management and reduction statutes and regulations related to solid waste?

The proposed long-term operation of the SWP would not generate any solid waste. **No impact** would occur.

3.20 WILDFIRE

Table 3.20-1. Potential Impacts on Wildfire

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
XIX. Wildfire. If located in or near State Responsibility Areas or lands classified as very high fire hazard severity zones, would the project:	-
a) Substantially impair an adopted emergency response plan or emergency evacuation plan?	No Impact
b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?	No Impact
c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts on the environment?	No Impact
d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, therefore of runoff, post-fire slope instability, or drainage changes?	No Impact

Note:
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3.20.1 ENVIRONMENTAL SETTING

3.20.1.1 Wildfire Classifications

Fires are classified by where they burn in the fuel strata: surface fires, understory fires, and crown fires (California Forest Stewardship Program 2015). Surface fires are the most common. Depending on the fuels, weather, and topography, these fires can be low to high intensity. Understory fires have flame lengths of up to 10 feet. They consume surface fuels, small trees, brush, and the lower branches of overstory trees. Crown fires reach into the crowns of trees with flame lengths that are more than 10 feet.

3.20.1.2 Fire Season

Fire season is the period when fires are expected to occur, based on knowledge of long-term climate patterns. The typical fire season in California is from May to November, and the most intense fires occur in late September and October. The fire season has been expanding and is now about 70 days longer than 40 years ago (California Forest Stewardship Program 2015).

3.20.1.3 Wildfire Behavior

Wildland fire behavior is based on three primary factors: topography, weather, and fuels. This section briefly describes how each of these factors influences wildfire behavior.

Topography

Topographic features such as slope and aspect influence a fire's intensity, direction, and rate of spread. Fires burning in flat or gently sloping areas tend to burn more slowly and spread in wider ellipses than

fires on steep slopes. Streams, rivers, and canyons can channel local diurnal and general winds, which can accelerate the fire's speed and affect its direction, especially during foehn (a warm, dry, and usually strong wind) events (California Forest Stewardship Program 2015).

Weather

Weather conditions influence the potential for fire ignition, rates of spread, intensity, and the direction(s) in which a fire burns. Temperature, relative humidity, and wind are the variables used to predict fire behavior. Coastal areas generally have a cool, stable temperature regime, and this marine influence can reduce fire hazards. With increasing distance from the ocean, the marine influence is less pronounced, and inland areas experience wider variations of temperature and lower humidity.

Wind plays a role in the flammability of fuels by removing moisture through evaporation, preheating fuels in a fire's path, and increasing spotting distances (the distance at which a flying ember might ignite a spot fire). Winds blowing more than 20 feet above the ground can carry embers downwind, causing spot fires. Fires during foehn events can result in extreme fire behavior because they are particularly strong and dry, thus reducing fuel moistures. This leads to easier ignitions and increased fire intensity and rate of spread (California Forest Stewardship Program 2015).

Fuels

Vegetation usually provides most of the fuel that feeds wildfire. The volume, character, distribution, and arrangement of vegetation all greatly influence fire behavior. Moisture content is critical to how easily a fire burns. Larger fuels take longer to absorb or lose moisture, while drier fuel fires generally spread faster, are more intense, and are consumed faster (California Forest Stewardship Program 2015).

3.20.1.4 Fire Hazard Severity Zones

Fire prevention areas considered to be under state jurisdiction are referred to as State Responsibility Areas, or SRAs, and the California Department of Forestry and Fire Protection (CAL FIRE) is responsible for vegetation fires within SRA lands.[4] In general, SRA lands contain trees producing or capable of producing forest products (timber, brush, undergrowth, and grass), whether of commercial value or not, that provide watershed protection for irrigation or for domestic or industrial use or lands in areas that are principally used or that are useful for range or forage purposes. In 2018, CAL FIRE managed 31 million acres of SRA land (CAL FIRE 2019).

Fire hazard severity zones are measured qualitatively based on vegetation, topography, weather, crown fire potential (a fire's tendency to burn upward into trees and tall brush), and ember production and movement within the area in question. CAL FIRE uses these factors to define three fire hazard levels for SRAs: moderate, high, and very high.

[4] California Public Resources Code (PRC) Sections 4125–4127 define a State Responsibility Area as land in which the financial responsibility for preventing and suppressing wildland fire resides with the State of California.

3.20.1.5 California Department of Forestry and Fire Protection Services

CAL FIRE's jurisdiction extends throughout the state. Its emergency response and resource protection capability consist of approximately 6,100 full-time fire professionals, foresters, and administrative employees; 2,600 seasonal firefighters; 105 California Conservation Corps firefighters; 600 Volunteers In Prevention; and 3,500 inmates and wards (CAL FIRE 2019).

CAL FIRE responds to approximately 6,000 wildland fires that burn on average over 260,000 acres each year (CAL FIRE 2019). Firefighting actions frequently involve helicopter transport of water from reservoirs located close to wildfires in the project area, including reservoirs owned by the U.S. Bureau of Reclamation and DWR.

Individual CAL FIRE strategic fire plans document and assess the fire conditions within each of CAL FIRE's 21 units and six contract counties.[5] Strategic fire plans include stakeholder contributions and priorities; identify strategic areas for pre-fire planning and fuel treatment; coordinate CAL FIRE's pre-fire activities with adjacent CAL FIRE units, National Forests, and local collaborators; and provide the foundation for planning, prioritizing, and funding unit projects. The project area falls within 16 CAL FIRE units and five contract counties. The counties within each unit in the project area are shown in Table 3.20-2, along with the number of battalions and stations within each unit.

3.20.2 DISCUSSION

a) Substantially impair an adopted emergency response plan or emergency evacuation plan?

The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance that would place new buildings or result in roadway closures that could impede emergency response or evacuation plans. Continued operation of the SWP would not involve any activities that would impede emergency response or evacuation plans. **No impact** would occur.

[5] Kern, Los Angeles, Marin, Orange, Santa Barbara, and Ventura counties contract with CAL FIRE to provide initial response to fires on SRA lands. CAL FIRE provides funding for fire protection services in these six counties, including the wages of suppression crews and funding for maintenance of firefighting facilities, infrastructure improvements, and equipment.

Table 3.20-2. CAL FIRE Units within the Project Area

Unit	County[1]	SRA Acreage	Battalions	Stations	Region
Los Angeles[3]	Los Angeles	468,800	22	174	Southern California Region
Orange[4]	Orange and portions of Riverside and San Diego	113,000	6	72	Southern California Region
Riverside[5]	Riverside and portions of Orange and San Diego	547,400	9	94	Southern California Region
San Bernardino	Inyo, Mono, San Bernardino	895,000	5	13	Southern California Region
San Diego	Imperial, San Diego	1.2 million	7	18	Southern California Region
San Luis Obispo	San Luis Obispo	1.5 million	6	48	Central Coast Region
Santa Barbara	Santa Barbara	3.4 million	2	9	Central Coast Region
Santa Clara	Alameda, Contra Costa, San Joaquin, Santa Clara, Stanislaus	1.6 million	8	12	Delta Region San Francisco Bay Area Region
Sonoma-Lake-Napa	Colusa, Lake, Napa, Solano, Sonoma, Yolo	2.3 million	10	20	Delta Region, San Francisco Bay Region
Tulare	Tulare	603,500	4	8	San Joaquin River Region
Ventura	Ventura	353,400	5	32	Southern California Region

SRA = State Responsibility Area

Source: CAL FIRE 2018

Notes:

1 The information provided for each county was found in each county's strategic fire plan.

2 The number of stations was not provided within the unit strategic fire plan.

3 The Los Angeles County Fire Department operates functionally as a unit of the California Department of Forestry and Fire Protection (CAL FIRE) and is responsible for all strategic fire plan activities within the county.

4 The Orange County Fire Authority is contracted by the State to provide all aspects of wildland fire management for SRA lands within Orange County and for designated adjacent SRA lands in both Riverside and San Diego counties.

5 The Riverside Unit provides wildland fire management to the majority of Riverside County and to 2,630 acres of SRA lands in Orange County and 620 acres of SRA lands in San Diego County.

b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?

In general, the use of construction equipment and diesel fuel can pose a wildfire risk because vehicle mufflers, combustion engines, gasoline-powered tools, and other equipment can produce a spark, fire, or flame. The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance that could pose a wildfire risk.

Some SWP facilities are located in rural areas where a high fire hazard risk exists because of the surrounding terrain and amount of vegetation. As previously stated, CAL FIRE manages State Responsibility Areas, and the U.S. Forest Service provides wildfire protection, both independently and cooperatively with CAL FIRE. In addition, the U.S. Forest Service and Bureau of Land Management provide resource management and fire protection on portions of federal lands. The proposed long-term operation of the SWP would not include any actions that would increase the probability of a wildland fire. Therefore, the Proposed Project would not exacerbate wildfire risks or cause the uncontrolled spread of wildfire. **No impact** would occur.

c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts on the environment?

The proposed long-term operation of the SWP would not involve any new construction of water facilities, infrastructure, or land disturbance. The proposed long-term operation of the SWP would not require installation or maintenance of infrastructure that may exacerbate fire risk or possibly result in temporary or ongoing impacts on the environment. **No impact** would occur.

d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, therefore of runoff, post-fire slope instability, or drainage changes?

The proposed long-term operation of the SWP would not involve housing development or other buildings; therefore, the Proposed Project would not expose people or structures to significant risks because of runoff, post-fire slope instability, or drainage changes. **No impact** would occur.

3.21 MANDATORY FINDINGS OF SIGNIFICANCE

Table 3.21-1. Mandatory Findings of Significance

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACT SIGNIFICANCE
XVIII. Mandatory Findings of Significance.	-
a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	Potentially Significant Impact
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	Potentially Significant Impact
c) Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?	No Impact

Authority: Public Resources Code Sections 21083 and 21083.05.

Reference: Government Code Section 65088.4; Public Resources Code Sections 21080(c), 21080.1, 21080.3, 21083, 21083.05, 21083.3, 21093, 21094, 21095 and 21151; *Sundstrom v. County of Mendocino* (1988) 202 Cal.App.3d 296; *Leonoff v. Monterey Board of Supervisors* (1990) 222 Cal.App.3d 1337; *Eureka Citizens for Responsible Govt. v. City of Eureka* (2007) 147 Cal.App.4th 357; *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th at 1109; *San Franciscans Upholding the Downtown Plan v. City and County of San Francisco* (2002) 102 Cal.App.4th 656.

3.21.1 DISCUSSION

a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of an endangered, rare, or threatened species, or eliminate important examples of the major periods of California history or prehistory?

As discussed in Section 3.4, "Biological Resources," and Section 3.10, "Hydrology and Water Quality," the proposed long-term operation of the SWP has the potential to adversely affect fish habitat, cause a fish population to drop below self-sustaining levels, and substantially reduce the number or restrict the range of an endangered, rare, or threatened species by altering Delta hydrology and water quality. Therefore, proposed long-term operation of the SWP may have a **potentially significant effect** and will be addressed in further detail in the EIR.

b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)

As discussed in the relevant sections above, the Proposed Project would have no impacts on aesthetics, agricultural resources, air quality, cultural resources, energy, geology, greenhouse gas emissions, hazards and hazardous materials, land use, mineral resources, noise, population and

housing, public services, recreation, transportation, tribal cultural resources, utilities and service systems, terrestrial biological resources, or wildfire. Because the proposed long-term operation of the SWP would not have an impact on these resource topics, the Proposed Project could not contribute to a potential cumulative impact on these resources. Cumulative impacts relating to these topics will therefore not be addressed in the EIR.

The potential for cumulative impacts from the proposed long-term operation of the SWP in relation to other topics is addressed in turn, in the following discussion.

3.21.1.1 Aquatic Biological Resources

The long-term operation of the SWP **may make a cumulatively considerable incremental contribution to a significant cumulative impact** on aquatic biological resources. These impacts, including the incremental contribution of the proposed long-term operation of the SWP when combined with impacts from past, present, and foreseeable future projects, will be addressed in the EIR.

3.21.1.2 Hydrology and Water Quality

The proposed long-term operation of the SWP **may make a cumulatively considerable incremental contribution to a significant cumulative impac**t on water quality. These impacts, including the incremental contribution of the proposed long-term operation of the SWP when combined with impacts from past, present, and foreseeable future projects, will be addressed in the EIR.

c) Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?

The proposed long-term operation of the SWP would not have environmental effects that would cause substantial adverse effects on human beings, either directly or indirectly. **No impact** would occur.

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5 DOCUMENT PREPARATION

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ATTACHMENT 1

Terrestrial Plant and Wildlife Species Potentially Affected by SWP Operations

TERRESTRIAL PLANT AND WILDLIFE SPECIES POTENTIALLY AFFECTED BY SWP OPERATIONS

Species considered are those that could be directly or indirectly affected by State Water Project (SWP) operations if they occur (1) along the shorelines of reservoirs that store SWP water supplies, (2) along rivers downstream from SWP reservoirs, (3) in potential habitat restoration areas in Yolo Bypass and Suisun Marsh, (4) wildlife refuges that receive SWP water supplies, (5) in riparian corridors within the Delta, and (6) in agricultural areas irrigated with SWP water supplies. The geographic scope includes:

- Sacramento River from the confluence with the Feather River downstream to, and including, the Delta;
- Feather River from the Federal Energy Regulatory Commission (FERC) boundary downstream to its confluence with the Sacramento River;
- San Joaquin River from Friant Dam downstream to, and including, the Delta;
- San Francisco Bay and Suisun Marsh;
- Nearshore Pacific Ocean on the coast from Point Conception to Cape Falcon in Oregon; and
- Areas that receive water from the SWP.

Table Att-1. Special-Status Wildlife Species Potentially Affected by the Proposed Long-Term Operation of the State Water Project

Common Name	Scientific Name	Status Federal/State/CDFW*
Invertebrates	-	-
Lange's metalmark butterfly	*Apodemia mormo langei*	FE/–/–
Conservancy fairy shrimp	*Branchinecta conservatio*	FE/–/–
Longhorn fairy shrimp	*Branchinecta longiantenna*	FE/–/–
Vernal pool fairy shrimp	*Branchinecta lynchi*	FT/–/–
San Diego fairy shrimp	*Branchinecta sandiegonensis*	FE/–/–
San Bruno elfin butterfly	*Callophrys mossii bayensis*	FE/–/–
Ohlone tiger beetle	*Cicindela ohlone*	FE/–/–
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	FT/–/–
Casey's June beetle	*Dinacoma caseyi*	FE/–/–
Delta green ground beetle	*Elaphrus viridis*	FT/–/–
El Segundo blue butterfly	*Euphilotes battoides allyni*	FE/–/–
Smith's blue butterfly	*Euphilotes enoptes smithi*	FE/–/–
Bay checkerspot butterfly	*Euphydryas editha bayensis*	FT/–/–
Quino checkerspot butterfly	*Euphydryas editha quino*	FE/–/–
Kern primrose sphinx moth	*Euproserpinus euterpe*	FT/–/–
Palos Verdes blue butterfly	*Glaucopsyche lygdamus palosverdesensis*	FE/–/–
Black abalone	*Haliotis cracherodii*	FE/–/–
Morro shoulderband (=banded dune) snail	*Helminthoglypta walkeriana*	FE/–/–
Hermes copper butterfly	*Lycaena hermes*	Candidate/–/–
Vernal pool tadpole shrimp	*Lepidurus packardi*	FE/–/–
Trinity bristle snail	*Monadenia infumata setosa*	–/ST/–
Shasta crayfish	*Pacifastacus fortis*	FE/SE/–
Mission blue butterfly	*Plebejus icarioides missionensis*	FE/–/–
Mount Hermon (=Barbate) June beetle	*Polyphylla barbata*	FE/–/–
Laguna Mountains skipper	*Pyrgus ruralis lagunae*	FE/–/–
Delhi Sands flower-loving fly	*Rhaphiomidas terminatus abdominalis*	FE/–/–
Callippe silverspot butterfly	*Speyeria callippe callippe*	FE/–/–
Behren's silverspot butterfly	*Speyeria zerene behrensii*	FE/–/–
Oregon silverspot butterfly	*Speyeria zerene hippolyta*	FT/–/–
Myrtle's silverspot Butterfly	*Speyeria zerene myrtleae*	FE/–/–
Riverside fairy shrimp	*Streptocephalus woottoni*	FE/–/–
California freshwater shrimp	*Syncaris pacifica*	FE/SE/–
Zayante band-winged grasshopper	*Trimerotropisiinfatilis*	FE/–/–
Reptiles and Amphibians	-	-
California tiger salamander	*Ambystoma californiense*	FT/ST/WL
Santa Cruz long-toed salamander	*Ambystoma macrodactylum croceum*	FE/SE/FP
Arroyo toad	*Anaxyrus californicus*	FE/–/SSC

Common Name	Scientific Name	Status Federal/State/CDFW*
Yosemite toad	*Anaxyrus canorus*	FT/–/SCC
Desert slender salamander	*Batrachoseps major aridus*	FE/SE/–
Kern Canyon slender salamander	*Batrachoseps simatus*	–/ST/–
Tehachapi slender salamander	*Batrachoseps stebbinsi*	–/ST/–
Southern rubber boa	*Charina umbratica*	–/ST/–
Green turtle	*Chelonia mydas*	FT/–/–
Barefoot gecko	*Coleonyx switaki*	–/ST/–
Leatherback sea turtle	*Dermochelys coriacea*	FE/–/–
Western pond turtle	*Emmys marmorata*	–/–/SSC
Blunt-nosed leopard lizard	*Gambelia sila*	FE/SE/FP
Desert tortoise	*Gopherus agassizii*	FT/ST/–
Limestone salamander	*Hydromantes brunus*	–/ST/FP
Shasta salamander	*Hydromantes shastae*	–/ ST/–
Alameda whipsnake	*Masticophis lateralis euryxanthus*	FT/ST/–
Scott Bar salamander	*Plethodon asupak*	–/ST/–
Siskiyou Mountains salamander	*Plethodon stormi*	–/ST/–
Cascades frog	*Rana cascadae*	–/CE/SSC
California red-legged frog	*Rana draytonii*	FT/–/SSC
Southern Mountain yellow-legged frog	*Rana muscosa*	FE/SE/WL
Oregon spotted frog	*Rana pretiosa*	FT/–/SSC
Sierra Nevada yellow-legged frog	*Rana sierrae*	FE/ST/WL
San Francisco garter snake	*Thamnophis sirtalis tetrataenia*	FE/SE/FP
Giant garter snake	*Thamnophis gigas*	FT/ST/–
Coachella Valley fringe-toed lizard	*Uma inornata*	FT/SE/–
Island night lizard	*Xantusia riversiana*	DL/–/–
Birds	-	-
Tricolored blackbird (nesting colony)	*Agelaius tricolor*	–/ST/SSC
Tule greater white-fronted goose (wintering)	*Anser albifrons elgasi*	–/–/SSC
Short-eared owl (nesting)	*Asio flammeus*	–/–/SSC
Burrowing owl (nesting and wintering sites)	*Athene cunicularia*	–/–/SSC
San Clemente sage sparrow	*Artemisiospiza belli clementeae*	FT/–/SCC
Marbled murrelet	*Brachyramphus marmoratus*	FT/SE/–
Cackling (=Aleutian Canada) goose	*Branta hutchinsii leucopareia*	Delisted/–/WL
Swainson's hawk (nesting)	*Buteo swainsoni*	BCC/ST/–
Western snowy plover	*Charadrius alexandrines nivosus*	FT/–/SSC
Black tern	*Childonias niger*	–/–/SSC
Gilded flicker	*Chelonia mydas*	BCC/SE/–
Western yellow-billed cuckoo (nesting)	*Coccyzus americanus occidentalis*	FT/SE/–
Yellow warbler (nesting)	*Dendroica petechia brewsteri*	BCC/–/SSC
White-tailed kite (nesting)	*Elanus leucurus*	–/–/FP

Common Name	Scientific Name	Status Federal/State/CDFW*
Willow flycatcher	*Empidonax traillii*	BCC/SE/–
Little willow flycatcher	*Empidonax traillii brewsteri*	BCC/SE/–
Southwestern willow flycatcher	*Empidonax traillii extimus*	FE/SE/–
American peregrine falcon	*Falco peregrinus anatum*	DL/DL/FP
California condor	*Gymnogyps californianus*	FE/SE/FP
Saltmarsh common yellowthroat	*Geothlypis trichas sinuosa*	BCC/–/SSC
Greater sandhill crane (nesting and wintering)	*Grus canadensis tabida*	–/ST/FP
Bald eagle (nesting and wintering)	*Haliaeetus leucocephalus*	BCC/FD/SE/FP
Least bittern (nesting)	*Ixobrychus exilis*	BCC/–/SSC
San Clemente loggerhead shrike	*Lanius ludovicianus mearnsi*	FE/–/SSC
California black rail	*Laterallus jamaicensis coturniculus*	BCC/ST/FP
Gila woodpecker	*Melanerpes uropygialis*	BCC/SE/–
Suisun song sparrow	*Melospiza melodia maxillaris*	BCC/–/SSC
Elf owl	*Micrathene whitneyi*	BCC/SE/–
Belding's savannah sparrow	*Passerculus sandwichensis beldingi*	–/SE/–
Osprey (nesting)	*Pandion haliaetus*	–/–/WL
California brown pelican	*Pelecanus occidentalis californicus*	DL/DL/FP
White-faced ibis (nesting colony)	*Plegadis chihi*	–/–/WL
Coastal California gnatcatcher	*Polioptila californica californica*	FT/–/SCC
Light-footed Ridgway's rail	*Rallus obsoletus levipes*	FE/SE/FP
California Ridgway's rail	*Rallus obsoletus obsoletus*	FE/SE/FP
Yuma Ridgway's rail	*Rallus obsoletus yumanensis*	FE/ST/FP
Bank swallow (nesting)	*Riparia riparia*	–/ST/–
California least tern	*Sternula antillarum browni*	FE/SE/FP
Great gray owl	*Strix nebulosi*	–/SE/–
Northern spotted owl	*Strix occidentalis caurina*	FT/ST/–
Scripp's murrelet	*Synthliboramphus scrippsi*	BCC/ST/–
Arizona bell's vireo	*Vireo bellii arizonae*	BCC/SE/–
Least bell's vireo (nesting)	*Vireo bellii pusillus*	FE/SE/–
Mammals	-	-
Nelson's antelope squirrel	*Ammospermophilus nelsoni*	–/ST/–
Guadalupe fur-seal	*Arcticephalus townsendi*	FT/ST/FP
Ring-tailed cat	*Bassariscus astutus*	–/–/FP
Gray wolf	*Canis lupus*	FE/SE/–
Fresno kangaroo rat	*Dipodomys nitratoides exilis*	FE/SE/–
Tipton kangaroo rat	*Dipodomys nitratoides nitratoides*	FE/SE/–
Morro Bay kangaroo rat	*Dipodomys heermanni morroensis*	FE/SE/FP
Giant kangaroo rat	*Dipodomys ingens*	FE/SE/–
Stephen's kangaroo rat	*Dipodomys stephensi*	FE/ST/–
Southern sea otter	*Enhydra lutris nereis*	FT/–/FP

Common Name	Scientific Name	Status Federal/State/CDFW*
Steller (=northern) sea-lion	*Eumetopias jubatus*	DL/–/SSC
California wolverine	*Gulo gulo*	PT/ST/FP
Lesser long-nosed bat	*Leptonycteris yerbabuenae*	DL/–/SSC
Humboldt marten	*Martes caurina humboldtensis*	–/CE/SSC
Riparian (= San Joaquin Valley) woodrat	*Neotoma fuscipes riparia*	FE/–/SSC
Peninsular bighorn sheep DPS	*Ovis canadensis nelsoni* pop. 2	FE/ST/FP
Sierra Nevada bighorn sheep	*Ovis canadensis sierrae*	FE/SE/FP
Fisher–West Coast DPS	*Pekania pennanti*	–/ST/SSC
Pacific pocket mouse	*Perognathus longimembris pacificus*	FE/–/SSC
Salt Marsh harvest mouse	*Reithrodontomys raviventris*	FE/SE/FP
Buena Vista Lake ornate shrew	*Sorex ornatus relictus*	FE/–/SSC
Suisun shrew	*Sorex ornatus sinuosus*	–/–/SSC
Riparian brush rabbit	*Sylvilagus bachmani riparius*	FE/SE/–
Santa Catalina Island fox	*Urocyon littoralis catalinae*	FT/ST/–
San Clemente Island fox	*Urocyon littoralis clementae*	–/ST/–
San Nicolas Island fox	*Urocyon littoralis dickeyi*	–/ST/–
San Miguel Island fox	*Urocyon littoralis littoralis*	DL/ST/–
Santa Cruz Island fox	*Urocyon littoralis santacruzae*	DL/ST/–
Santa Rosa Island fox	*Urocyon littoralis santarosae*	DL/ST/–
San Joaquin kit fox	*Vulpes macrotis mutica*	FT/ST/–
Sierra Nevada red fox	*Vulpes vulpes necator*	FC/ST/–
Mohave ground squirrel	*Xerospermophilus mohavensis*	–/ST/–

Sources: CNDDB 2019
"-" indicates blank cell
Status Codes:
Federal—U.S. Fish and Wildlife Service:
BCC = bird species of conservation concern
FE = federally endangered
FT = federally threatened
FC = candidate for federal listing under the federal Endangered Species Act
FD = federal delisted
FS = Forest Service sensitive species
DPS = Distinct Population Segment
– = no status
State—California Department of Fish and Wildlife:
SE = state endangered
ST = state threatened
FP = California fully protected species
PT = proposed threatened
SSC = California species of special concern
WL = CDFW watch list
– = no status

Table Att-2. Special-Status Plants Potentially Affected by the Proposed Long-Term Operation of the State Water Project

Common Name	Scientific Name	Status Federal/State/CRPR*
Adobe sanicle	*Sanicula maritima*	–/SR/1B.1
Algodones Dunes sunflower	*Helianthus niveus* ssp. *tephrodes*	–/SE/1B.2
Antioch Dunes evening primrose	*Oenothera deltoides* ssp. *howellii*	FE/SE/1B.1
Ash-gray paintbrush	*Castilleja cinerea*	FT/SE/1B.1
Ashland thistle	*Cirsium ciliolatum*	–/SE/2B.1
Large-flowered fiddleneck	*Amsinckia grandiflora*	FE/SE/1B.1
Bakersfield cactus	*Opuntia basilaris* var. *treleasei*	FE/SE/1B.1
Bakersfield smallscale	*Atriplex tularensis*	–/SE/1A
Baja California birdbush	*Ornithostaphylos oppositifolia*	–/SE/2B.1
Beach layia	*Layia carnosa*	FE/SE/1B.1
Beach spectaclepod	*Dithyrea maritima*	–/ST/1B.1
Ben Lomond spineflower	*Chorizanthe pungens* var. *hartwegiana*	FE/–/1B.1
Bensoniella	*Bensoniella oregona*	–/SR/1B.1
Big Bear Valley sandwort	*Eremogone ursina*	FT/–/1B.2
Bird-foot checkerbloom	*Sidalcea pedata*	FE/SE/1B.1
Big-leaved crownbeard	*Verbesina dissita*	FT/ST/1B.1
Bogg's Lake hedge-hyssop	*Gratiola heterosepala*	–/SE/1B.2
Bolander's water hemlock	*Cicuta maculata* var. *bolanderi*	–/–/2.1
Braunton's milk-vetch	*Astragalus brauntonii*	FE/–/1B.1
Burke's goldfields	*Lasthenia burkei*	FE/–/1B.1
Butte County meadowfoam	*Limnanthes floccosa* ssp. *californica*	FE/SE/1B.1
California dandelion	*Taraxacum californicum*	FE/–/1B.1
California jewelflower	*Caulanthus californicus*	FE/SE/1B.1
California orcutt grass	*Orcuttia californica*	FE/SE/1B.1
California seablite	*Suaeda californica*	FE/–/1B.1
Calistoga popcornflower	*Plagiobothrys strictus*	FE/ST/1B.1
Cammata Canyon amole	*Chlorogalum purpureum* var. *reductum*	FT/SR/1B.1
Canyon liveforever	*Dudleya cymosa* ssp. *agourensis*	FT/–/1B.2
Cuyamaca Lake downingia	*Downingia concolor* var. *brevior*	–/SE/1B.1
Chinese Camp brodiaea	*Brodiaea pallida*	FT/SE/1B.1
Clara Hunt's milk-vetch	*Astragalus claranus*	FE/ST/1B.1
Coachella Valley milk-vetch	*Astragalus lentiginosus* var. *coachellae*	FE/–/1B.2
Coastal Dunes milk-vetch	*Astragalus tener* var. *titi*	FT/SE/1B.1
Colusa grass	*Neostapfia colusana*	FT/SE/1B.1
Conejo dudleya	*Dudleya parva*	FT/–/1B.2
Contra Costa goldfields	*Lasthenia conjugens*	FE/–/1B.1
Contra Costa wallflower	*Erysimum capitatum* var. *angustatum*	FE/SE/1B.1
Coast yellow leptosiphon	*Leptosiphon croceus*	–/SE/1B.1
Coyote ceanothus	*Ceanothus ferrisiae*	FE/–/1B.1
Crampton's tuctoria	*Tuctoria mucronata*	FE/SE/1B.1
Crystal Springs fountain thistle	*Cirsium fontinale* var. *fontinale*	FE/SE/1B.1

Common Name	Scientific Name	Status Federal/State/CRPR*
Cushenbury buckwheat	*Eriogonum ovalifolium* var. *vineum*	FE/–/1B.1
Cushenbury milk-vetch	*Astragalus albens*	FE/–/1B.1
Cushenbury oxytheca	*Acanthoscyphus parishii* var. *goodmaniana*	FE/–/1B.1
Dehesa nolina	*Nolina interrata*	–/SE/1B.1
Delta button-celery	*Eryngium racemosum*	–/SE/1B.1
Delta tule pea	*Lathyrus jepsonii* var. *jepsonii*	–/–/1B.2
Del Mar manzanita	*Arctostaphylos glandulosa* ssp. *crassifolia*	FE/–/1B.1
Encinitas baccharis	*Baccharis vanessae*	FT/SE/1B.1
Few flowered navarretia	*Navarretia leucocephala* ssp. *pauciflora*	FE/ST/1B.1
Franciscan manzanita	*Arctostaphylos hookeri* ssp. *franciscana*	FE/–/1B.1
Gambel's watercress	*Nasturtium gambelii*	FE/ST/1B.1
Gaviota tarplant	*Deinandra increscens* ssp. *villosa*	FE/SE/1B.1
Geysers panicum	*Panicum acuminatum* var. *thermale*	–/SE/1B.2
Greene's tuctoria	*Tuctoria greenei*	FE/SR/1B.1
Hairy orcutt grass	*Orcuttia pilosa*	FE/SE/1B.1
Hartweg's golden sunburst	*Pseudobahia bahiifolia*	FE/SE/1B.1
Hearst's manzanita	*Arctostaphylos hookeri* ssp. *hearstiorum*	–/FE/1B.2
Hickman's cinquefoil	*Potentilla hickmanii*	FE/SE/1B.1
Hickman's knotweed	*Polygonum hickmanii*	FE/SE/1B.1
Hidden Lake bluecurls	*Trichostema austromontanum* ssp. *compactum*	DL/–/1B.1
Hoover's spurge	*Chamaesyce hooveri*	FT/–/1B.2
Humboldt County milk-vetch	*Astragalus agnicidus*	–/SE/1B.2
Indian knob mountainbalm	*Eriodictyon altissimum*	FE/SE/1B.1
Ione buckwheat	*Eriogonum apricum* var. *apricum*	FE/SE/1B.1
Ione manzanita	*Arctostaphylos myrtifolia*	FT/–/1B.2
Irish Hill buckwheat	*Eriogonum apricum* var. *prostratum*	FE/SE/1B.1
Kaweah brodiaea	*Brodiaea insignis*	–/SE/1B.2
Keck's checkerbloom	*Sidalcea keckii*	FE/–/1B.1
Kenwood Marsh checkerbloom	*Sidalcea oregana* ssp. *valida*	FE/SE/1B.1
Kern mallow	*Eremalche parryi* ssp. *kernensis*	FE/–/1B.2
Kneeland Prairie pennycress	*Noccaea fendleri* ssp. *californica*	FT/ST/1B.1
La Graciosa thistle	*Cirsium scariosum* var. *loncholepis*	FE/ST/1B.1
Laguna Beach dudleya	*Dudleya stolonifera*	FT/ST/1B.1
Lane Mountain milk-vetch	*Astragalus jaegerianus*	FE/–/1B.1
Lassics lupine	*Lupinus constancei*	–/SE/1B.1
Layne's ragwort	*Packera layneae*	FT/SR/1B.2
Livermore moonshine	*Deinandra bacigalupii*	–/SE/1B.1
Livermore tarplant	*Deinandra bacigalupii*	–/SE/1B.2
Loch Lomond button-celery	*Eryngium constancei*	FE/SE/1B.1
Lompoc yerba santa	*Eriodictyon capitatum*	FE/SR/1B.2
Lyon's pentachaeta	*Pentachaeta lyonii*	FE/SE/1B.1
Many-flowered navarretia	*Navarretia leucocephala* ssp. *plieantha*	FT/SE/1B.1
Marcescent dudleya	*Dudleya cymosa* ssp. *marcescens*	FT/ST/1B.1

Common Name	Scientific Name	Status Federal/State/CRPR*
Marin western flax	*Hesperolinon congestum*	FT/ST/1B.1
Mariposa lupine	*Lupinus citrinus* var. *deflexus*	–/ST/1B.2
Mariposa pussypaws	*Calyptridium pulchellum*	FT/–/1B.1
Marsh sandwort	*Arenaria paludicola*	FE/SE/1B.1
Mason's lilaeopsis	*Lilaeopsis masonii*	--/SR/1B.1
McDonald's rockcress	*Arabis mcdonaldiana*	FE/SE/1B.1
Menzie's wallflower	*Erysimum menziesii*	FE/SE/1B.1
Merced clarkia	*Clarkia lingulata*	–/SE/1B.1
Metcalf Canyon jewel flower	*Streptanthus albidus* ssp. *albidus*	FE/–/1B.1
Mexican flannelbush	*Fremontodendron mexicanum*	FE/SR/1B.1
Milo Baker's lupine	*Lupinus milo-bakeri*	–/ST/1B.1
Mojave tarplant	*Deinandra mohavensis*	–/SE/1B.3
Monterey spineflower	*Chorizanthe pungens* var. *pungens*	FT/–/1B.2
Morro manzanita	*Arctostaphylos morroensis*	FT/–/1B.1
Munz's onion	*Allium munzii*	FE/ST/1B.1
Napa blue grass	*Poa napensis*	FE/SE/1B.1
Nevin's barberry	*Berberis nevinii*	FE/SE/1B.1
Nipomo Mesa lupine	*Lupinus nipomensis*	FE/SE/1B.1
North Coast semaphore grass	*Pleuropogon hooverianus*	–/ST/1B.1
Orcutt's hazardia	*Hazardia orcuttii*	–/ST/1B.1
Orcutt's spineflower	*Chorizanthe orcuttiana*	FE/SE/1B.1
Otay Mesa mint	*Pogogyne nudiuscula*	FE/SE/1B.1
Otay tarplant	*Deinandra conjugens*	FT/SE/1B.1
Pacific manzanita	*Arctostaphylos pacifica*	–/SE/1B.1
Pallid manzanita	*Arctostaphylos pallida*	FT/SE/1B.1
Palmate-bracted bird's-beak	*Chloropyron palmatum*	FE/SE/1B.1
Parish's daisy	*Erigeron parishii*	FT/–/1B.1
Parish's meadowfoam	*Limnanthes alba* ssp. *parishii*	–/SE/1B.2
Pierson's milk-vetch	*Astragalus magdalenae* var. *peirsonii*	FT/SE/1B.2
Pine Hill flannelbush	*Fremontodendron decumbens*	FE/SR/1B.2
Pismo clarkia	*Clarkia speciose* ssp. *immaculate*	FE/SR/1B.1
Pitkin marsh lily	*Lilium pitkinense*	FE/SE/1B.1
Presidio clarkia	*Clarkia franciscana*	FE/SE/1B.1
Presidio manzanita	*Arctostaphylos hookeri* ssp. *ravenii*	FE/SE/1B.1
Red Hills vervain	*Verbena californica*	FT/ST/1B.1
Robust spineflower	*Chorizanthe robusta* var. *robusta*	FE/–/1B.1
Sacramento orcutt grass	*Orcuttia californica* var. *viscida*	FE/SE/1B.1
Salt Marsh bird's-beak	*Chloropyron maritimum* ssp. *maritimum*	FE/SE/1B.2
San Benito evening-primrose	*Camissonia benitensis*	FT/–/1B.1
San Bernardino blue grass	*Poa atropurpurea*	FE/–/1B.2
San Bernardino Mountains bladderpod	*Physaria kingii* ssp. *bernardina*	FE/–/1B.1
San Bruno Mountain manzanita	*Arctostaphylos imbricata*	–/SE/1B.1
San Diego ambrosia	*Ambrosia pumila*	FE/–/1B.1

Common Name	Scientific Name	Status Federal/State/CRPR*
San Diego button celery	*Eryngium aristulatum* var. *parishii*	FE/SE/1B.1
San Diego mesa mint	*Pogogyne abramsii*	FE/SE/1B.1
San Diego thorn-mint	*Acanthomintha ilicifolia*	FT/SE/1B.1
San Fernando valley spineflower	*Chorizanthe parryi* var. *fernandina*	FP/SE/1B.1
San Francisco lessingia	*Lessingia germanorum*	FE/SE/1B.1
San Francisco popcornflower	*Plagiobothrys diffusus*	–/SE/1B.1
San Luis Obispo fountain thistle	*Cirsium fontinale* var. *obispoense*	FE/SE/1B.2
San Jacinto valley crownscale	*Atriplex coronata* var. *notatior*	FE/–/1B.1
San Joaquin adobe sunburst	*Pseudobahia peirsonii*	FT/SE/1B.1
San Joaquin valley orcutt grass	*Orcuttia inaequalis*	FT/SE/1B.1
San Joaquin woollythreads	*Monolopia congdonii*	FE/–/1B.2
Santa Ana River woollystar	*Eriastrum densifolium* ssp. *sanctorum*	FE/SE/1B.1
San Mateo thorn-mint	*Acanthomintha duttonii*	FE/SE/1B.1
San Mateo woolly sunflower	*Eriophyllum latilobum*	FE/SE/1B.1
Santa Clara valley dudleya	*Dudleya abramsii* ssp. *setchellii*	FE/–/1B.1
Santa Cruz cypress	*Hesperocyparis abramsiana* var. *abramsiana*	FT/SE/1B.2
Santa Cruz tarplant	*Holocarpha macradenia*	FT/SE/1B.1
Santa Cruz wallflower	*Erysimum teretifolium*	FE/SE/1B.1
Santa Lucia purple amole	*Chlorogalum purpureum* var. *purpureum*	FT/–/1B.1
Santa Monica Mountains dudleya	*Dudleya cymosa* ssp. *ovatifolia*	FT/–/1B.1
Sand gilia	*Gilia tenuiflora* ssp. *arenaria*	SE/ST/1B.2
Scadden flat checkerbloom	*Sidalcea stipularis*	–/SE/1B.1
Scotts Valley spineflower	*Chorizanthe robusta* var. *hartwegii*	FE/–/1B.1
Seaside bird's-beak	*Cordylanthus rigidus* ssp. *littoralis*	–/SE/1B.1
Sebastopol meadowfoam	*Limnanthes vinculans*	FE/SE/1B.1
Short-leaved dudleya	*Dudleya brevifolia*	–/SE/1B.1
Slender horned spineflower	*Dodecahema leptoceras*	FE/SE/1B.1
Slender orcutt grass	*Orcuttia tenuis*	FT/SE/1B.1
Slender-petaled thelypodium	*Thelypodium stenopetalum*	FE/SE/1B.1
Small-leaved rose	*Rosa minutifolia*	–/SE/2B.1
Soft-leaved paintbrush	*Castilleja mollis*	FE/–/1B.1
Soft Salty bird's-beak	*Chloropyron molle* ssp. *molle*	FE/SR/1B.2
Southern Mountain buckwheat	*Eriogonum kennedyi* var. *austromontanum*	FT/–/1B.2
Spreading navarretia	*Navarretia fossalis*	FT/–/1B.1
Springville clarkia	*Clarkia springvillensis*	FT/SE/1B.2
Stebbin's morning glory	*Calystegia stebbinsii*	FE/SE/1B.1
Striped adobe lily	*Fritillaria striata*	–/ST/1B.1
Succulent owl's-clover	*Castilleja campestris* var. *succulenta*	FT/SE/1B.2
Suisun Marsh aster	*Symphyotrichum lentum*	–/–/1B.2
Suisun thistle	*Cirsium hydrophilum* var. *hydrophilum*	FE/–/1B.1
Surf thistle	*Cirsium rhothophilum*	–/ST/1B.2
Tahoe yellow cress	*Rorippa subumbellata*	–/SE/1B.1
Thorne's buckwheat	*Eriogonum thornei*	–/SE/1B.2

Common Name	Scientific Name	Status Federal/State/CRPR*
Thread-leaved brodiaea	*Brodiaea filifolia*	FT/SE/1B.1
Tiburon jewelflower	*Streptanthus niger*	FE/SE/1B.1
Tiburon mariposa lily	*Calochortus tiburonensis*	FT/ST/1B.1
Tiburon paintbrush	*Castilleja affinis* var. *neglecta*	FE/ST/1B.2
Tidestrom's lupine	*Lupinus tidestromii*	FE/SE/1B.1
Tree-anemone	*Carpenteria californica*	–/ST/1B.2
Triple-ribbed milk-vetch	*Astragalus tricarinatus*	FE/–/1B.2
Trinity buckwheat	*Eriogonum alpinum*	–/SE/1B.2
Two-fork clover	*Trifolium amoenum*	FE/–/1B.1
Vail Lake ceanothus	*Ceanothus ophiochilus*	FT/SE/1B.1
Vandenberg monkeyflower	*Diplacus vandenbergensis*	FE/–/1B.1
Ventura Marsh milk-vetch	*Astragalus pycnostachyus* var. *lanosissimus*	FE/SE/1B.1
Verity's dudleya	*Dudleya verityi*	FT/–/1B.1
Water howellia	*Howellia aquatilis*	FT/–/2B.2
Webber's ivesia	*Ivesia webberi*	FT/–/2B.2
Western lily	*Lilium occidentale*	FE/SE/1B.1
Willowy monardella	*Monardella viminea*	FE/SE/1B.1
White-rayed pentachaeta	*Pentachaeta bellidiflora*	FE/SE/1B.1

Sources: CalFlora 2019; CDFW 2019; CNPS 2019
"-" indicates blank cell
Status Codes
Federal—U.S. Fish and Wildlife Service:
E = endangered
FC = candidate for federal listing under the federal Endangered Species Act
– = no status
State—California Department of Fish and Wildlife:
E = endangered
– = no status
California Rare Plant Ranks (CRPRs):
1B = plant species considered rare, threatened, or endangered in California and elsewhere
2 = plant species considered rare, threatened, or endangered in California but more common elsewhere
California Rare Plant Rank Extensions:
.1 = seriously endangered in California (>80% of occurrences are threatened and/or have high degree and immediacy of threat)
.2 = fairly endangered in California (20–80% of occurrences are threatened)
.3 = not very endangered in California