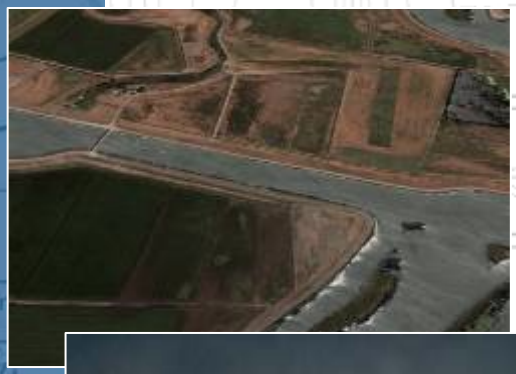
2-Gates Fish Protection Demonstration Project

Draft Mitigated Negative Declaration and Environmental Assessment



APRIL 2009

MITIGATED NEGATIVE DECLARATION • ENVIRONMENTAL ASSESSMENT

2-Gates Fish Protection Demonstration Project

DRAFT

APRIL 2009

Prepared for

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Abbreviations & Acronyms

°C	degrees Celsius
°F	degrees Fahrenheit
2-Gates Project	Project
AB	Assembly Bill
ABAG	Association of Bay Area Governments
ADCP	Acoustic Doppler Channel Profiler
BA	Biological Assessment
BAAQMD	Bay Area Air Quality Management District
Banks	Harvey O.Banks Pumping Plant
BDCP	Bay-Delta Conservation Plan
BMP	Best Management Practice
BO	Biological Opinion
BP	before present
BSFC	brake specific fuel consumption
CAA	Clean Air Act of 1970
CAAQS	California ambient air quality standards
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CBC	California Building Code
CCFB	Clifton Court Forebay
CCG	Clifton Court Gates
CCR	California Code of Regulations
CCWD	Contra Costa Water District
CDOC	California Department of Conservation
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CFS	Conservancy fairy shrimp
cfs	cubic feet per second
CH^4	methane
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CO	carbon monoxide
CO^2	carbon dioxide
Corps	U.S. Army Corps of Engineers
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act

CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Clean Water Act
CWT	Coded Wire Tagged
D-1485	SWRCB Water Rights Fish Decision 1485
D-1641	SWRCB Water Rights Decision 1641
dB	decibel(s)
DCC	Delta Cross Channel
Delta	Sacramento-San Joaquin River Delta
DFG	California Department of Fish and Game
DO	dissolved oxygen
DOI	Department of Interior
DPM	diesel particulate matter
DPS	distinct population segment
DSM2	Delta Simulation Model II
DTSC	Department of Toxic Substances Control
DWR	(California) Department of Water Resources
EA	Environmental Assessment
EBMUD	East Bay Municipal Utility District
EC	electrical conductivity
ECO	Environmental Compliance Officer
EFH	Essential Fish Habitat
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ERP	Ecosystem Restoration Program
ESA	Endangered Species Act [Federal]
ESU	Evolutionarily Significant Unit
EWP	Environmental Water Program
FMP	Fishery Management Plan
FMWT	Fall midwater trawl
GGS	giant garter snake
GHG	greenhouse gas
HCP	Habitat Conservation Plan
HORB	Head of Old River Barrier
IEP	Interagency Ecological Program
in	inch(es)
ITA	Indian Trust Asset
Jones	C.W. “Bill” Jones Pumping Plant
L_{dn}	day/night average sound level
L_{max}	maximum sound level
lb/mgal	pounds per thousand gallons

LWD	large woody debris
M	meter
MBTA	Migratory Bird Treaty Act
MEI	Maximally Exposed Individual
mgd	million gallon(s) of water per day
MLD	Most Likely Descendent
mm	millimeters
MND/EA	Mitigated Negative Declaration / Environmental Assessment
mph	miles per hour
MRZ	Mineral Resource Zone
MSA	Magnuson-Stevens Fishery Conservation and Management Act
msl	mean sea level
MTC	Metropolitan Transportation Commission
N_2O	nitrous oxide
NAAQS	national ambient air quality standards
NAHC	Native American Heritage Commission
NAVD88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPPA	California Native Plant Protection Act
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTU	Nephelometric Turbidity Unit
OCAP	Operations Criteria and Plan
OMR	Old and Middle Rivers
O_3	ozone
PCE	Primary constituent elements
PFMC	Pacific Fishery Management Council
PG&E	Pacific Gas and Electric Company
PM_{10}	respirable particulate matter
$PM_{2.5}$	fine particulate matter
POD	Pelagic Organism Decline
Ppmv	parts per million by volume
pmw	part(s) per million by weight
ppt	part(s) per thousand
PRC	Public Resources Code
PTM	particle tracking model

QWEST	Average daily flow in the San Joaquin River at Jersey Point
RCRA	Resource Conservation and Recovery Act
Reclamation	U.S. Bureau of Reclamation
RHA	Rivers and Harbors Act of 1899
RMA	Resource Management Associates
ROC	reactive organic compound
RPA	Reasonable and Prudent Alternative
RWQCB	Reasonable Water Quality Control Board
SCWA	Sacramento County Water Agency
SDIP	South Delta Improvements Program
SERA	Significant Ecological Resource Area
SFF	Skinner Fish Facility
SHPO	State Historic Preservation Office
SJCMSCP	San Joaquin County Multi-Species Conservation Plan
SDIP	South Delta Improvements Program
SFF	Skinner Fish Facilities
SIP	State Implementation Plan
SJR	San Joaquin River
SJVAPCD	San Joaquin Valley Air Pollution Control District
SKT	Spring Kodiak Trawl
SLC	State Lands Commission
SMARA	Surface Mining and Reclamation Act
SMSCG	Suisun Marsh Salinity Control Gates
SO_2	sulfur dioxide
SPCC	Spill Prevention Control and Countermeasures
SR	State Route
SWG	Smelt Working Group
SWP	State Water Project
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board (California)
TBP	Temporary Barrier Project
TFCF	Tracy Fish Collection Facility
TNS	Townet Survey
µmhos	micromhos
$\mu g/m^3$	microgram(s) per cubic meter
µmhos	micromhos per centimeter
UCMP	University of California Museum of Paleontology
USDA	U.S. Department of Agriculture
U.S.	United States
U.S.C.	United States Code
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service

USGS	U.S. Geological Survey
VAMP	Vernalis Adaptive Management Plan
VELB	Valley Elderberry Longhorn Beetle
VOC	volatile organic compound
VPFS	Vernal Pool Fairy Shrimp
VPTS	Vernal Pool Tadpole Shrimp
WAP	Water Acquisition Program
WOMT	Water Operations Management Team
WQIP	Water Quality Improvement Projects
WSEL	Water Surface Elevation
WY	water year
YOY	young-of-the-year
X2	Location of 2 ppt Salinity Isohaline

SUMMARY

The 2-Gates Fish Protection Demonstration Project (2-Gates Project) is intended to demonstrate and validate the value of proposed modifications to the flow patterns in the Sacramento-San Joaquin River Delta (Delta) with regard to the protection of sensitive species and management of water supply. The Delta provides habitat for several sensitive species, is a vital source of drinking water for over 23 million Californians, and supports more than 1.3 million acres of irrigated agricultural lands. The 2-Gates Project would install and operate removable gate structures in two key channels in the central Delta in order to control flows and thereby provide reduced entrainment of delta smelt and other sensitive aquatic species at the State Water Project and federal Central Valley Project export pumping facilities. The 2-Gates Project is designed to operate in conjunction and coordination with water management operation criteria established by State and federal water quality and environmental regulators.

The California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (Reclamation) are co-leads in the development of the Mitigated Negative Declaration/ Environmental Assessment (MND/EA). Reclamation has also prepared a Biological Assessment (BA) of the 2-Gates Project in compliance with the federal Endangered Species Act. The two agencies intend to apply for all applicable permits and enter into required coordination and consultations.

A description of the gate structures and their operations are presented in Section 2 and further described in the appendices. All potentially significant impacts identified in the MND/EA developed concurrent with this BA have been mitigated to a less than significance level through the design of the gate structures and modifications to their operation or mitigation measures. Based on the best available science and the results of detailed hydrodynamic and fish behavioral models, developed specifically for this analyses, the 2-Gates Project and operational criteria would establish a region of hydrologic influence in the western and central Delta that would provide the same or better protection for delta smelt as is currently provided by the new water management operation restrictions established by the State and federal resource agencies, while allowing for the water management actions that would provide additional water for use by municipal and agricultural water users south of the Delta.

The project has followed a deliberate process to avoid and minimize on-site and operational effects. Installation and removal of all project facilities would be completed within the ‘in-water construction window’ established by the USFWS to avoid impacts to sensitive species. The project would include temporary facilities to be removed after 5 years. These facilities include sheet pile dikes extending from each channel bank to the gates in lieu of rock barriers, a pile-supported boat ramp to reduce impacts to recreational boating and limited dredging and ground disturbance to minimize other biological effects. Barge-mounted gates will be fabricated at an off-site location, floated to the site, and sunk (ballasted) down directly over the peat removal area. On-site preparatory work to receive the barge-gates would be done over about a month within the in-water construction window, followed by installation of the barge-mounted gates. . As a demonstration project, Project operatons can be readily modified in the event of forecasted fish concerns and residual, but unanticipated impacts, would be avoided.

The concept of the 2-Gates Project evolved from information developed by several research efforts documenting relationships between high entrainment events and population declines and high salvage of pre-spawning adult delta smelt and occurrence of high turbidity in the south Delta. An idea evolved to install gates that would allow operations to influence the turbidity plume (preferred by pre-spawning delta smelt) and therefore the distribution of adults, and a similar approach could be used with larval and juvenile smelt. Development of the 2-Gates Project employed a deliberate, iterative process of modeling and model improvement, starting with a conceptual framework and baseline assumptions, then progressing through

initial site selection, development of project operational parameters and eventually through the analysis of potential effects on sensitive fish and wildlife species and water supply.

Early in the analytical process, it was anticipated that complex delta smelt behavioral models would be needed to predict distribution, abundance and fate of delta smelt under the published USFWS Operations Criteria and Plan (OCAP) Biological Opinion (BO) which restricts CVP and SWP pumping from December through June and in the fall and 2-Gates Project operational conditions. Because the development of such behavioral models would be time-consuming and its success could not be accurately predicted, a decision was made to initially use the One-Dimensional (1D) DSM2 model formulation for hydrodynamic, water quality and particle tracking to determine the most favorable location of gates, their region of control and their effects on baseline flow conditions. Concurrent with this effort a delta smelt behavioral model was developed by Resource Management Associates (RMA), which recognized that delta smelt do not react simply as neutrally buoyant passive particles floating in the water column, and that larvae/juvenile delta smelt distributions should address hatching and mortality rates. Using a Two-Dimensional (2D) formulation, computer simulation methods were developed to characterize both adult and larvae/juvenile dealt smelt behavior. The 2D behavioral models were used to determine effects of the 2-Gates Project for environmental documentation purposes under several hydrodynamic conditions within the Delta. Subsequent model runs and refinements in modeling capabilities helped enhance an understanding of the likely effects of project operations on Delta hydrodynamics, water quality, and delta smelt entrainment. Iterative analyses over a period of time improved the evaluation process and helped formulate the project. A summary of the technical formulation process for the Project is shown in Appendix M.

Project Operations: To protect migrating and pre-spawning adult delta smelt from December through February, both gates would be operated about an hour per day in the closed position to manage the movement of adult delta smelt habitat (turbidity plume). To provide added protection to larvae/juvenile delta smelt from March through June, the predominate mode of gate operations would be with the Old River gate closed about 10 hours per day on flood-tide and open on ebb-tides (including slack-tides), during which the Connection Slough gate would be open about 4 hours per day on slack-tides. Gate would be in a fully open position during Vernalis Adaptive Management Plan (VAMP) period and the Memorial Day weekend. The gates would not be operated, and would remain in a fully open position, from July through November. The gate opening periods would provide ample opportunity for commercial and recreational vessel passage. A boat ramp and vehicles would be provided for portage of recreational vessels up to 24-feet in length.

Project Results: Adult delta smelt entrainment at the SWP and CVP export facilities was evaluated under varied hydrologic conditions using the RMA adult delta smelt behavioral model from December through February. These simulations considered historic conditions, flow restrictions established by the 2008 USFWS OCAP BO and the addition of the 2-Gate Project. Key results comparing simulated OCAP BO and Project entraiment of adult delta smelt using the hydrology and delta smelt distribution for 2003 and 2004 are shown in Figure F-1. These Project operations were found to maintain adult delta smelt generally in the region of influence of the Project in the central and western Delta, where subsequent gate and OCAP BO flow control operations during larvae/juvenile stages have also been shown to significantly reduce entrainment.

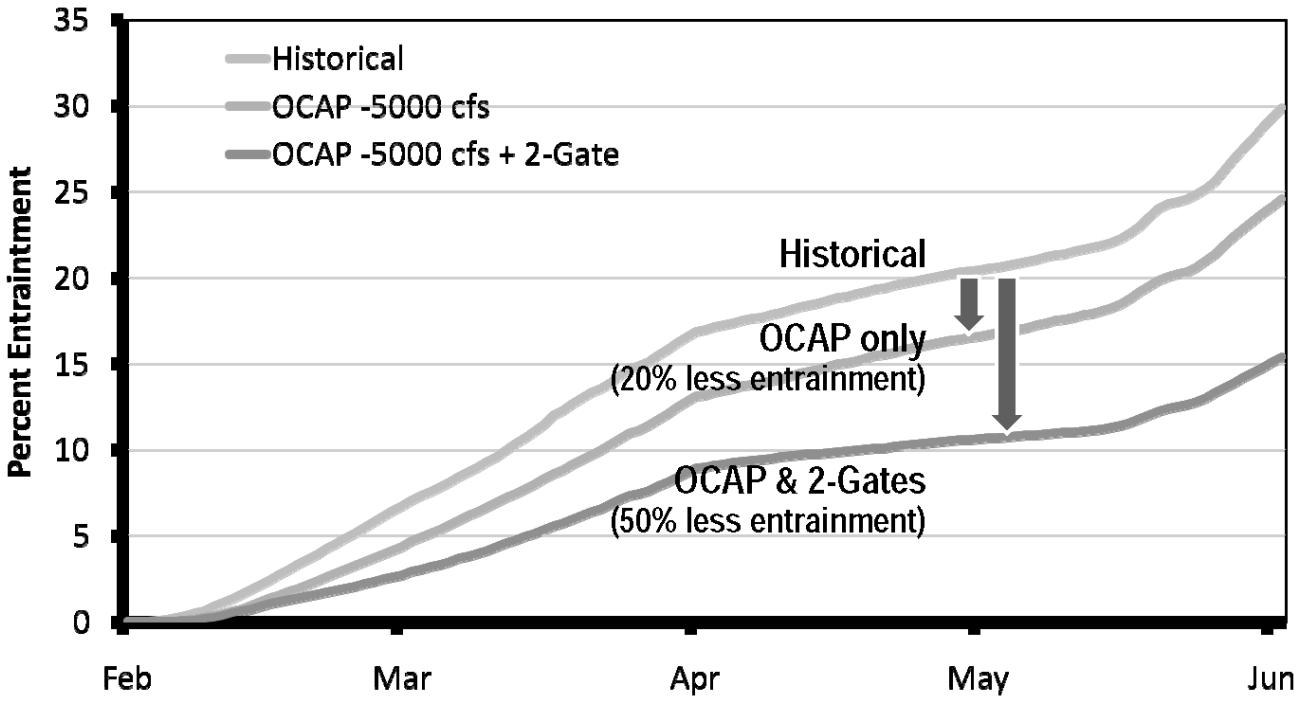


Figure F-1 **Cumulative entrainment as percent of total particles released at the CVP and SWP export locations, December 2003 through March 2004**

Larvae/juvenile delta smelt entrainment at the SWP and CVP export facilities was evaluated under varied hydrologic conditions using RMA 2D particle tracking model from March through June. Key results of larvae/juvenile delta smelt simulations for 2003 and 2004 are shown in Figures F-2 and F-3. Given predicted adult delta smelt distributions following adult stage control by the Project, these springtime operations were found to significantly reduce entrainment when applied to the discretionary range of flow restrictions under the OCAP BO.

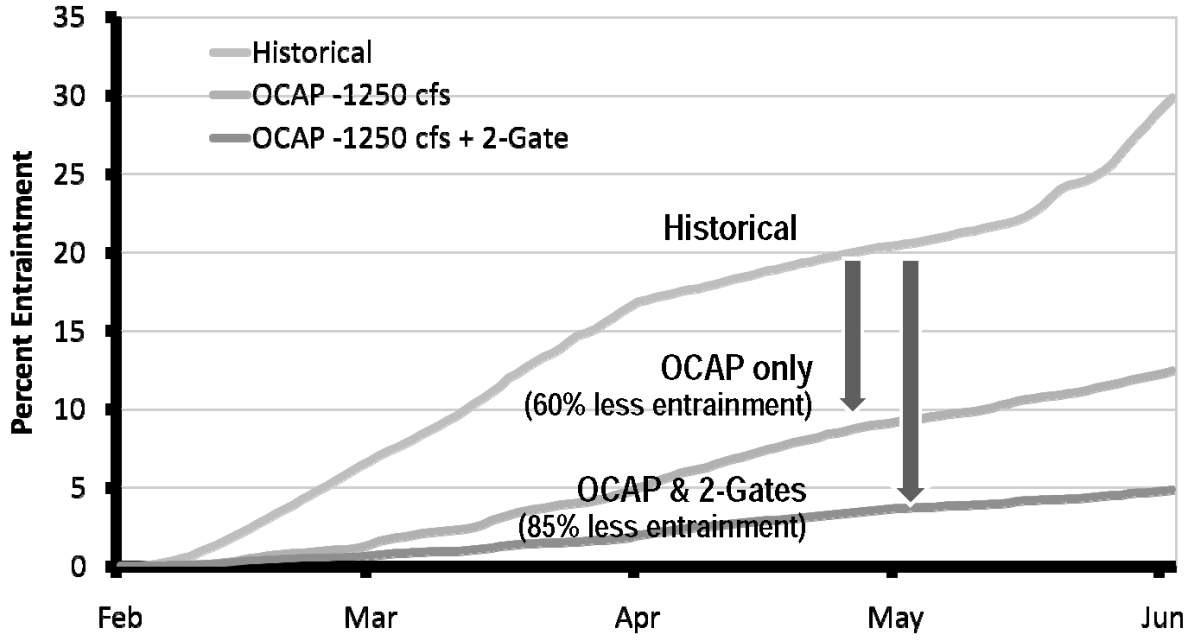


Figure F-2 **Percent Particles (larval and juvenile delta smelt) entrained at the CVP+SWP originating from "Source Regions", generally depicting the region of influence of the gates. Both simulations of the Project Operations display results that provide enhanced protection for delta smelt (lower entrainment) that could allow lower restrictions on water management actions at the SWP and CVP pumps.**

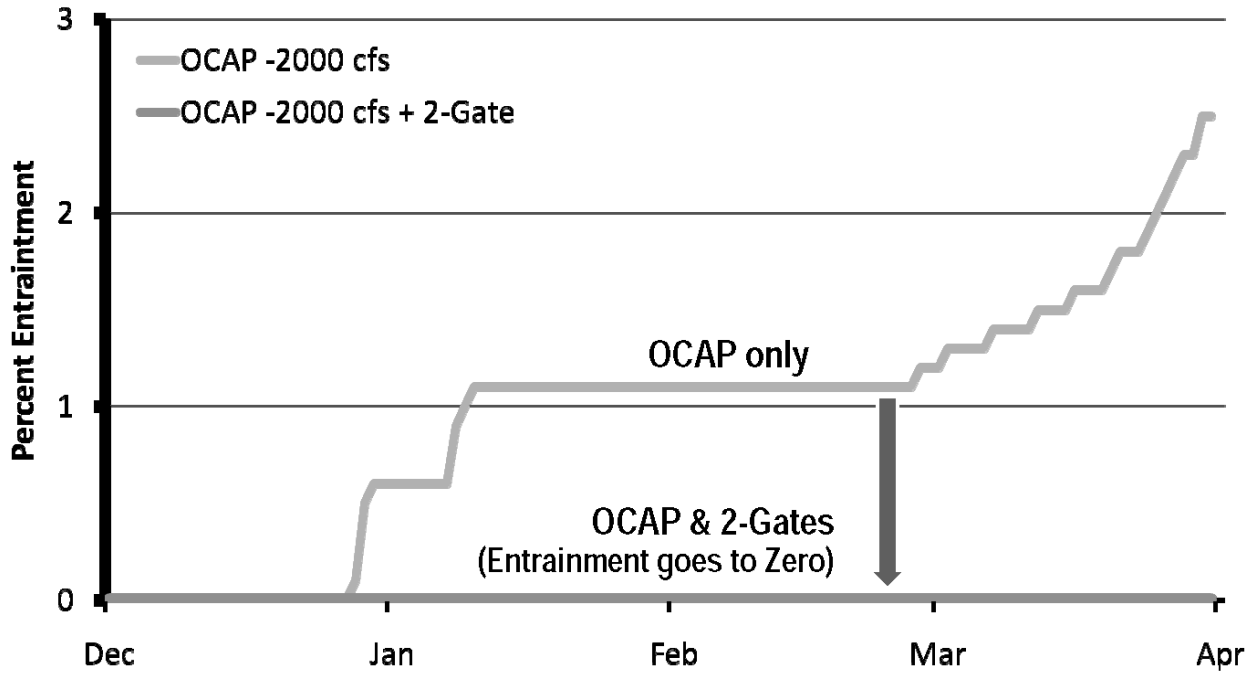


Figure F-3 **Percent Particles (larval and juvenile delta smelt) entrained at the CVP+SWP originating from "Source Regions", generally depicting the region of influence of the gates. Both simulations of the Project Operations display results that provide enhanced protection for delta smelt (lower entrainment) that could allow lower restrictions on water management actions at the SWP and CVP pumps.**

SECTION 1

Introduction

This Mitigated Negative Declaration (MND)/Environmental Assessment (EA) evaluates the impacts of implementing the 2-Gates Demonstration Project (2-Gates Project, or Project) in compliance with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). The Project would be located in the Sacramento-San Joaquin River Delta (Delta), which is a vital source of drinking water for over 23 million Californians and supports more than 1.3 million acres of irrigated agricultural lands. The 2-Gates Project would install and operate removable gates in two key channels in the central Delta (Old River and Connection Slough) in order to control flows and thereby help reduce entrainment of delta smelt (*Hypomesus transpacificus*) and other sensitive aquatic species at the State Water Project (SWP) and Central Valley Project (CVP) export pumps.

1.1 CEQA REQUIREMENTS, LEAD AGENCY, AND STATE ACTIONS

This document is being prepared in accordance with relevant provisions of CEQA (Public Resources Code [PRC] 21000 et seq.), and the CEQA Guidelines as amended (California Code of Regulations [CCR], Title 14, Division 6, 15000 et seq.). The foundation of CEQA documents is the Initial Study environmental checklist included in Section 4 of this document. Section 15063(c) of the CEQA Guidelines indicates that the purposes of an Initial Study include:

- Provide the lead agency, the California Department of Water Resources (DWR), with information to use as the basis for deciding whether to prepare an Environmental Impact Report (EIR) or Negative Declaration.
- Enable the lead agency to modify a project and mitigate adverse impacts before an EIR is prepared, thereby enabling the Project to qualify for a Negative Declaration.
- Identify the effects determined not to be significant.
- Explain the reasons why potentially significant effects would not be significant.
- Facilitate environmental assessment early in the design of a project.
- Provide documentation of the factual basis for the finding in a Negative Declaration that a project will not have a significant effect on the environment.
- Eliminate unnecessary EIRs.

CEQA Guidelines Section 15070 indicates that an MND is appropriate when:

- The Initial Study shows that there is no substantial evidence, in light of the whole record before the agency, that the Project may have a significant effect on the environment, or
- The Initial Study identifies potentially significant effects but;
- Revisions in the Project plans or proposals made by, or agreed to by the applicant before a proposed MND and Initial Study are released for public review would avoid the effects or mitigate the effects to a point where clearly no significant effects would occur, and

- There is no substantial evidence, in light of the whole record before the agency, that the Project as revised may have a significant effect on the environment.

An MND is the appropriate CEQA document for this Project because the above guidelines have been met. Adequate mitigation measures have been incorporated into the Project to either avoid significant impacts or reduce them to less than significant.

Section 15050(a) of the CEQA Guidelines indicates that the lead agency is the public agency with the principal responsibility for carrying out or approving a project. The lead agency is to decide whether an EIR or Negative Declaration will be required and will initiate the preparation of the document as identified in CEQA Guidelines Sections 15367, 15051(a). DWR is the lead agency for the preparation of this MND under CEQA because it would be the ultimate owner of the Project and because the Project addresses impacts on delta smelt and other special-status species that potentially result from SWP pumps, which are operated by DWR.

1.2 NEPA REQUIREMENTS, LEAD AGENCY, AND FEDERAL ACTIONS

The EA has been prepared in accordance with NEPA (42 United States Code [USC] 4321 et seq.); the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] Parts 1500-1508); and the U.S. Bureau of Reclamation's (Reclamation) Draft National Environmental Policy Handbook (U.S. Bureau of Reclamation [USBR] 2000). An EA is a concise public document that has three defined functions: (1) it briefly provides sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS); (2) it aids an agency's compliance with NEPA when no EIS is necessary (i.e., it helps to identify better alternatives and mitigation measures); and (3) it facilitates preparation of an EIS when one is necessary (CFR Section 1508.9(a)). Since the EA is a concise document, it should not contain long descriptions or detailed data which the agency may have gathered. Rather, it should contain a brief discussion of the need for the proposal, alternatives to the proposal, the environmental impacts of the proposed Project and alternatives, and a list of agencies and persons consulted (CFR Section 1508.9(b)). An EA also may include mitigation measures that would be desirable to consider and adopt even though the impacts of the proposal will not be "significant."

Reclamation is the lead agency for compliance with NEPA because the Project addresses impacts on delta smelt and other special-status species that potentially result from CVP pumps, and Reclamation may adjust CVP operations after the 2-Gates Project is constructed and because Reclamation would provide funding for the Project. Whether Reclamation would modify CVP operations is speculative at this time and is not the focus of this MND/EA.

1.3 BACKGROUND

A substantial amount of the water exported from the Delta is conveyed by the SWP and CVP. The SWP is operated to provide flood control and water supply for agricultural, municipal, industrial, recreational, and environmental purposes. DWR has State Water Resources Control Board (SWRCB) permits and licenses to appropriate and divert (or redivert) water for the SWP. Water is conserved in the Oroville Reservoir and released to three Upper Feather River area contractors, two contractors served by the North Bay Aqueduct, and the Harvey O. Banks Pumping Plant (Banks) in the Delta, after which it is delivered to the remaining 24 contractors in the SWP service areas south of the Delta. In addition, Banks pumps water from other sources entering the Delta (i.e., the Sacramento River, San Joaquin River, and Mokelumne River). The current operations of the SWP reservoirs, pumping plants, and aqueducts vary throughout the year based on changing hydrologic and environmental factors, as well as regulations and agreements governing the operation of the SWP.

The CVP is operated by Reclamation and includes several reservoirs, hydroelectric plants, and pumping plants, including the Jones Pumping Plant in the south Delta near Tracy. The CVP's major storage facilities are Shasta, Trinity, Folsom and New Melones. The upstream reservoirs release water to provide water for the Delta, of which a portion is exported through Jones Pumping Plant for storage in San Luis Reservoir (jointly operated by the CVP and SWP) or delivered down the Delta Mendota Canal to south of Delta contractors. DWR and Reclamation collectively have built water conservation and water delivery facilities in the Central Valley in order to deliver water supplies to water rights holders as well as project contractors. Some CVP facilities were developed in coordination with the SWP. Both the CVP and the SWP use the San Luis Reservoir, O'Neill Forebay, and more than 100 miles of the California Aqueduct and its related pumping and generating facilities.

Both DWR and Reclamation's water rights are conditioned by the SWRCB to protect the beneficial uses of water within each respective project and jointly for the protection of beneficial uses in the Sacramento Valley and the Sacramento-San Joaquin Delta Estuary. The Coordinated Operations Agreement was signed in 1986 and defines both SWP and CVP facilities and their water supplies, sets forth procedures for coordination of operations, identifies formulas for sharing joint responsibilities for meeting Delta standards, as the standards existed in the SWRCB Water Right Decision 1485 (D-1485), and other legal uses of water, identifies how unstored flow will be shared, sets up a framework for exchange of water and services between the two projects, and provides for periodic review of the Agreement. Additional water management restrictions are included in the SWRCB Water Right Decision 1641 (D-1641).

The combination of tidal flows, channel geometry and connections of Franks Tract, Old River and Middle River, export pumping at the CVP and SWP pumps near Tracy, along with salinity, temperature and turbidity gradients conducive to delta smelt movement can all influence the movement of delta smelt into the south Delta toward the export pumps. This unnatural movement makes these sensitive fish more vulnerable to entrainment. The proposed Project seeks to reduce this entrainment while preserving water management options. Delta smelt is a federally and state-listed threatened species, and both the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Game are considering petitions to change its status to endangered.

The Biological Opinion (BO) for the Operations Criteria and Plan (OCAP) for the Operation of the CVP and SWP (USFWS 2008b) further constrains the operation of these facilities for the protection of delta smelt. This BO thoroughly describes the components of the CVP and SWP and evaluates the operation of these components for species listed under the federal Endangered Species Act (ESA). This BO also identifies modified operations of the CVP and SWP as a "Reasonable and Prudent Alternative" (RPA) to current operations. The set of RPAs forms the basis for an incidental take statement, under Section 7 of the ESA, and generally form the basis for operations in compliance with the ESA. The RPAs are summarized in Table 1-1.

The description of existing conditions and the evaluation of impacts of the 2-Gates Project consider the various components of D-1641 and the Coordinated Operations Agreement (e.g.; water quality standards, discharge requirements, and allowed diversions), as well as the permit conditions issued by others, particularly those contained in the OCAP BO. This layering of conditions and constraints provided a range of conditions that were used to bound the analysis. During certain time periods and environmental conditions, the components of D-1641 provide the bounding condition, while during under other time periods and environmental conditions, the OCAP BO RPAs describe the limit of operational conditions.

Table 1-1 OCAP Biological Opinion RPAs

RPA Component	Action Number	Action	Timing	Triggers	Suspension of Action	Off-Ramps
1 Protection of the Adult Delta Smelt Life Stage	1 Designed to protect upmigrating delta smelt *Objective:* Protect pre-spawning adult delta smelt from entrainment during 1st flush Provide advantageous hydrodynamic conditions early in the migration period	Limit Exports so OMR flows ≥ -2,000 cfs (14-day average) with 5-day running average ≥ -2,500 cfs (± 25%)	Part A: Dec. 1 to Dec. 20 (Low-Entrainment Risk Period)	*Turbidity*: 3-day average ≥ 12 NTU @ Prisoner's Point, Holland Cut & Victoria Canal (all three) FWS discretion based on turbidity, flows, FMWT, and salvage		*Temperature*: 3 Station daily mean water temps. at Mossdale, Antioch & Rio Vista ≥ 12°C OR *Biological*: Onset of spawning (presence of spent females in SKT or at Banks or Jones)
			Part B: After Dec. 20 (High Entrainment Risk Period)	*Turbidity*: 3-day average ≥ 12 NTU @ Prisoner's Point, Holland Cut & Victoria Canal (all three) OR *Salvage*: daily salvage index value ≥ 0.5 (daily delta smelt salvage > 1/2 prior year FMWT index value)		Same as above
	2 Designed to protect adult delta smelt that have migrated upstream and are residing in the Delta prior to spawning *Objective*: Same as action 1 above	Net daily OMR flows ≥ -1,250 to -5,000 cfs (determined by SWG)	Immediately after Action 1 If Action 1 not implemented, SWG will determine start date		*Flow:* 3 day Average flow on Sacramento River at Rio Vista ≥ 9,000 cfs AND on San Joaquin River at Vernalis ≥ 10,000 cfs	Same as above
2 Protection of Larval & Juvenile Delta Smelt	3 Entrainment protection of larval smelt *Objective*: Minimize the number of larval delta smelt entrained at the CVP/SWP facilities	Net daily OMR flows ≥ -1,250 to -5,000 cfs based on a 14-day running average with 5-day running average ± 25% of required OMR	Initiate action when triggers met	*Temperature*: 3 Station daily mean water temperature at Mossdale, Antioch & Rio Vista ≥ 12°C OR *Biological*: Onset of spawning (presence of spent females in SKT or at Banks or Jones		*Temporal*: June 30 OR *Temperature*: daily average of 25°C for 3 consecutive days @ Clifton Court Forebay
	5 Temporary Spring HORB & TBP *Objectiv*: Minimize entrainment of larval & juvenile delta smelt at the CVP/SWP facilities	Do not install HORB if delta smelt is a concern. Operate TBP as described in project description If HORB installed (no smelt concerns) tie open TBP flap gates	Spring (varies depending on conditions)	When PTM results show entrainment levels of delta smelt increase > 1% at station 815 as a result of installation of HORB		If Action 3 ends or May 15, whichever comes first

Table 1-1 OCAP Biological Opinion RPAs

RPA Component	Action Number	Action	Timing	Triggers	Suspension of Action	Off-Ramps
3 Improve Habitat for Delta Smelt Growth & Rearing	4 Estuarine Habitat During Fall *Objective*: Improve fall habitat for delta smelt by managing X2 through increasing Delta outflow	Provide sufficient Delta outflow to maintain X2 west of 74 km in fall following wet years and 81 km in fall following above normal years	September 1 to November 30	Wet & above normal water years classified from the 1995 Water Quality Control Plan used to implement D-1641		
4 Habitat Restoration	6 Habitat Restoration *Objective*: Improve habitat conditions for delta smelt by enhancing food production & availability	Create or restore a minimum of 8,000 acres of intertidal and associated subtidal habitat in the Delta and Suisun Marsh	Begin restoration program by 12/15/2009 (within 12 months of BO) AND complete by 12/15/2018 (within 10 years)			
5 Monitoring and Reporting						

1.4 CONTENTS AND ORGANIZATION OF THE MND/EA

Together, DWR and Reclamation have the responsibility for the scope, content, and legal adequacy of the MND/EA. The terminology and specific needs of CEQA and NEPA do not entirely overlap; therefore, modifications have been made to the standard requirements of each to accommodate these differences. For example, CEQA uses the term "proposed project or project" to refer to the subject of the document, whereas NEPA uses the term "proposed action." In this MND/EA, the term used is "Project." The resources include those that are typically evaluated under both NEPA and CEQA; additionally, Section 5 includes discussions of resources that are required by NEPA, but not CEQA, including environmental justice, Indian Trust Assets, socioeconomics, and wild and scenic rivers. Significance criteria for evaluating impacts on resources that are considered under both NEPA and CEQA have been provided in the environmental checklist included in Section 4. They are based on CEQA Guidelines, Appendix G, and modified where appropriate to address impacts specific to the Project. NEPA does not require the use of specific significance criteria, and specifies that the description of their impacts is to be based on the context and intensity of the impacts and on the relationship between them. Thus, no significance criteria have been provided for those resources required only in an EA.

This MND/EA is organized as follows:

- **Section 1.** Introduces the Project and the uses of the MND/EA.
- **Section 2.** Describes the Project, required permits and approvals, and alternatives that were considered.
- **Section 3.** Describes related projects that are included in the cumulative impact analysis.
- **Section 4.** Provides an environmental evaluation/checklist identifying the environmental setting and impacts of the Project categorized pursuant to Appendix G of the CEQA Guidelines as "potentially significant unless mitigation incorporated," "less than significant," and "no impact" (in response to the checklist findings). It also provides mitigation measures for any impacts found to be "potentially significant unless mitigation incorporated." Impacts of the No Project Alternative also are considered, as are cumulative impacts.
- **Section 5.** Evaluates potential impacts on climate change, as well as impacts on resource areas required by NEPA but not CEQA.
- **Section 6.** Identifies references used in this document.
- **Section 7.** Lists agencies contacted.
- **Section 8.** Lists the document preparers.

1.5 PUBLIC REVIEW PROCESS

This MND/EA will be circulated for public review and comment pursuant to the requirements of CEQA and NEPA. DWR and Reclamation as the lead agencies will consider the MND/EA, along with any comments received during the public review process, prior to taking action on the Project.

SECTION 2

Project Description

2.1 PURPOSE OF AND NEED FOR THE PROJECT

2.1.1 Purpose of the Project

The 2-Gates Project is intended to provide temporary, cost-effective, immediate protection to delta smelt and other sensitive aquatic species from entrainment in State Water Project (SWP) and Central Valley Project (CVP) facilities. It also is designed and planned to have the flexibility to be operated to test alternative water management and fish protection strategies. The environmental monitoring component is designed to provide the environmental and habitat information predictive of delta smelt distribution, upon which to base timely gate operational decisions and to acquire related information on aquatic ecosystem health.

The 2-Gates Project could be used to support future decision-making regarding the installation of more permanent operable gates for the protection of aquatic resources in the Delta. Should such a permanent project be implemented in the future, it would be subject to separate environmental review and permitting that would evaluate pertinent information collected from operation of the 2-Gates Project. The 2-Gates Project has independent utility and is not dependent upon the implementation of a longer-term plan, including the Bay-Delta Conservation Plan. It provides no long-term commitments to permitting or constructing a permanent gate structures in Old River and Connection Slough. The 2-Gates Project is removable if required once the demonstration phase ends.

2.1.2 Need for the Project

In light of the current environmental conditions in the Delta, the population declines in estuarine and anadromous fish in the Sacramento-San Joaquin River watershed, and the needs of water users dependent on the waters native to the watershed, the water agencies that rely on the CVP and SWP are proposing ways to meet the water needs of their customers while seeking ways to provide additional benefits to the environment and species using the Delta. In addition to the water resource management controls described in State Water Resources Control Board Water Right Decisions 1485 and 1641 (D-1485 and D-1641), the published USFWS OCAP Biological Opinion restricts CVP and SWP pumping from December through June and in the fall in an attempt to minimize entrainment of delta smelt from the central Delta (USFWS 2008a). Depending on the level of pumping allowed, water supply impacts can be severe.

2.2 PROJECT OBJECTIVES

The 2-Gates Project objectives are as follows:

- Achieve equivalent or reduced entrainment of delta smelt compared to OCAP BO RPA restrictions while providing SWP and CVP water supply benefits.
- Collect and evaluate data needed to determine whether it would be beneficial to install permanent operable gates to achieve Project purposes over a longer time period.

2.3 KEY DESIGN CRITERIA

The additional design criteria for both proposed facilities and operations of the 2-Gates Project were:

- Allow the passage of recreational and commercial vessels on Old River and Connection Slough in a safe and timely manner.
- Provide design and operational flexibility for a broad range of demonstration operations

2.4 PROJECT LOCATION

The Old River and Connection Slough sites are located in the central Delta, approximately 13 and 16 miles northwest of Stockton, and 4.8 and 6.8 miles north and northwest of Discovery Bay, respectively. The nearest developed areas are located in the City of Oakley, about 2.4 miles west of the Old River site. The regional location is shown in Figure 2-1, and a more detailed view of the area surrounding the Project sites is shown in Figure 2-2. The Contra Costa County-San Joaquin County boundary is formed by the Old River; therefore, Project construction at this site would occur in both counties. The Connection Slough site is located entirely in San Joaquin County. As shown on Figure 2-2, the Old River site is located on Old River between Holland Tract and Bacon Island, about 3 miles south of Franks Tract and about 1 mile north of the confluence of Old River and Rock Slough. The Connection Slough site is located about 3.5 miles southeast of Franks Tract between Mandeville Island and Bacon Island and between Middle River and Little Mandeville Island.

2.5 PROJECT FACILITIES

2.5.1 Overview

The 2-Gates Project is a temporary and cost-effective project that is intended to immediately improve Delta water management activities for the benefit of delta smelt and other listed species. The Project increases the certainty of critical water supplies from the Delta and includes a monitoring component that would allow the effectiveness of the gate system to be evaluated.

The 2-Gates Project provides a means of controlling the combined flows in Old and Middle Rivers (OMR) in order to help reduce the entrainment of fish from the western and central Delta at the export facilities. This will be accomplished by the installation of temporary "butterfly gates" in Old River and Connection Slough and operation of those gates when turbidity and salinity conditions are expected to support upstream movement of delta smelt. Changes to the movement of water and the timing of water movement were evaluated using the "Delta Simulation Model II" (DSM2)[1] its associated modules and post processing applications. Overall, the results from the DSM2-related models indicate that under certain hydrologic conditions (including all normally expected OMR flows) when sensitive fish are located north and west of the 2-Gates Project facilities, the gates would be very effective at reducing entrainment of delta smelt, plankton, and other weak swimming fish from the western and central Delta by the export facilities in the southern Delta (model results are included in Appendices E and F). Preliminary results from the newly developed adult delta smelt behavioral model applications further indicate that distribution and density of adult delta smelt can be modified to reduce the potential entrainment at the CVP and SWP facilities with the pumping restrictions from the OCAP BO (USFWS 2008) and the Project. Keeping adult delta smelt away from the south Delta reduces potential entrainment of larval and juvenile smelt. Gate operations also enhance the ability to reduce this entrainment. This would enhance delta smelt populations in the western and central Delta while allowing for the export of water to meet critical water needs.

[1] DSM2 models calculate stages, flows, velocities in channel segments in the Delta and is the basis for many post processed models that calculate many water quality parameters and the movement of individual particles. Detailed descriptions of this model are available at http://baydeltaoffice.water.ca.gov/modeling/deltamodeling/models/dsm2/dsm2.cfm.

The 2-Gates Project will be operated for up to five years. Monitoring data will be used to verify the model information which indicates that operable gates in Old River and Connection Slough near Franks Tract can be used to provide additional protection from entrainment for delta smelt without adversely affecting Chinook salmon, steelhead, green sturgeon, and longfin smelt. The Project will be monitored to verify that operable gates can improve water quality and allow for altered flow rates and pumping levels while reducing the movement of delta smelt from the lower San Joaquin River to the south Delta. The Project will make real-time adjustments to operations to reduce delta smelt entrainment while minimizing or avoiding impacts on other species. It also provides the ability to adjust operations based on changing conditions in the Delta, including changes associated with CVP and SWP operations.

The 2-Gates Project provides a means of controlling OMR flows in order to help reduce the entrainment of fish from the western and central Delta at the export facilities. This would be accomplished by the installation of temporary "butterfly gates" in Old River and Connection Slough and operation of those gates when turbidity and salinity conditions are expected to support upstream movement of delta smelt.

Monitoring information would be used to improve operational efficiency and to verify model information indicating that operable gates in Old River and Connection Slough near Franks Tract can be used to provide additional protection from entrainment for delta smelt and other sensitive aquatic species in the Delta. The Project further would be used to verify that operable gates can improve water quality and allow for altered flow rates and pumping levels while reducing the movement of delta smelt and other aquatic species from the lower San Joaquin River to the south Delta. The Project provides the ability to make real-time adjustments to operations to reduce delta smelt entrainment while minimizing and avoiding impacts on sensitive salmonids. It also provides the ability to adjust operations based on changing conditions in the Delta, including changes associated with SWP and CVP operations.

2.5.2 2-Gates Concept

The Project involves the installation and operation of gate structures mounted on commercially available cargo barges. Barges are fitted with top-mounted butterfly gates and keyed into sheetpile dikes. Pre-installed sheet pile abutment panels would be attached to the ends of the barges. The converted barges would be floated to the sites and ballasted to the prepared sites on the river bottom. Prior to the installation of the barge-mounted gate system, the channel bottom would be dredged to remove unstable peat material, and a gravel sub-base foundation would be installed. The barges would be cleaned prior to their placement in the channels, and residual oils, lubricants, and other contaminants would be removed. At each site a combination of sheet piles and/or rock would be used to secure the barge in place, and sheet pile dikes would be used to connect the structure to the adjacent levees.

A plan view of the design at both the Old River and Connection Slough sites is shown on Figures 2-3 and 2-4. Elevation views of the design at both the Old River and Connection Slough sites are shown on Figures 2-3 and 2-4. The conceptual layout of the operational gate system is shown in Figure 2-5. For detailed Project design plan views, cross-sections, and layouts see Appendices F and G for the Old River and Connection Slough Site, respectively.

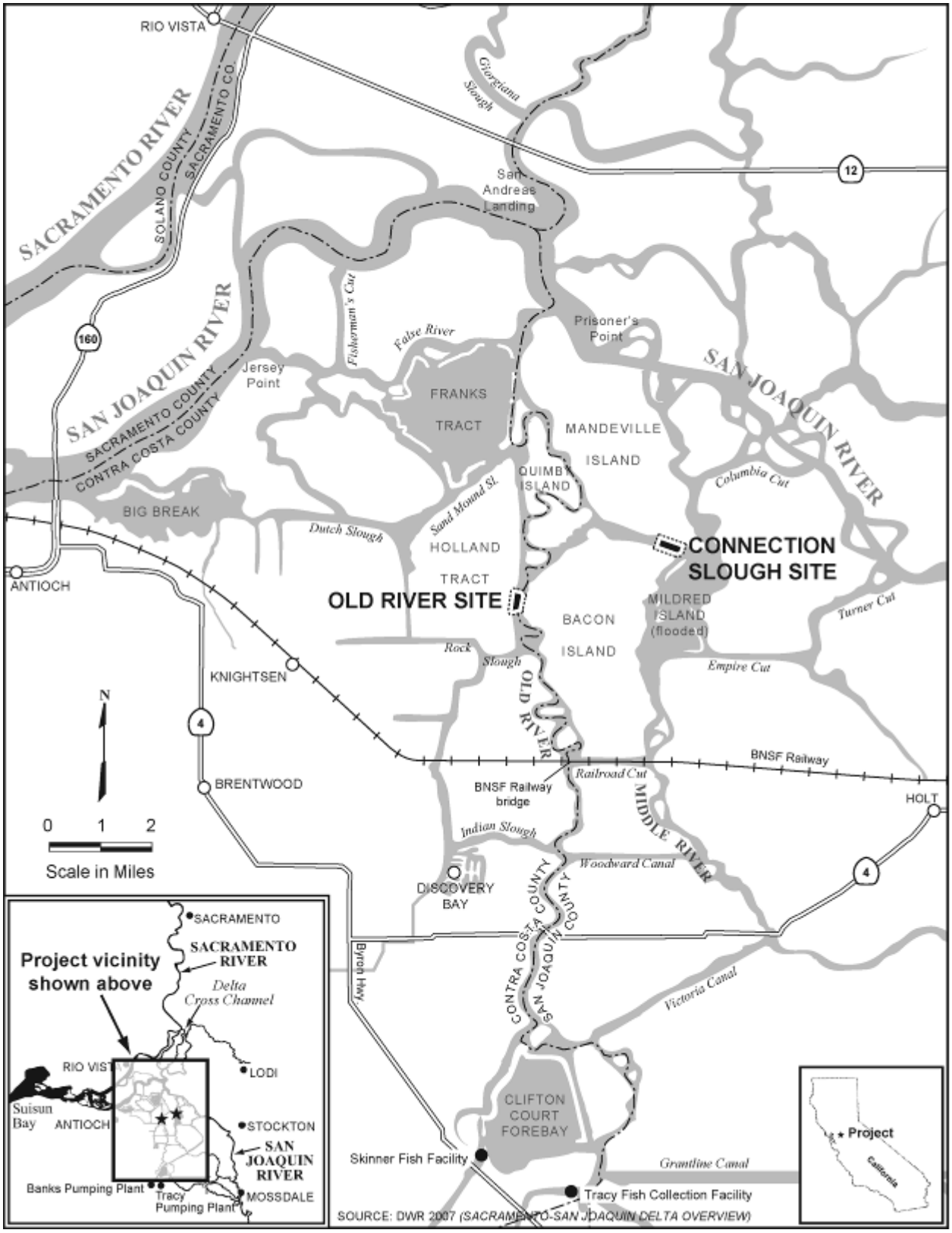


Figure 2-1 Regional Location

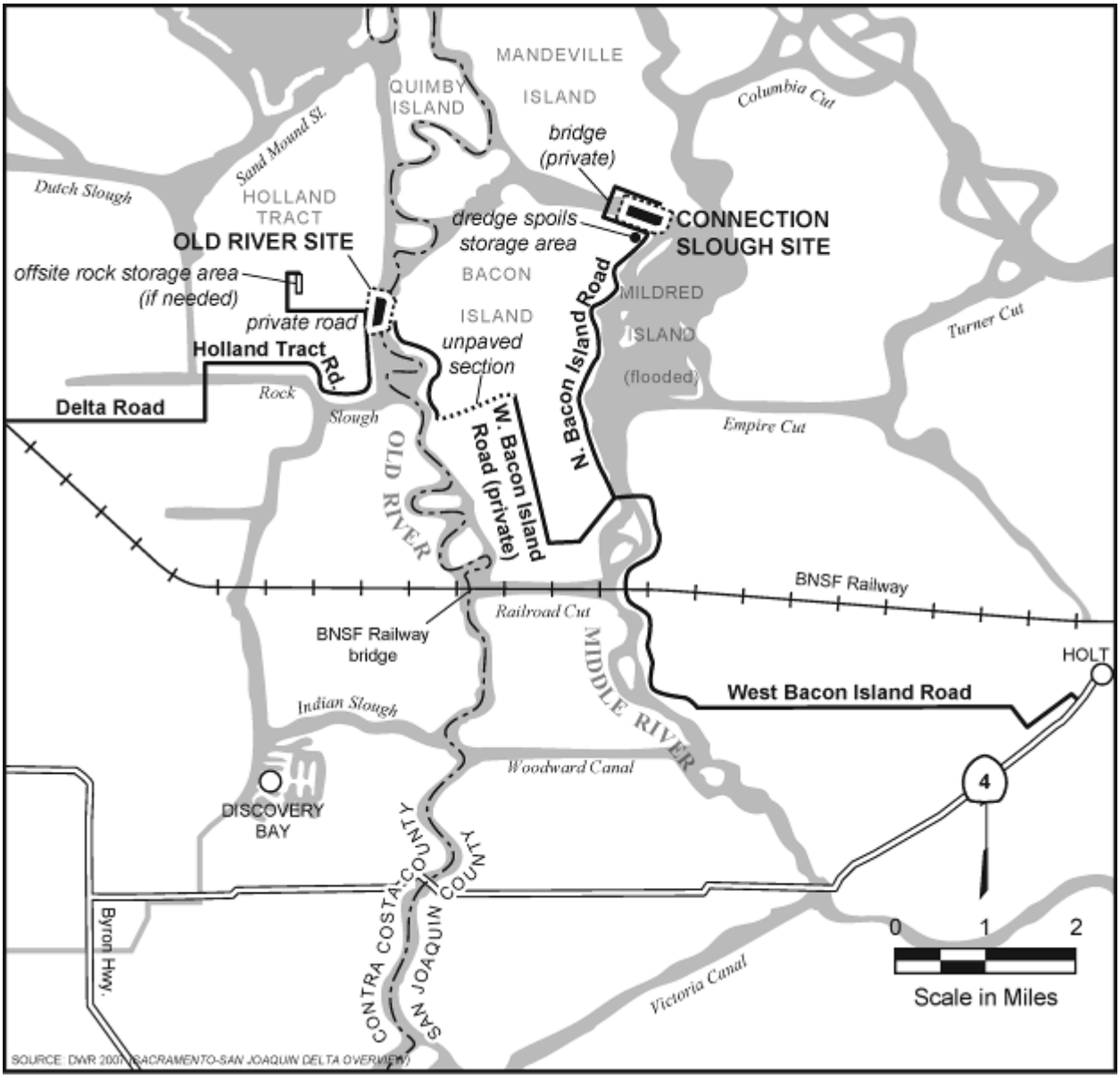


Figure 2-2 2-Gates Project Vicinity and Access

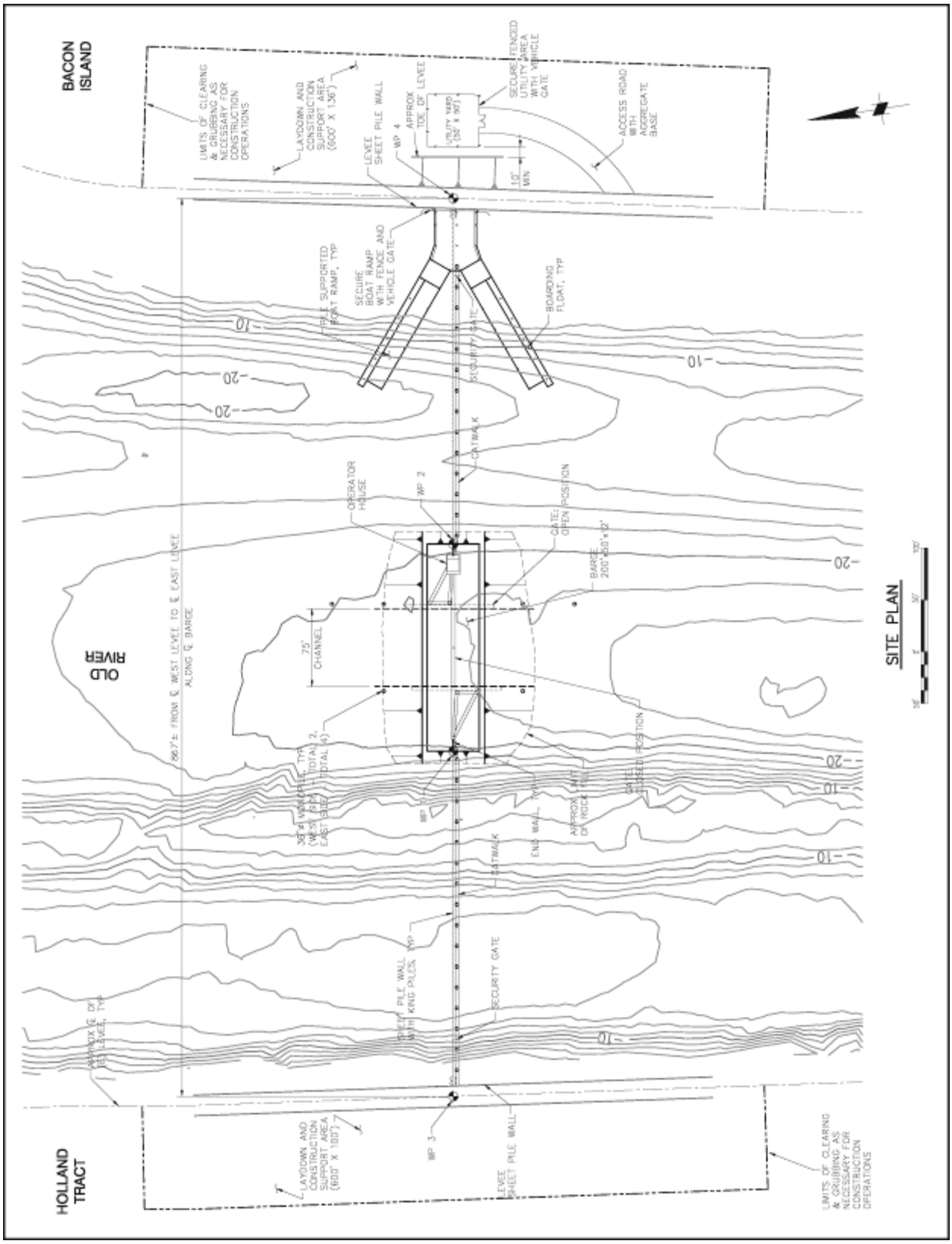


Figure 2-3 Old River Site Plan View

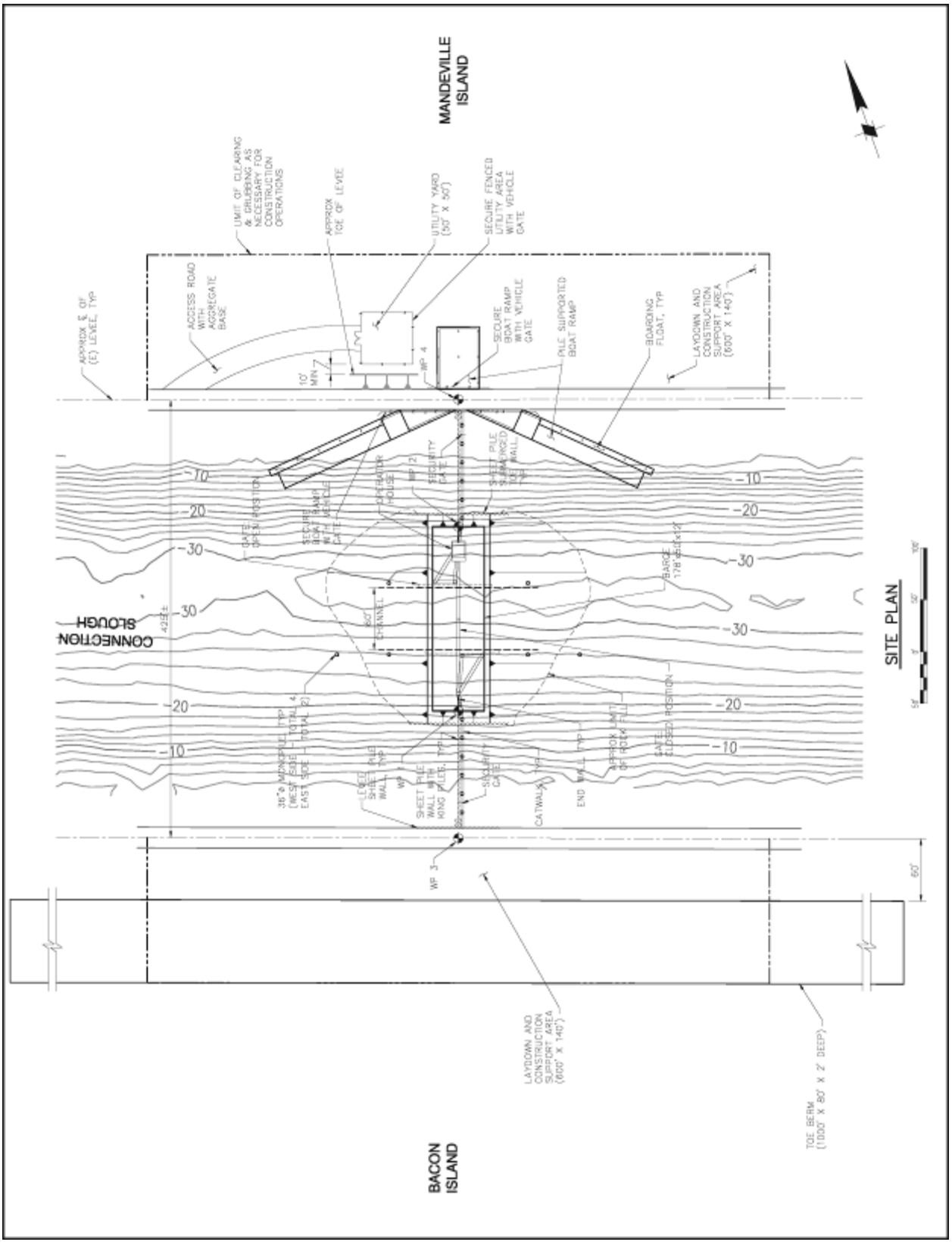


Figure 2-4 Connection Slough Site Plan View

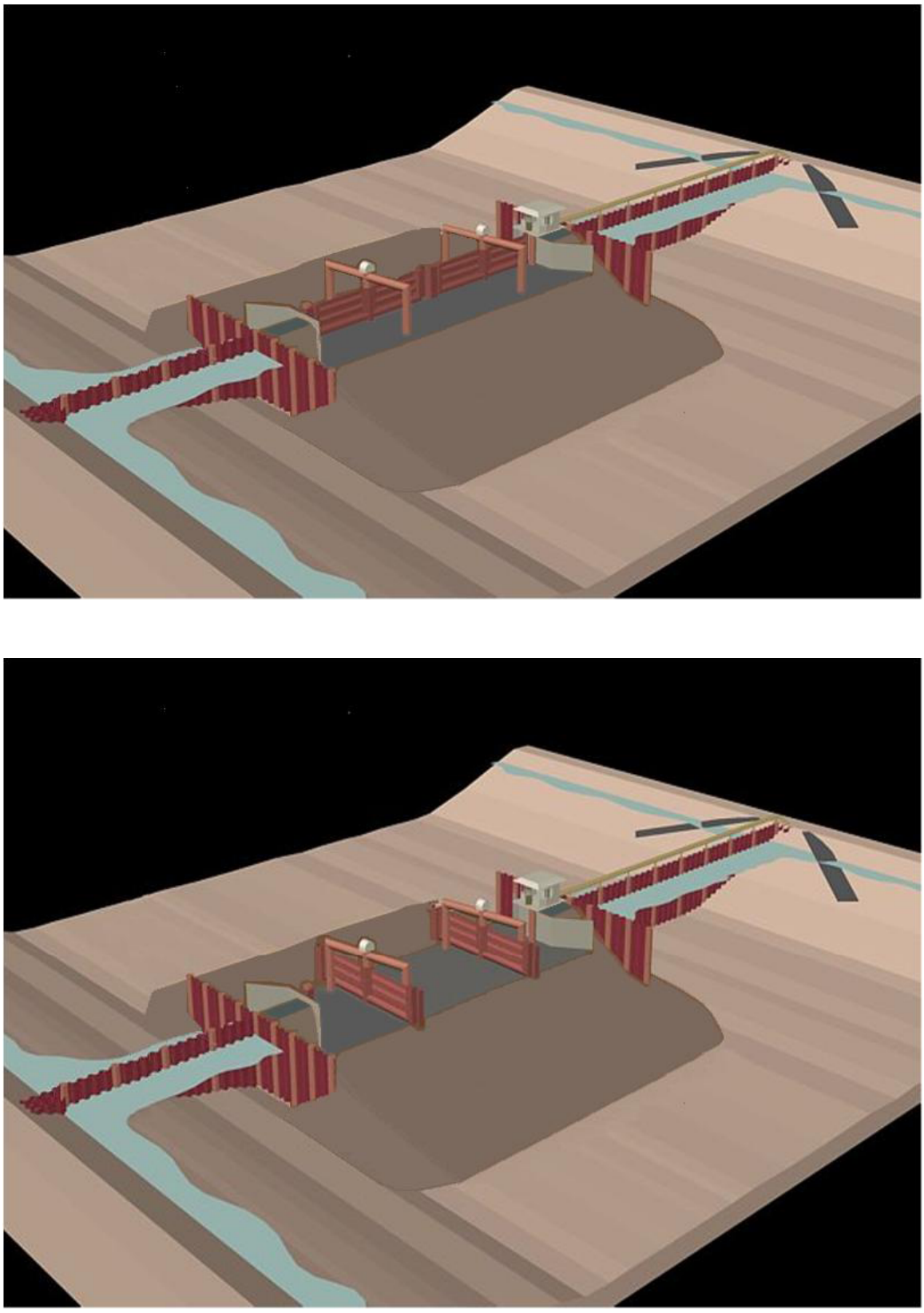


Figure 2-5 **Old River Slough Site Conceptual View Showing Gates Closed and Open**

The gates would be installed at two sites: one in Old River and one in Connection Slough. At Old River, which is approximately 800 feet wide at the Project site, about 300 feet of sheet pile dike would be placed at both ends of the approximately 200-foot long grounded barge, extending to the adjacent levees. At Connection Slough, which is approximately 400 feet at the Project site, about 100 feet of sheet piles would be placed at both ends of the approximately 180-foot long grounded barge to anchor it to the river banks. The sheet pile dike would extend into the levees on both sides of the channel. At each end of each dike a 50 foot perpendicular sheet pile dike would be installed into levees for approximately 25 feet on either side of the dike. Gate barges would be constructed offsite and floated to their respective Project sites and sunk to a prepared foundation. Barges would be locked in place with large rock.

Installation of the 2-Gates Project facilities would occur in the summer and fall of 2009 during the window for in-channel activities (which ends November 30th). From 2010 through 2014, the barge-gate system and sheet pile dikes would remain in place from late 2009 through 2014.

Under normal water conditions, the gates would not be submerged completely because the gate frames rise above the gates and would be visible under all tide stages. All in-channel structures would be designed to withstand over-topping during major flood events. The gates would be open during flood events and thus would accommodate 100-year flood flows with an approximately 0.1-foot change in flood stage elevation compared to the no-action condition. The gates are designed to operate up to a 3-foot maximum surface water differential elevation on either side of the gates, however because of velocity transients would only be operated up to a differential of 1.5 feet.

When open, the Old River gates would provide a 75-foot wide navigation opening to accommodate commercial and large private vessel traffic typical for these locations and the Connection Slough gate would provide a 60-foot opening. Both gates would include boat ramps, boat trailers and dedicated trucks to support passage for smaller recreational boats (a maximum of 24 feet and 10,000 pounds) when the gates are closed. It is anticipated that the gates would be open a large percentage of the time, which would limit the need to use the boat ramps.

2.5.2.1 Gate Design

At each site, two approximately 85-foot long butterfly gates would be mounted on a steel barge and ballasted into place on a prepared bed in the channel (Figures 2-3 and 2-4). The barge would be further held by rock fill placed along each side of the barge to provide additional resistance to lateral forces from tidal flows.

The double butterfly gate design consists of gates that are supported on a center pivot to allow vessels to pass through the gates when they are open. The 75-foot navigation opening is consistent with the navigation opening provided at the BNSF Railway Bridge, which is just south of the Old River site, for traffic on this river reach. The gate top elevation would be +8 feet (NAVD 88), and the pipe frame supporting the gates would be at +12 feet. The top of the sheet pile dikes would be +6.6 feet, and the top of the levees are set at 10.5 feet. The gate sill (barge deck) elevation would be at -13 feet. Two gates per location would be required to provide a 75-foot clear opening. An operator house would be constructed on the gate barges and would be manned by the gate operator, who would open and close the gates in response to fish protection criteria as well as to accommodate passage of commercial vessels and large recreational boats. The operator would coordinate the operations necessary for passage of small recreational boats using the levee boat ramps when the barrier gates are not otherwise open.

2.5.2.2 Gate Structures

The barge supporting the gates are expected to be approximately 200 feet long and 50 feet wide at the Old River Site and 178 feet by 50 feet at the Connection Slough Site, but their size may be changed as design/value engineering of the structure progresses, and actual available barges are identified and procured.

The gate barge would be about 12 feet high and designed with abutments to join the sheet pile dike at both ends. Barges would be sunk onto a prepared foundation at each gate location. The foundation would be prepared by dredging about 20 feet of peat beneath the foot print of the barge and refilling it with crushed rock.

2.5.2.3 Sheet Pile Dikes

A sheet pile dike would be placed between the gate structure and the levee. No excavation of the peat is needed between the gate and the levee for sheet pile placement. Preliminary analysis has been performed to check the required depth of embedment and estimate the strength criteria for the sheet piles acting as the dam between the gate structure and the levee. Based on this analysis, sheet piles in lengths of 60 to 70 feet would be required to be driven approximately 30 feet into the underlying sand layer. The sheet pile dike would be supported by 36-inch diameter king piles, set on approximately 20-foot centers at both locations (see Figures 2-3 and 2-4).

The sheet pile dike would tie into the levee and will require removal of a strip of existing levee slope protection material. At the gate barge end, a special end piece fabrication would be required to facilitate barge placement tolerances. The sheet pile wall can be constructed without displacing existing river bed peat material, thus minimizing the risk of seepage through the existing levees and the need for constructing cut-off walls within the existing levees.

2.5.2.4 Boat Ramps

Boat ramps (and associated small boat trailers and trucks) are provided to facilitate portage of small boats around the closed gates. Two pile-supported boat ramps would straddle the sheet pile walls at each of the two sites. The ramps would be elevated with piles and grated plates for launching and retrieving boats by the gate operator. Boarding floats would be provided alongside the ramps to facilitate staging of the boat launch and retrieval operation. The width of the levee would be increased to provide sufficient maneuvering space to accommodate launching and retrieving boats.

2.5.2.5 Mechanical and Electrical Components

The barge design would incorporate the piping and valves necessary for ballasting and de-ballasting operations, thus allowing the barge to be removed if necessary. The pumps, compressors, and generators for this operation would be provided on a separate construction support barge. Once the barge was submerged, the construction support barge would be removed until it was needed to lift the barge out of the water.

The electrical system would be powered by electric power from Pacific Gas & Electric Company (PG&E), using its nearby power line, or pending the PG&E interconnection; a skid-mounted diesel generator located on an upland area next to the existing levee would be used. The generator skid would be a self-contained system including a generator, diesel engine, starter batteries, and fuel tank. Should the system need to run continuously for an extended period of time, an additional fuel tank skid with fuel pump could be required.

Cabling would transmit the electrical power from the PG&E pole or the generator to the operator house. The operator would use levers on the control console to open and close the gates. The operator house would include outlets, fluorescent lights, and a wall-mounted heating, ventilating, and air-conditioning unit. The operator would control three sets of flood lights, allowing the eastern and western gates and boat ramp to be illuminated. Channel marker lights would be U.S. Coast Guard (USCG) approved.

Power for construction activities during the installation of the facilities would be from stand alone generators at each of the Project sites. Temporary power for construction is anticipated only for land based welding or

small winches or hoists to position barrier sheet elements. Most, if not all, welding and sheet pile placement is anticipated to be from the waterside barge.

2.5.2.6 Navigation Markers

Signage would comply with navigation requirements established by the U.S. Aids to Navigation System and the California Waterway Marker system as appropriate. A boat safety exclusion zone would be established to keep small boats clear of the closed gates in case gates begin to open, both to avoid gate swing and potential rapid changes in water velocity. A safety exclusion zone should also keep small boats clear of the upstream side of the barrier during floods when the barrier is spilling and boats could be swept over the barrier. Channel markers also would be installed to show that the center opening (between the gate pivot posts) is the only navigable opening in the structure, and the side openings are not to be used.

2.5.2.7 Fender System

A fender system would be implemented to provide protection to the gate structure resulting from potential vessel impact. The fenders would consist of six steel mono-pile dolphins constructed at each site. Three fenders would be placed at the sides of the navigation channel on the upstream and on the downstream approaches to the gates approximately 40 feet from the face of the barge. Vessel and recreational boating traffic intending to pass through the gates would enter the channel aligned with the gate opening and would not change direction until it has passed through the gate structure.

2.5.3 Project Construction

Construction of the gate structures includes installation of sheet pile dikes, dredging of the barge foundations, sealing the foundation from seepage, and refilling them with crushed rock. Following these steps, the sequence of events entails sinking the barges to the foundations, keying them into the sheet pile walls, and adding rock at each end of the barge, and on the sides of the barge to the lock the barge in place. Boat ramps will be constructed at each site and the existing levees will be widened to accommodate activities at the boat ramps. The prefabricated gate barge structures will be fabricated offsite and will be towed to the designated locations at Old River and Connection Slough.

The sheet pile wall sections to complete the barrier will then be installed, and the center pivot butterfly gates made operational. The Project will mostly be built from the water using barges and other vessels within the river channels. Materials will be brought to the site by barges. Some construction also will take place from the levees. For example, boat ramps will be constructed on one adjacent levee at each gate site. The boat ramps will intersect with the existing levee roads and will require a widening of the levee area to facilitate movement of the boats up one ramp and down the other. The boat ramps will be supported by piles and will be tied into the levee road.

The proposed design includes rock fill for the barge foundation and large rock for tie-in to the sheet pile dike. The preliminary geotechnical assessment concludes that the peat should be excavated from beneath the barge-gate foundation to increase the stability of the structure. The excavation at Old River is estimated at 7,000 cubic yards. Excavation at Connection Slough is estimated at 5,500 cubic yards. Seepage mats will be used where the peat layer is removed to control possible increased seepage through the channel bed to the adjacent islands.

2.5.3.1 Dredging and Rock Placement

Based on the geotechnical investigation, the weak peat material would be removed for the gate barge foundation by a barge-mounted clamshell dredge. Foundation preparation for the gate barge consists of dredging peat material estimated at 5,500 cubic yards for Connection Slough and 7,000 cubic yards for Old

River from the bed of Old River and Connection Slough to the top of the underlying compact sand layer (believed to be at about elevation -32'± at both sites). Seepage mats would be used where the peat layer is removed to control possible increased seepage through the channel bed to the adjacent islands.

Dredge material from the Connection Slough site can be sidecast over the levee. Material from Old River would need to be placed on a barge then offloaded over the levee. Dredged material would be disposed of locally on Bacon Island. The disposal area would be surrounded by a low berm in order to contain any runoff. Disposal of the12,500 cubic yards of material would require about 2.5 to 3 acres. A roughly 240-foot long by 65-foot wide support mat would be needed for the gate barge. The support mat would be roughly 5 feet thick. The foundation would be constructed with a layer of impermeable material to serve as a seepage barrier topped with a layer of crushed rock to an elevation of -25 feet, which would be graded for bedding the gate barge. It is anticipated that dredging and rock placement would require approximately 36 days.

While not anticipated to be required, removal of the peat material from the barge foundation may require additional sheet pile installation in the vicinity of the barge foundation parallel to the levees. It is currently anticipated that the additional sheet piles would be installed as a precaution to mitigate the potential seepage. These can be eliminated during construction should peat excavation not result in seepage.

2.5.3.2 Sheet Pile Dikes

A sheet pile dike would be constructed at each site. Sheet piles in lengths of 60 to 70 feet would be required to be driven through the peat and approximately 30 feet into the underlying sand layer. The sheet pile dike would be supported by 36-inch diameter king piles, set on approximately 20-foot centers across the channel at both locations. Sheet piles and king piles would be installed using vibration driving techniques.

The sheet pile dike would tie into the levee and would require removal of vegetation and riprap along a 75 foot length of levee on each side of each site. At each levee end a 50 foot long perpendicular sheet pile wall would be installed parallel to the levee and tied into the sheet pile dike.

2.5.3.3 Gate Barge Construction and Installation

Assembly and fabrication of the gate structures, and electrical and mechanical installation would be carried out in Rio Vista by the contractor. Prior to gate barge arrival at the site, sheet pile installation, dredging work and seepage barrier mat and bedding rock placement would have been completed. Guide piles may be installed to help position the barge during the ballasting / grounding procedure, but these piles would be removed once the barge is in place.

The gate barge for the Connection Slough Site would be delivered first according to the contractor's schedule and would be ballasted into place. Fendering dolphins would then be installed, and rock fill work would begin. The same sequence would then be repeated for the Old River site. The estimated installation time for the barges is estimated to be 31 days.

2.5.3.4 Levees

The levees will be bolstered on either side of the gates for a distance of approximately 50 feet using sheet piles and rock consistent with the agreement of Reclamation District 2025 associated with Holland Tract, Reclamation District 2028 associated with Bacon Island and Reclamation District 2027 associated with Mandeville Island.

2.5.3.5 Laydown and Construction Support Areas

Areas on Bacon Island and Holland Tract adjacent to the Old River gate site (measuring approximately 600 feet by 100 feet) have been identified for laydown and construction. Both locations will require clearing, grubbing, and grading per the contactor's recommendations. Similarly, on Connection Slough, an area on Bacon Island and Mandeville Island adjacent to the Project location (measuring approximately 600 feet by 140 feet) has been identified for laydown and construction.

These areas will include the pile-supported boat ramp estimated to be 80 feet by 40 feet and a 50-foot by 50-foot utility yard. The adjacent construction sites also may be used for storage of materials removed when the gate is deconstructed, pending reuse of the material for gate re-installation.

An area of approximately 12 acres on Holland Tract is available for storage of materials such as rock if rock needs to be removed and stored beyond the adjacent construction area prior to reinstallation. It is quite possible the Project would not require a rock storage laydown area since much of the gate is being constructed of sheet piles and it is anticipated that the barge foundations would remain in place.

Land areas will be needed for construction of the gate structures, tie-in of the sheet pile dikes to the levees, boat ramps, and creation of abutments to bolster the levees at the gate locations, and for any other land-side facilities such as parking for construction personnel and operations staff, and generators. Laydown areas will need to include initial staging of rock or sheet pile, as well as vehicles or equipment. Finally, approximately 3 acres of land will be needed for disposal of dredged material. The geographic areas in which rights are expected to be needed for construction and laydown are shown in Figures 2-1 and 2-2. The offsite rock storage area on Holland Tract and additional toe berm area to support the levee on the Bacon Island side of Connection Slough as required by Reclamation District 2028 are illustrated in Appendices F and G.

2.5.3.6 Access

Most of the construction (e.g., dredging, placement of rock, and driving sheet pile) would be done from barges. However, it may be necessary to deploy earthmoving equipment on the islands to install levee buttresses. Figure 2-2 shows the access routes that would be needed from public roads to the Project locations. Movement of earthmoving equipment during construction is expected to be limited to the construction/laydown areas shown above. Truck access to the dredged material disposal site would be within the Connection Slough and Old River work areas.

Connection Slough and Old River Project Sites are navigable from the San Joaquin River. The Old River Site is accessible by land from Holland Tract and Bacon Island. The west Old River levee is on Holland Tract and is accessible by road by proceeding through the town of Knightsen and crossing Delta Road Bridge on Delta Road. The Old River site is then accessed via a private road. The east side Old River Site is accessible via the private West Bacon Island Road approximately 10 miles from State Route (SR) 4 on Bacon Island Road. Part of West Bacon Island Road is an unpaved. The Connection Slough Site can be accessed by Bacon Island Road. The Mandeville Island side of the Connection Slough Site is accessed via a bridge crossing Connection Slough (Figure 2-1).

Any degradation to levee roads, private or maintenance roads and other access roads that result from land based construction equipment use would be restored to pre-construction conditions. For example, it may be necessary to grade and apply gravel to the Holland Tract access road. It may be necessary to grade and gravel the unpaved part of West Bacon Island Road. It may be necessary to pave small sections on the Bacon Island Road between SR 4 and Connection Slough to ensure safe passage of land-based construction equipment.

2.5.3.7 Vessel Passage during Construction

During construction, the contractor would maintain vessel access as needed. Notices of construction would be posted at local marinas and in the Local Notice to Mariners. Navigational markers would be used to prevent boaters from entering the construction area, and speed limits would be posted. Safe vessel passage procedures would be coordinated with the USCG and California Department of Boating and Waterways.

2.5.4 Project Schedule

Construction work at the Old River and Connection slough sites can be completed in about seven weeks. It would be scheduled to occur in the fall and early winter of 2009 in order to minimize impacts to sensitive aquatic and terrestrial resources as well as to avoid peak recreational use periods. Site preparation prior to the placement of the barges would require about one month (17 days at Connection Slough and 36 days at Old River). This includes dredging the foundation areas of the barges, laying rock in the dredged area, and the installation of sheet pile dikes. Placement of the barges would occur at the end of the site preparation period and would require approximately one additional month (20 days at Connection Slough and 24 days at Old River). Sheet pile installation would most likely be conducted during daylight hours only; dredging would be conducted 24 hours per day, as would rock placement and gate barge installation. Additional construction site details are presented in Appendices F and G.

The Project facilities would be operational immediately upon the completion of construction. They would be operated from December 2009 through June 2014. In 2010 through 2014 the gates systems and sheet pile dikes would remain in place with gates in an open position from July through November (Table 2-1).

Table 2-1 2-Gates Project Construction Timing and Duration

Construction Activity	Construction Timing	Construction Duration
Construction of sheet pile dike, dredging, installation of barge foundation rock	September/October 2009	Five weeks
Installation of barge with gates and anchor rock	November 2009	Two weeks
Removal of barge with gates, barge anchor rock at both sites, and sheet pile dikes	July 2014	Two weeks

2.5.4.1 Maintenance

Project facilities would require limited maintenance to insure operations and would include:

- Infrequent fueling and lubrication of emergency generators,
- Repair of coatings (e.g. painting) necessary to maintain equipment function, and
- Equipment repair essential to maintain Project function.

On-site maintenance would occur on a regular basis through qualified contracting services retained as part of the operational protocols of the Project. Annual maintenance activities would be scheduled to occur during the summer-fall non-operations period.

2.5.4.2 Removal

At the completion of the five-year demonstration period, the barge-mounted gates would be removed during the "in-water work window" prior to November 30, 2014. The barges and all associated facilities would be deballasted and removed from the Project sites. Rock fill would be removed only to the extent necessary to free the barge. The rock removed would be transported by trucks to the off-site rock storage area shown in

Figure 2-2. The other foundation materials would be left in place. Sheet pile dikes, boat launching ramps and all other 'in water' facilities would be removed up to the toe of the levee.

2.5.4.3 Restoration

Locations adversely affected by the Project would be restored and this includes:

- Construction laydown areas,
- Land-based utility yards, and
- Pile-supported boat ramps.

Restoration activities would be facilitated by siting to avoid sensitive areas (e.g. wetlands) and by limiting the duration of the use of land-based areas. The construction laydown areas would be used only during the associated land-based construction period. The adversely affected areas would be restored to meet local land use and resource agency requirements as soon as it was no longer needed. The pile-supported boat ramps would be removed as soon as they are no longer necessary, and the area below these decks would be restored to meet local land use and resource agency permit conditions.

A restoration plan would be developed, as required by applicable regulatory agencies, and would be completed prior to the onset of construction. The restoration plan would identify areas that would be restored and restoration methods. Seed mixes, schedules, success criteria, and success monitoring for restoration of wetlands, streams, and drainages would be identified. The restoration plan would be included in the contract specifications.

2.6 PROJECT OPERATIONS

2.6.1 Overview

Based on extensive hydrodynamic and delta smelt behavioral modeling, the 2-Gates Project is predicted to be very effective at controlling entrainment at the south Delta export facilities for a region of the central Delta largely bounded by the San Joaquin River between Dutch Slough and Old River. The circulation pattern developed by 2-Gates Project operation modeling within this region reduces negative flows in Old River and Connection Slough near Franks Tract. Although these actions are currently the subject of a court challenge, water management actions at the CVP and SWP facilities that are limited by the OCAP BO restrictions provide hydrodynamic conditions to reduce movement of delta smelt from the central Delta into the south Delta. The 2-Gates Project operation is expected to further reduce both the entrainment of delta smelt and the establishment of water quality conditions in the south Delta used by delta smelt. The Project facilities enhance the isolation of delta smelt from water management operations at the CVP and SWP pumps.

The coordination of the Project operations and the OCAP BO RPA flow actions form a hydraulic barrier to the upstream movement of delta smelt toward the pumps. Project operation is also designed to reduce entrainment of other pelagic fish species and not adversely affect anadromous fish. Modeling results indicate that the effectiveness of the 2-Gates Project operation is dependent on the distribution of delta smelt, estimated relative abundance, and water quality conditions.

Due to the need for immediate feedback, it is important to incorporate a real-time decision framework that evaluates the best course of action for particular delta smelt distributions, hydrodynamic conditions, and water quality. The 2-Gates Project is designed to work in concert with other operational measures that seek to manage flows on the mainstem San Joaquin River and other channels in the Delta during critical periods in order to maintain the general distribution of adult delta smelt generally within the region of influence of the

Project in the western and central Delta. Control of the adult delta smelt during upstream movement immediately prior to spawning may also control the distribution of larval and juvenile delta smelt.

The control of water movement from the western and central Delta into Old and Middle Rivers, when water quality conditions are expected to support upstream movement of delta smelt, is critical to the avoidance and minimization of entrainment of delta smelt (and other pelagic species) by the export facilities. These water quality conditions (decreased salinity and increased turbidity) are positively correlated with the onset of winter storm and runoff events on the Sacramento and San Joaquin rivers. The operation of the 2-Gates system would substantially reduce or eliminate direct upstream water flow from False River, Old River, and Franks Tract (either by tidal action or from operation of the export facilities) from the western and central Delta. The Project would be operated in consultation with the Smelt Working Group (SWG) and the Water Operations Management Team (WOMT) in a manner that considers salmon movement and that would accommodate the needs of commercial and recreational boaters.

Detailed operational parameters and actions are described in more detail below and in Appendix B. More information regarding the key monitoring parameters is provided in Section 2.6. The operations plan includes steps to evaluate the performance of the Project. The principal testing and evaluations are intended to better inform Project operational decisions and future water management operations with regard to the Project:

- Can provide better protection to delta smelt when used in conjunction and coordination with protection provided by the OCAP BO operations,
- Can maintain the distribution of pre-spawning adult delta smelt generally within the region of influence of the gates. where gate operations, in conjunction with OCAP BO flow restrictions, has been shown to be effective in reducing larvae/juvenile delta smelt entrainment by eliminating the influence of the net reverse flow in Old River near the San Joaquin River, and
- Can achieve, under certain hydrologic conditions, reduced export curtailments from that prescribed under OCAP BO operations alone.

2.6.2 Factors Considered in Project Operations

2.6.2.1 Hydrodynamics and Water Quality Factors Affecting Smelt Entrainment

Historical entrainment of delta smelt at the export facilities has primarily occurred during the period of December through June. The science related to smelt movement, behavior, and entrainment is continuing to improve, but the presence of water quality conditions in the south Delta and net flow reversals in Old and Middle rivers can be important factors leading to delta smelt entrainment. Adult delta smelt pre-spawning distribution is believed to be strongly related to specific ranges of salinity and turbidity. The recently released OCAP BO (USFWS 2008) identifies supports the linkages between turbidity and delta smelt occurrence. These water quality conditions (electrical conductivity less than 400 µmhos/cm and turbidity greater than 12 nephelometric turbidity units [NTU]) occurs in different parts of the Delta depending on naturally occurring hydrologic conditions and operation of the State Water Project (SWP) and Central Valley Project (CVP) facilities. These water quality conditions are sought by pre-spawning delta smelt. Smelt seeking these conditions are thought to move into the central Delta by surfing the tides and can remain in these areas of suitable water quality as they are moved about by the tides. However, under certain hydrologic and operating conditions, the water quality conditions can be substantially moved into the central and south Delta due to reversal of flows on the lower San Joaquin River. Actual mechanisms supporting the pre-spawning movement of delta smelt to inland areas are unverified. Under the current configuration of the south Delta, high exports during these times cause net flow reversals of Old and Middle rivers, drawing water with the water quality conditions identified above into the south Delta. These conditions can lead to entrainment of pre-spawning adult delta smelt. In addition, the assumption is that adult delta smelt spawning distribution in the south Delta

would likely result in increased risk of entrainment for larval and juvenile delta smelt due to the proximity of the export facilities.

2.6.2.2 Potential Measures for Controlling Delta Smelt Entrainment

Since the current hypotheses describing the mechanisms for delta smelt entrainment relate to either the movement of the water quality conditions into the central and south Delta or the direct transport of the early life stages from this region to the export facilities, management strategies to reduce the risk of delta smelt entrainment should seek to control associated adverse hydrodynamic conditions. The influence of 2-Gates operations in conjunction and coordination with OCAP BO restrictions have been assessed in the modeling analyses that follow.

2.6.3 Modeling Operations and Monitoring with Adult and Larvae/Juvenile Behavior Models

2.6.3.1 Modeling Process

Resource Management Associates (RMA) has developed and refined models of the Sacramento-San Joaquin Delta system (Delta model) utilizing the RMA finite element models for surface waters (see Appendix D). The RMA models are a generalized hydrodynamic model that is used to compute two-dimensional depth-averaged velocity and water surface elevation (RMA2) and another model (RMA11) is a generalized two-dimensional depth-averaged water quality model that computes a temporal and spatial description of water quality parameters. RMA11 uses stage and velocity results from RMA2. The Delta model extends from Martinez to the confluence of the American and Sacramento Rivers and to Vernalis on the San Joaquin River. Daily average flows in the model are applied for the Sacramento River, Yolo Bypass, San Joaquin River, Cosumnes River, Mokelumne River, and miscellaneous eastside flows which include Calaveras River and other minor flows. The model interpolates between the daily average flows at noon each day. Delta Islands Consumptive Use (DICU) values address channel depletions, infiltration, evaporation, and precipitation, as well as Delta island agricultural use. DICU values are applied on a monthly average basis and were derived from monthly DSM2 input values. Delta exports applied in the model include SWP, CVP, Contra Costa exports at Rock Slough and Old River intakes, and North Bay Aqueduct intake at Barker Slough. Dayflow and IEP database data are used to set daily average export flows for the CVP, North Bay Aqueduct and Contra Costa's exports. Historical simulations were run for the period between December and July for 1999-2000, 2002-2003, 2003-2004 and 2007-2008 to evaluate how conditions change in the Delta under historical conditions, historical conditions operated under the OCAP RPAs and operated under OCAP RPAs with the Project.

Effective real-time forecasting requires knowing initial water quality and flow conditions, acquiring and interpreting delta smelt survey and salvage data, operations forecasts, and timely agency interaction. Forecasts would utilize the most recent field observations of delta smelt distribution and density; and forecasted estimates of inflow, inflow water quality, and operations. For each forecast period, several simulations may be performed using alternative estimates of future conditions. An initial set of forecast simulations would be performed using best estimates of future operations provided by Reclamation and DWR system operators. Upon review of delta smelt distribution and entrainment estimates by the Smelt Working Group (SWG), a second set of forecast simulations may be performed with revised future operations with the objective of identifying operations that reduce expected delta smelt entrainment.
In real-time, an initial set of forecast simulations will be performed using best estimates of future operations provided by Reclamation and DWR system operators. Upon review of delta smelt distribution and entrainment estimates by the Smelt Working Group (SWG), a second set of forecast simulations may be performed with revised future operations with the objective of identifying operations that reduce expected delta smelt entrainment.

2.6.4 2-Gates Operations in Conjunction with OCAP BO Flow Management

2-Gates operations would be conducted in conjunction and coordination with the OCAP BO Old and Middle River RPAs. Flow, salinity, turbidity, and particle forecasting simulations would be performed to forecast timing of the Old River and Connection Slough gate operations consistent with the RPAs. OMR flow restrictions would be achieved primarily through export curtailments.

Since the 2-Gates Project is being proposed as a temporary solution aimed at reducing delta smelt entrainment, it is useful to describe an operating plan that is sufficiently flexible to adapt to real-time monitoring and predictive hydrodynamic, water quality, and delta smelt behavior modeling. DSM2 modeling results have shown that the operational effects of various measures of entrainment are strongly influenced by the initial distribution of delta smelt and relatively short duration adverse hydrodynamic conditions in winter and spring. The following operating measures are described as examples of different operations under changing field conditions.

2.6.4.1 Operation—December through February

The 2-Gates Project operations are designed to be operated in conjunction with and in coordination with OMR flows prescribed through the U.S. Fish and Wildlife Service's OCAP Biological Opinion (Biological Opinion). Project operations would take place in consultation with the Smelt Working Group (SWG) and the Water Operations Management Team (WOMT). The 2-Gate Project operations, in conjunction with OMR restrictions, would be guided by the following two actions:

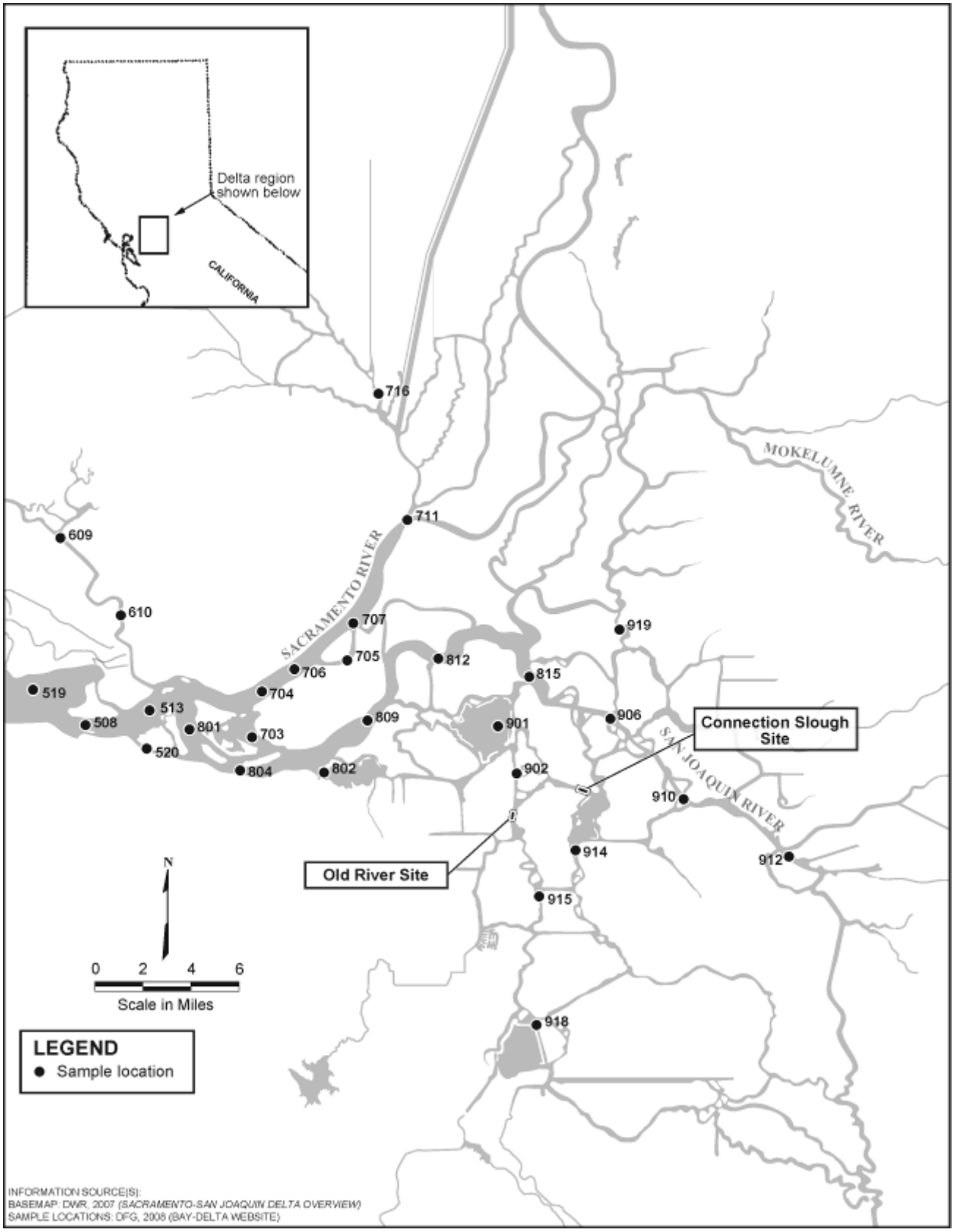
- Old River and Connection Slough Gates would be operated when triggering turbidity concentrations ≥ 12 NTU begin to appear at the region of influence of the 2-Gates, defined here as San Joaquin River at Jersey Point. Hydrodynamic modeling results indicate that the gates would be operated about an hour per day in a closed position, combined with flow balancing to manage the turbidity plume and adult delta smelt distributions, generally within the region of influence of 2-Gates. In this region, behavioral modeling has shown that 2-Gates, in conjunction with OMR flow restrictions is effective in maintaining the turbid conditions linked to pre-spawning movement of delta smelt generally within the region of influence of the gates, thereby reducing the entrainment of delta smelt at the CVP and SWP pumps. These early actions also control the initial distribution of larval and juvenile delta smelt in locations that reduce the probability of entrainment at the CVP and SWP export pumps.
- Preemptive management of the turbidity plume and attracted adult delta smelt distributions would be accomplished using 2-Gates operations in conjunction with OMR flow restrictions. The restriction of OMR negative flow rates would be triggered when turbidity ≥ 12 NTU is exceeded at San Joaquin River at Prisoners Point, about a day after 2-Gates operations would be triggered at Jersey Point. These operations would actively manage the turbidity plume further downstream and several days earlier than specified in the OCAP BO RPA (OMR 3-station turbidity trigger). Alternatively, OMR restrictions in conjunction with 2-Gates operations would be tested in conjunction with OMR flows initiated upon the OMR 3-station turbidity trigger. Flexibility would be retained in field demonstrations to test both turbidity triggering options. In addition to OMR restrictions, operational flexibility would be retained in isolated cases to test effects of moderately increased San Joaquin River flow measured by QWEST[2] @ San Andreas ≥ 0 cfs. Hydrodynamic modeling indicates that this action would be effective in restricting smelt passage and reducing entrainment in conjunction with the 2-Gates. These operations would be taken until the 3-station daily mean water temperatures at Mossdale, Antioch and Rio Vista ≥ 12ºC, signaling a transition from adult to larvae/juvenile delta smelt management actions.

[2] QWEST, in this case, is the net average daily flow in the San Joaquin River at San Andreas Landing.

2.6.4.2 Operation—March through June

Gate operations and flow control measures during the adult delta smelt life stage, are expected to maintain the turbidity plume and adult distributions generally in region of influence of the 2-Gates Project. With adult distributions generally in this region, 2-Gate operations in conjunction with OMR restrictions for larvae/juvenile delta smelt have been shown to be effective in significantly reducing entrainment. The 2-Gates operations for larvae/juvenile smelt would take place from March through June except during the Vernalis Adaptive Management Plan (VAMP) period (April 16 – May 15), and the Memorial Day weekend when gates would remain open. These operations would limit entrainment and manage the distribution of larvae/juvenile delta smelt through monitoring of delta smelt densities, spawning areas, and biweekly predictive modeling. 2-Gates operations and OMR restrictions would be governed by the following two actions:

- Based on the real-time monitoring of hydrodynamic conditions, 2-Gates operations and OMR restrictions for larvae/juvenile delta smelt would be imposed, in consultation with the Smelt Working Group (SWG) and the Water Operations Management Team (WOMT), when the 3-station daily mean water temperatures at Mossdale, Antioch and Rio Vista ≥ 12ºC signaling a transition from adult to larvae/juvenile delta smelt management actions.
- 2-Gate operations and OMR restrictions would take place, consistent with boundary conditions of OMR discretionary operations, until June 30 or until the daily average temperature reaches 25ºC for three consecutive days at Clifton Court Forebay.



PTM = Particle Tracking Model

Figure 2-6 IEP Monitoring Stations for Long Term Delta Fish Surveys

2.6.4.3 Daily Gate Operations Cycles

ADULT DELTA SMELT (DECEMBER THROUGH FEBRUARY)

To protect migrating and pre-spawning adult delta smelt from December through February, both gates would be operated about an hour per day in the closed position to manage the movement of adult delta smelt habitat (turbidity plume) through the balancing of daily flows generally within the region of influence of the gates.

LARVAE/JUVENILE DELTA SMELT (MARCH THROUGH JUNE)

To provide added protection to larvae/juvenile delta smelt from March through June, the predominate mode of gate operations would be with the Old River gate closed about 10 hours per day on flood-tide and open on ebb-tides (including slack-tides), during which the Connection Slough gate would be open about 4 hours per day on slack-tides. The gates would remain open during the Vernalis Adaptive Management Plan (VAMP) period (April 16 – May 15), and on Memorial Day weekend for recreational purposes. However, to retain flexibility during field demonstrations, one or both gates could be operated in the flood-ebb mode, or could be operated during VAMP if fish migration monitoring allows.

JULY THROUGH NOVEMBER

The gates would not be operated from July through November, and would remain in a fully open position.

2.6.4.4 Gate Operation Protocols for Commercial and Recreational Boat Traffic

Open-gate periods consistent with 2-Gates operations would be prepared and posted weekly on the Project website and posted at local marinas. These periods would also be published through the U.S. Coast Guard Notice to Mariners for commercial and recreational boat traffic.

> December – February. The gate opening schedule for commercial and large recreational vessel passage during adult delta smelt gate operations allows both gates in an open position about 23 hours per day, excepting gate closures on one or the other of the high tides.
>
> March – June. The gate opening schedule for commercial and large recreational vessel passage during larvae/juvenile delta smelt gate operations allows gates in an open position about 14 hours per day during ebb-tide (including slack-tides) conditions on Old River, and about 4 hours a day on Connection Slough during slack-tide conditions. Gates would be in an open position on the Memorial Day weekend.

Construction Stage Vessel Passage: During construction, the contractor would maintain vessel access as needed. Notices of construction would be posted at local marinas and in the U.S. Coast Guard Notice to Mariners. Navigational markers would be used to prevent boaters from entering the construction area, and speed limits would be posted. Safe vessel passage procedures would be coordinated with the USCG and California Department of Boating and Waterways.

Small recreational vessels would be allowed to pass through the gates along with the commercial and large recreational vessels. Small recreational vessel would also be allowed to portage around the 2-Gates facilities via the use of the boat ramps and small boat trailer facilities provided. As described above, two pile-supported boat ramps would straddle the sheet pile walls at each of the two sites. Ramps would accommodate recreational vessels up to 24-feet in length.

2.7 ENVIRONMENTAL MONITORING FOR OPERATIONS

2.7.1 Introduction

The modeling results indicate that the effectiveness of the 2-Gates Project operation, or other measures, is strongly dependent on the distribution of smelt, estimated relative abundance, and the hydrodynamic conditions of that particular survey date. These results also indicate that the 2-Gates facilities are effective for all Old and Middle River (OMR) flow regimes. In order to optimize the operation of the two gates to reduce entrainment at the pumps, a regime of control has been established for which the two gates are most effective, based on the above conditions. Hydrodynamic modeling has suggested that the two gates perform best against particle entrainment at the pumps when the particles are in the region roughly bounded by the San Joaquin River near Big Break, False River, Fisherman's Cut, and the mouth of Old River north of the gates. Operation of the gates when smelt are well outside of this region is likely to have no or slightly adverse effects.

Because the two gates have an optimal region of control, real-time monitoring is necessary to identify, or forecast, when smelt are first to occur at the boundaries of the region. This monitoring could comprise two-day or three-day monitoring of smelt at these locations, forecasts of particle fate using particle tracking model simulations re-initialized weekly with the current state of the system, fixed-station flow, and smelt monitoring at the Sacramento River near Emmaton and at the San Joaquin River near Jersey Point to understand whether the smelt are moving or originating upstream or downstream of each station, or a combination of these actions. This monitoring, combined with rapid decision protocols, would allow the two gates to be operated for optimal fish protection. The gates would otherwise be open to facilitate normal passage.

The 2-Gates Project would work in concert with other operational measures that reduce flows toward the pumps, providing potential benefits to both delta smelt as well as San Joaquin River and Mokelumne River salmonids. While other operational measures are not a part of the environmental documentation for the 2-Gates Project, a real-time dual hydrodynamic approach for protecting against delta smelt and salmonids entrainment would likely be the most appropriate strategy. The strategy could focus on (1) targeted increases to flow rates near San Andreas to protect against rapid reversals on the San Joaquin River, and (2) the 2-Gates for protection against entrainment within the Old River-Franks Tract-Big Break-False River region. These two actions could work in concert for effective protection of delta smelt and salmonids and could effectively integrate within flow control measures described in the OCAP BO (USFWS 2008). An objective of these two actions would be to ensure no net increased entrainment of Mokelumne River salmonids under 2-Gates Project demonstration operations. Related studies of such combined actions are addressed in Appendix D.

This monitoring requirements and protocols (monitoring plan) included in the Project are designed to obtain water quality and biological data needed to efficiently operate the Project facilities and to determine the effects of the 2-Gates Project operations on delta smelt, salmon, steelhead, green sturgeon and longfin smelt. These monitoring requirements and protocols are guided by the principles of adaptive management, which uses science tools to improve management decisions. Assessing the performance of the 2-Gates Project is a critical component of the adaptive management cycle. Monitoring would provide data essential for evaluation, which would then feed back into learning, refining the conceptual model and objectives if necessary, and adapting management actions to the operations. Monitoring also would occur over a five-year period to evaluate the effectiveness of the 2-Gates Project; however, this description focuses on the monitoring that would occur during the first year of operations. This monitoring plan is the starting framework and future efforts may be substantially influenced from what is learned from the results of the monitoring during the 2009-2010 operating season and by technological advances in monitoring tools.

Project monitoring requirements includes the needs to provide real-time monitoring to determine triggering conditions for Project operations and documenting resultant hydrodynamic, water quality and biological responses. Real-time monitoring results may also be useful for refining operations to minimize detrimental

effects on water quality and sensitive species, and for documenting other Delta factors that may be important when considering the overall efficacy of Project operations. The monitoring program builds on ongoing monitoring efforts conducted through the Interagency Ecological Program of the CALFED Bay-Delta Program and other Delta area programs. Because the Delta is a complex and variable system, multiple parallel approaches are often necessary to develop useful monitoring information, and the proposed monitoring program reflects this need.

2.7.2 Monitoring Objectives

The 2-Gates Project monitoring program has two objectives:

1) Detect conditions to trigger gate operations, and

2) Evaluate the effects of 2-Gates operations, including any unforeseen consequences, on:

   – Delta smelt, salmon, steelhead, green sturgeon and longfin smelt
   – Water quality in the southern Delta
   – Entrainment of fish species at the pumps

2.7.3 Monitoring Methods

This section outlines the type of information and monitoring methods that would be required both to guide operations of the gates and to evaluate the effects on fish and water quality, as expressed in the Project hypotheses. The approach would rely on data from existing monitoring programs, with enhancements to provide finer resolution data (e.g., additional sites for fish monitoring) or address additional factors (e.g., fish occurrence at gate structures). The overall monitoring approach is summarized in Tables 2-2, 2-3, and 2-4.

Table 2-2 Monitoring of Triggers for Gate Operations

Indicators	Method	Location	Frequency	Duration	Monitoring Enhancements
Instantaneous Flow, Net Flow, Stage	Flow Monitoring	Existing stations	Real-Time (hourly)	December – June	No adjustments to this existing program
Turbidity, Electrical Conductivity, Temperature	Automated Water Quality Monitoring	Jersey Pt., Prisoners Pt.	Real-Time (hourly)	December – June	No adjustments to this existing program
Delta smelt density and location	Spring Kodiak Trawl	Existing stations	Every other week	January - March	Increase sampling frequency at stations in the central and south Delta to twice per week during December-March.
	20 mm Survey	Existing stations	Monthly to bi-weekly	March-June	Increase sampling frequency at stations in the central and south Delta to twice per week during December-March.
	Salvage Monitoring	Skinner Fish Facilities	Daily	March-June	No adjustments to this existing program

Table 2-3 Monitoring to Evaluate of Gate Operations on Fish

Indicators	Method	Location	Frequency	Duration	Monitoring Enhancements
Density and location of smelt and salmonids	Spring Kodiak Trawl	Existing stations	Every other week	January - March	Increase sampling frequency at stations in central and south Delta to twice per week during December-March
Density and location of larval longfin and delta smelt	Longfin smelt Larval Trawl	Existing stations	Every other week	January-June	Increase sampling at south Delta stations to twice per week during January-June
Population index of adult smelt	Fall Midwater Trawl	Existing stations	Monthly	September-December	No adjustments to this existing program
Population index of juvenile delta smelt	Summer Townet Survey	Existing stations	Twice annually	June - August	No adjustments to this existing program
Entrainment indices	Salvage Monitoring	Skinner Fish Facilities	Daily	All year	No adjustments to this existing program
Location and movement of tagged salmon in relation to gate operations	Juvenile salmon migration study	Releases in lower Sacramento, Mokelumne and San Joaquin rivers	Multiple lots each migration season	March – May	Additional acoustic tags for release sites, additional release sites in the central Delta, additional hydrophone stations
	CWT tag recoveries in salvage	Skinner Fish Facilities and TCFC	Ongoing annually	December-June	No adjustments to this existing program
Timing of outmigrating of San Joaquin river salmon	Mossdale Trawl	Mossdale Trawl Operation dates for Head of Old River Barrier (HORB)	3-5 days per week	January -May	No adjustments to this existing program
Presence of large predators, adult sturgeon or adult salmon	Boat-mounted DIDSON Camera , Acoustic tagging of predators	Immediately upstream and downstream of gates, and control sites in central Delta channels	Bi-monthly during gate operations	December – mid May	New sampling program

Table 2-4 Monitoring to Evaluate Effects of Gate Operations on Water Quality

Indicators	Method	Location	Frequency	Duration	Monitoring Enhancements
Turbidity, Electrical Conductivity, Temperature,	Automated Water Quality Monitoring	Multiple from Western Delta to South Delta	Real-Time (hourly)	All year	No adjustments to this existing program.
Temperature, Electrical Conductivity, Turbidity, Dissolved oxygen concentration	Automated Water Quality Monitoring	¼ mile downstream and upstream of each gate.	Real-Time (hourly)	During prolonged gate closure	New sampling program adding four monitoring stations at the gates, and roving crew for profiles

2.7.4 Monitoring Needs

2.7.4.1 Monitoring to Detect Triggering Conditions

Gate operations would be triggered by water quality conditions and distribution of delta smelt. The monitoring elements are detailed below and summarized in Table 2-2.

Water Quality

Existing sites for water quality monitoring occur at USGS and DWR supported sites around the Delta. The sites to be used for monitoring water quality triggering levels include those listed in Table 2-4 and Figure 2-7. The main water quality parameters include turbidity (NTU), electrical conductivity (µmhos/cm.), and water temperature (C°). Some sites also provide a flow. According to the OCAP BO (USFWS 2008), conditions that initiate delta smelt movement in advance of spawning are associated with the storms that generate sufficient runoff in the Sacramento River to affect water quality in the Delta beginning in late December. Delta smelt salvage occurs at the CVP Tracy Fish Collection Facility (TFCF) and at the SWP Skinner Fish

Facility (SFF) following these water quality events (USFWS 2008). Ongoing water quality monitoring for turbidity, electrical conductivity and temperature at Jersey Point and Prisoners Point would be used to determine triggering conditions for operating the gates.

DELTA SMELT PRESENCE

Delta smelt occurrence in the vicinity of the gate structure would be determined by using a Kodiak Trawl deployment earlier in the season (December instead of January) at an expanded number of monitoring sites in the area leading up to the gates and in Middle River and the San Joaquin River. Frequent sampling at multiple stations in the central Delta would be necessary to determine the proximity of migrating delta smelt to the gates. Monitoring salvage at the TFCF and SFF would be ongoing for the occurrence of pre-spawning adult delta smelt.

2.7.4.2 Monitoring to Detect Effects of Gate Installation and Operations

Three components of the Delta ecosystem would be directly altered or influenced by the installation and operation of the gates and need to be monitored: hydrodynamics, water quality and fisheries. Monitoring of these factors would help define how gate operations affect conditions in the central and south Delta. This section describes the monitoring elements proposed for evaluating the response of fish (Table 2-3) and water quality (Table 2-4).

Hydrodynamics

Real-time monitoring of flow in key Delta channels would document hydrodynamic changes caused by gate operations. Hydrodynamic changes can change impacts to water quality and fish species distribution. Real-time flow monitoring data would also be essential to correctly interpreting the results of water quality and biological monitoring. A combination of existing flow stations (Figure 2-7) and remotely operated Acoustic Doppler Channel Profiles (ADCP) would be used at strategic locations in Old, Middle, and False rivers; Fisherman's Cut and the San Joaquin River; and other channels (Rock Slough, Dutch Slough) as necessary to document the changes in flow patterns in the conveyance channels and other channels as a result of the 2-Gates Project.

Water Quality

Gate closure would reduce or attenuate tidal flows in and out of Old River between Franks Tract and Railroad Cut and in Connection Slough. Levels of dissolved oxygen, turbidity and temperature would be monitored in the area in close proximity to the gates and in the channels on either side to document water quality conditions. Monitoring would occur with deployed sensors (such as a Hydrolab Datasonde®) and with a roving water quality crew using a boat and a portable meter with a sensor on a 50-foot lead to obtain water profile data. All water quality instruments would be calibrated weekly. Actions would be taken to open the gates if closures result in elevated water temperatures (exceeding 18 °C for smelt spawning, or 24°C for smelt survival) or if dissolved oxygen levels approach 5.0 ppmv for the protection of salmon.

Established DWR, Reclamation, and USGS monitoring sites would be used in conjunction with monitoring sites established for 2-Gates (Figure 2-7).

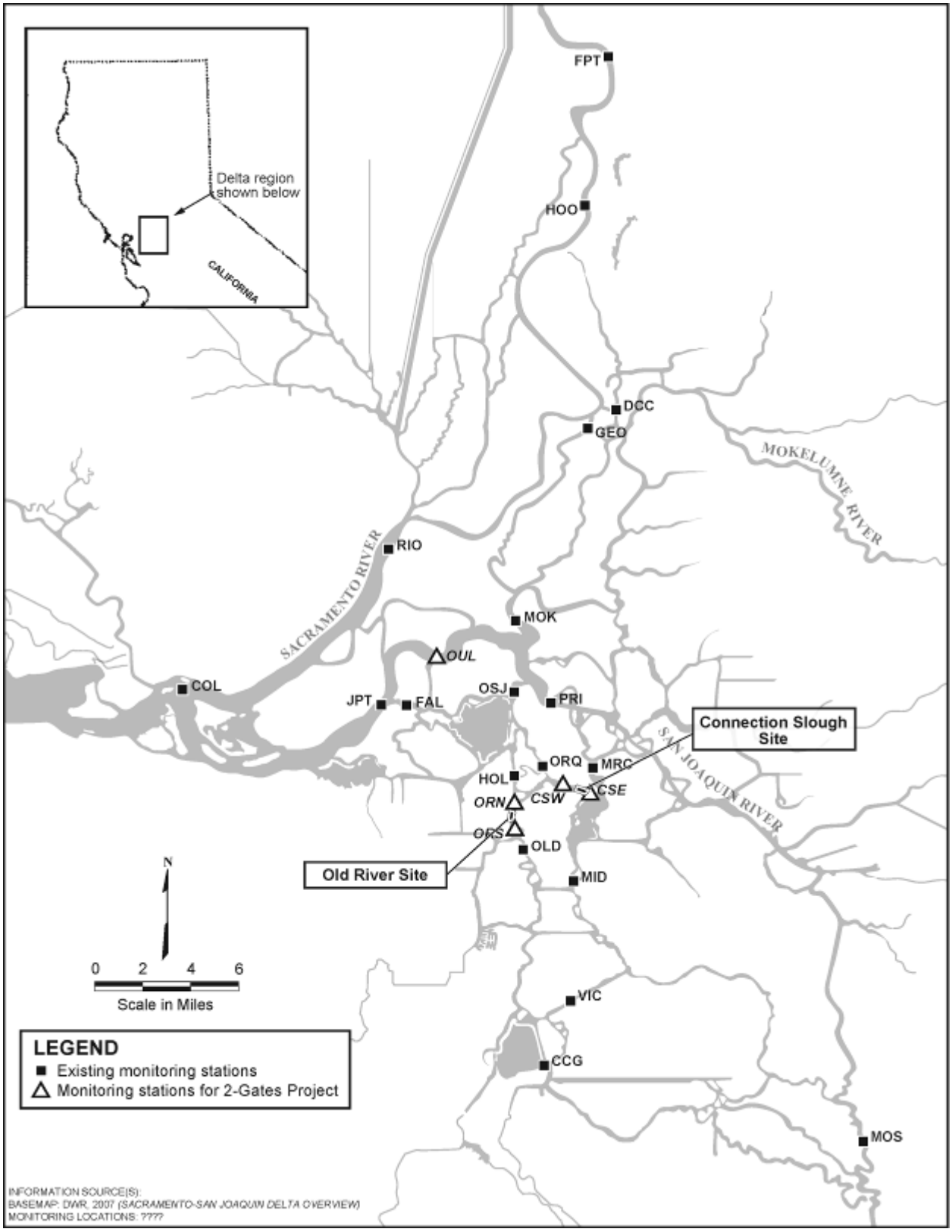


Figure 2-7 **Locations of Existing DWR, Reclamation, and USGS Monitoring Stations in the Delta and Stations that would be added for the Project**

Fish Response

Gate closure would prevent delta smelt, salmon, and other fishes from migrating up Old River or into Middle River from the Franks Tract area by changing the water quality dispersal or by being physically blocked during gate closures. Particle tracking and delta smelt behavioral models indicate that gate operations would have beneficial effects on adult and larval delta smelt by reducing entrainment. Direct sampling of the larval fish community at sites in the central and south Delta would be used to assess the results of the model. Migrating smelt could spawn in the vicinity of Franks Tract, elsewhere in the western Delta or move up the San Joaquin River for spawning. However, there is an undesirable possibility that smelt blocked by the gates from entering Old and Middle Rivers directly would move into Middle River around the north side of Mandeville Island and become entrained through Project-related increased reverse flows in Middle River. Frequent, direct sampling of fish density at sites throughout the south and central Delta would be needed to determine whether the effects of gate closure on migrating delta smelt were desirable during the December to June operating period.

The effects of gate operations on juvenile salmon and steelhead would be evaluated by tracking acoustic-tagged juvenile salmon and steelhead on their migration routes through the Delta. During 2008, the Sacramento River Salmon study was conducted using an array of hydrophone listening stations to track individually tagged juvenile salmon in real time as they moved down the Sacramento River and through the Delta. A similar approach was developed for the Mokelumne River and VAMP pilot studies conducted in 2007 and 2008 used acoustic tagged salmon and listening stations to track survival into the Delta. The 2-Gates Project Monitoring Program would use the structure of these studies monitor movement of salmonids into the south Delta and would closely coordinate and cooperate with similar studies planned form 2009-2010. The 2-Gates Project would provide additional acoustic tagged fish and hydrophone monitoring stations (Figure 2-8) to evaluate how juvenile salmon and steelhead move through the area of the Delta affected by 2-Gates operations. Coded Wire Tagged (CWT) tagged fish would also be used to evaluate the fate of salmon and steelhead moving through the Delta. CWT recoveries would be evaluated based upon release time and location and recovery time and location at either the Chipps Island trawl, the fish salvage facilities or other CWT recovery efforts. Combined, these methods would allow for the evaluation of the effects of 2-Gates Project on the migration route, migration time and survival of juvenile salmonids.

Salvage

A measure of the effects of gate operations on entrainment would be the relative quantities of each species salvaged at the SFF and TFCF compared to what occurred without the installation of the 2-Gates Project. Salvage data from periods of gate operation would be compared to historic data of average salvage rates categorized by water year type and OMR flows. This comparison would provide general idea of whether gate operations are succeeding in the goal of reducing entrainment or having unintended consequences on entrainment of certain species or life stages, or runs.

Predation

Predation may become an undesirable consequence of gate operations if predatory fishes are able to effectively utilize the gate structures or the turbulence associated with operations to increase foraging success. Several methods are available to assess predator populations. A DIDSON camera can be used to image areas near the gate to search for large predators using the turbulence associated with open gates. DIDSON cameras would be used to image standard transects on either side of the gate and at control sites during closed on open conditions to enumerate and identify large predators. Imaging would be done from boat-based platforms and could be used to compare to similar localities without gate structures. Periodic localized boat electrofishing around the gate structures would document other resident fishes that may occupy habitats created by the gate structures. A third method is the capture, acoustic tagging and track predators near the gates (Figures 2-9 and 2-10).

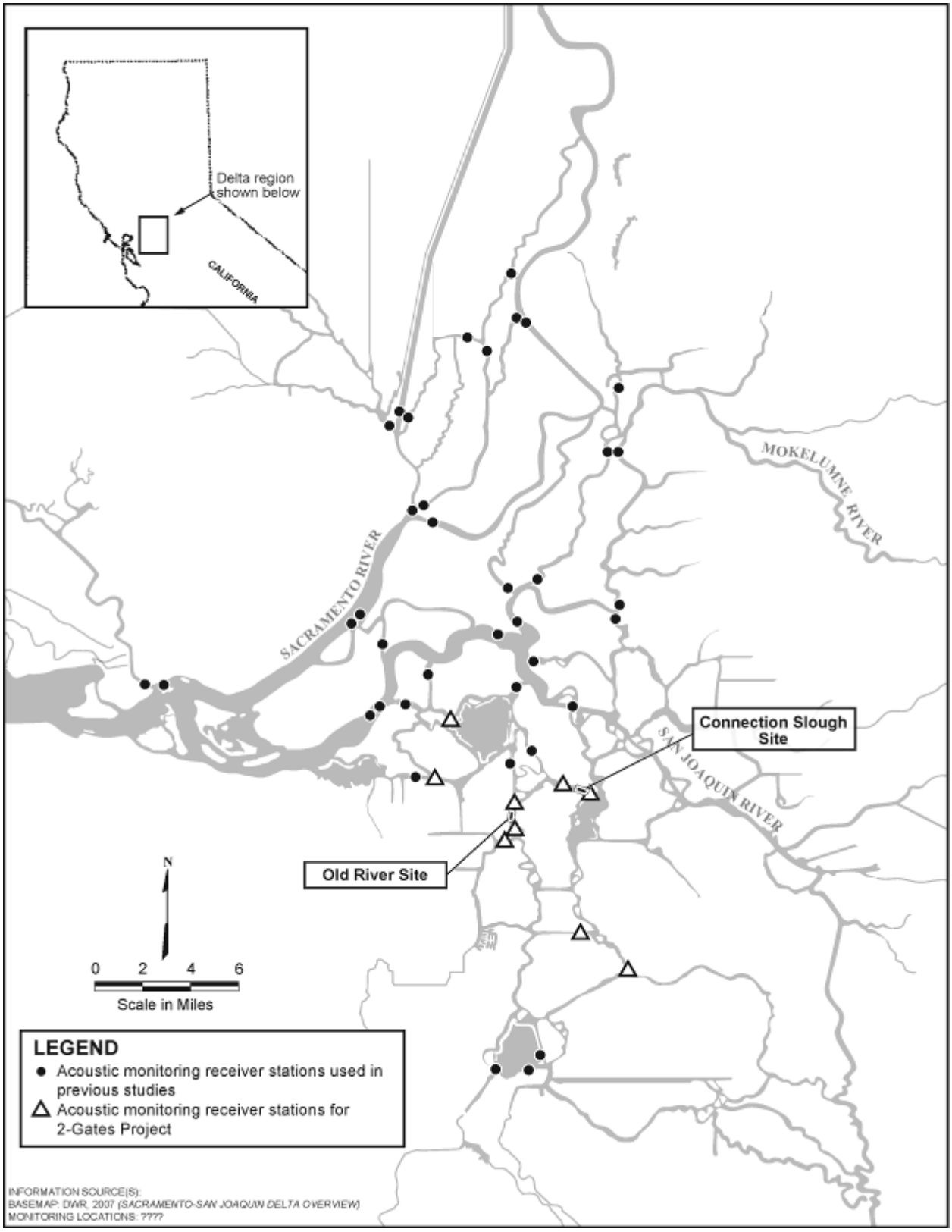


Figure 2-8 **Acoustic Monitoring Stations Used in Previous Studies and Monitoring Stations that would be added for the Project**

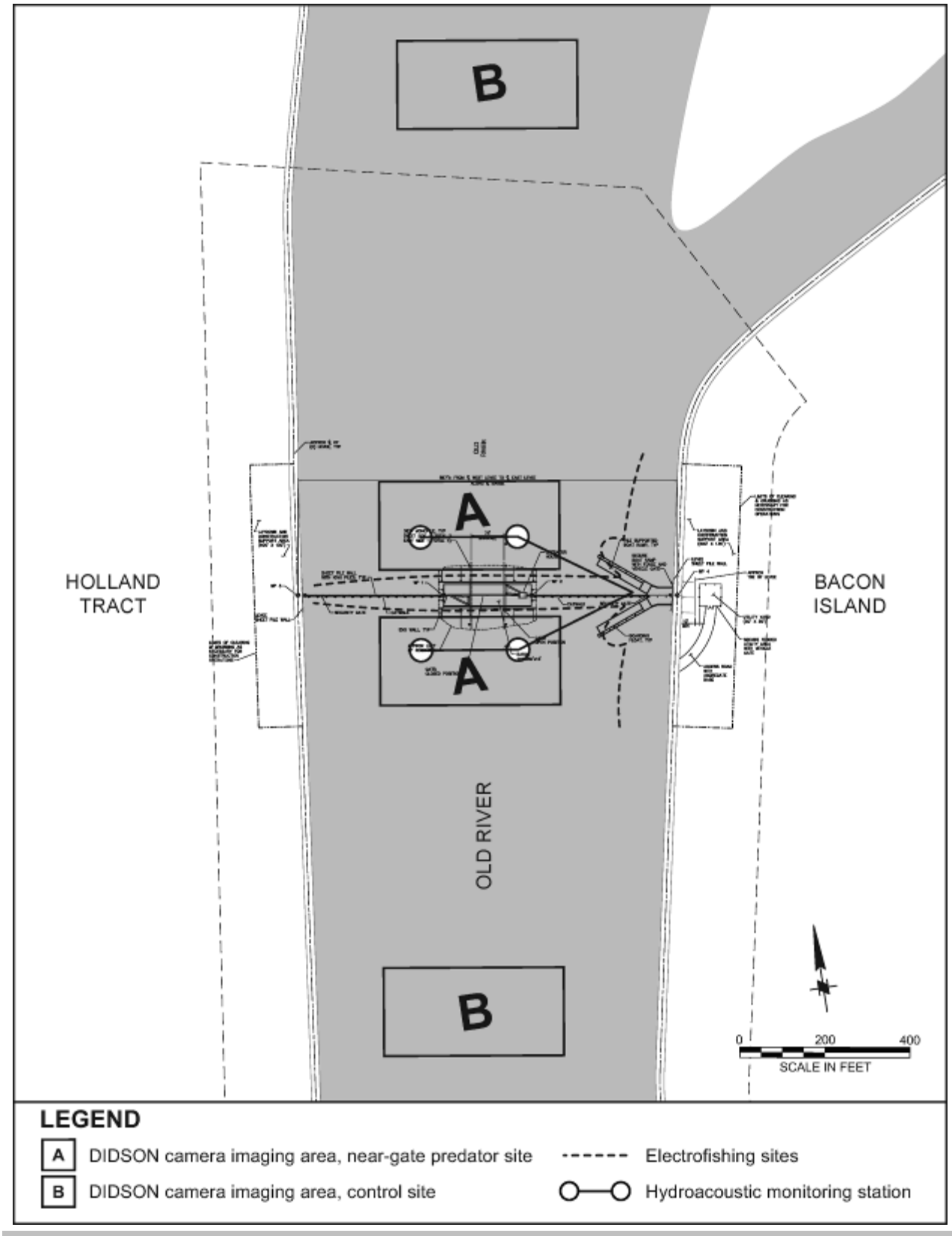


Figure 2-9 **Old River Gate Area showing location of continuously recording hydrophone array, monitoring areas for boat-based DIDSON imaging and electrofishing sites**

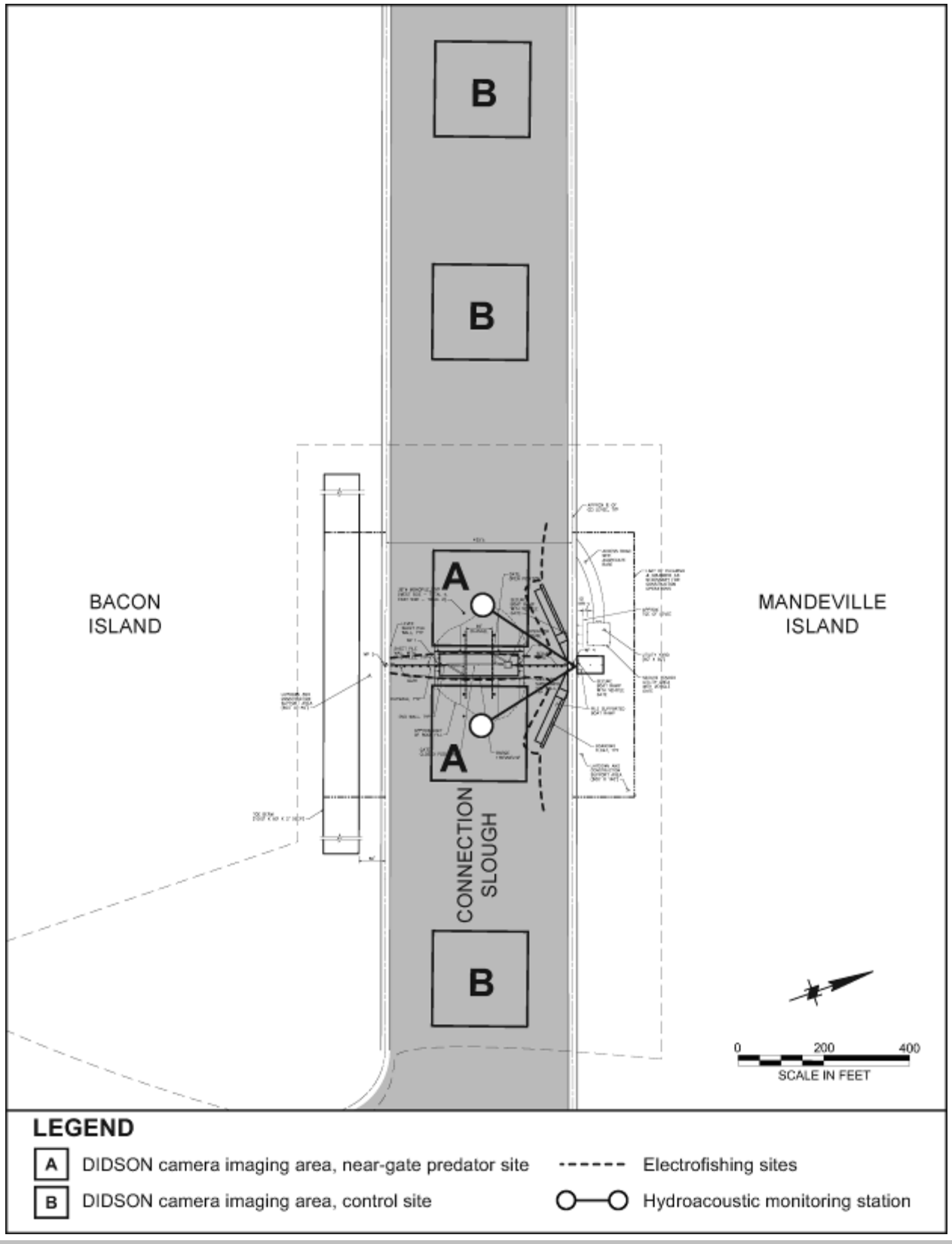


Figure 2-10 **Connection Slough Gate Area showing location of continuously recording hydrophone stations, areas for boat-based DIDSON imaging and electrofishing sites**

2.7.5 Existing Monitoring Programs

Much of the data to satisfy the monitoring needs described above can be gathered from existing monitoring programs. These programs have been proven to generate reliable data. Furthermore, utilizing these existing sources of data allows post-Project data to be easily compared to existing databases of pre-Project data. Many of these programs sample widely distributed sites over long sampling periods and would generate monitoring data that allows for a "big picture" analysis of Project effects. Existing monitoring programs and how they would integrate into the 2-Gates Monitoring Plan are provided in Table 2-5.

2.7.5.1 Fish Monitoring

Fall Midwater Trawl and Summer Townet Survey

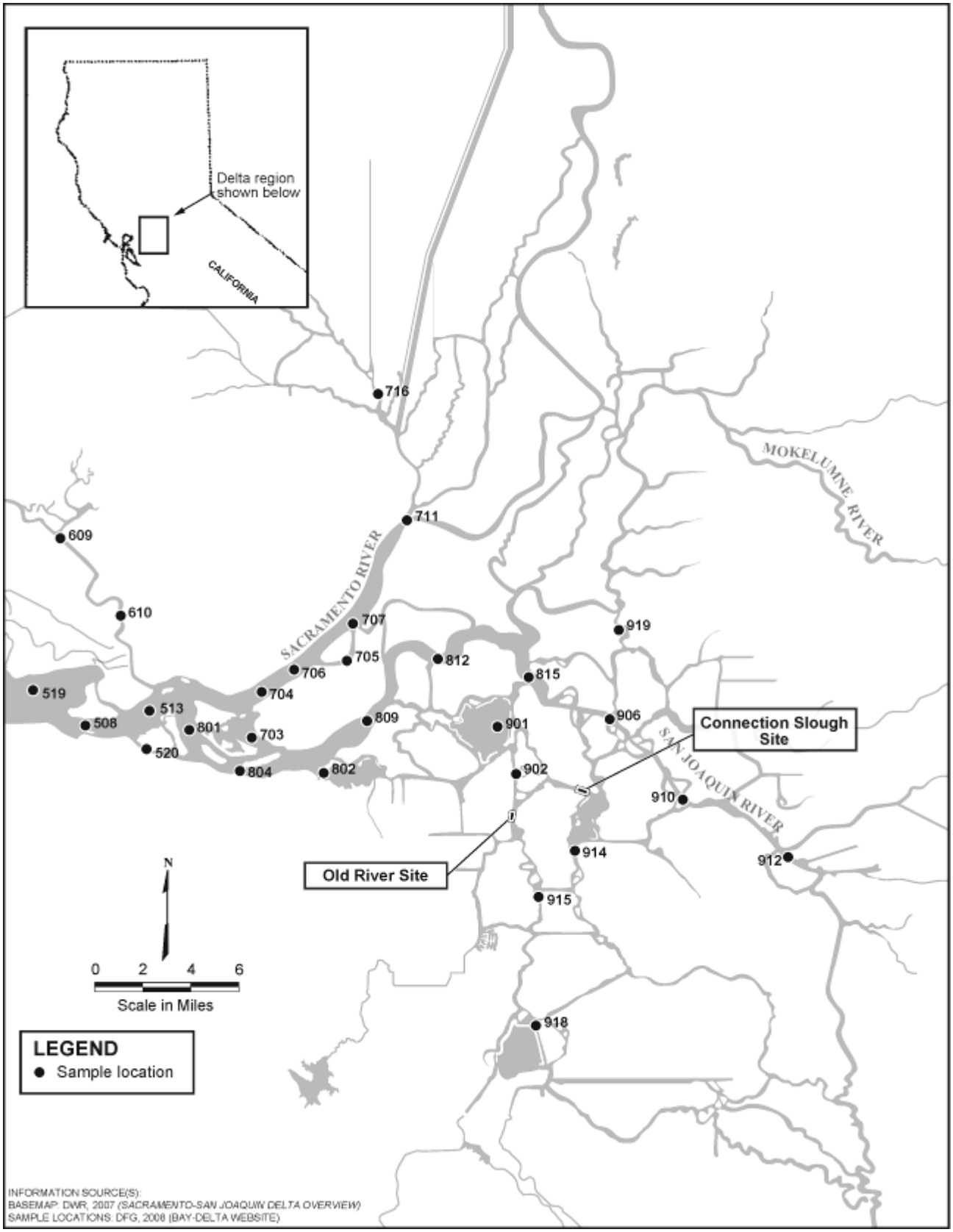
The Fall Midwater Trawl (FMWT) and the Summer Townet Survey (TNS) are the two longest running fish monitoring programs used to index delta smelt abundance. They were designed to target mid-water age-0 species and are used to develop an index of abundance and show distribution throughout the Delta. The FMWT is conducted monthly at sites throughout the delta from September through December. The TNS is conducted during the summer at 32 stations in the Delta (Figure 2-11). The TNS occurs at slightly different times each year that depend upon conditions, but a minimum of two surveys are conducted each year with start and ending dates ranging from early June to late August, respectively. These two monitoring programs occur outside of the period of potential gate operations and would not be employed as real-time monitoring tools. However, if the Project is successful in reducing the entrainment of pre-spawning adults and or improving the survival of spawned delta smelt, then abundance indices developed from these surveys should reflect an increase in delta smelt in response to decreases in entrainment.

Spring Kodiak Trawl

The Kodiak Trawl occurs every other week starting in January or February and running through March. This trawl survey would provide very useful monitoring tool for sampling the anticipated period of gate operations. The gear has proven to be effective for sampling adult delta smelt, adult longfin smelt, and juvenile salmonids. Data from the existing Kodiak Trawl program would be used for verifying the occurrence of delta smelt in close proximity to the gates and the evaluation of fish response described above. The number of trawl site and duration of the survey would need to be expanded to cover the additional information needs associated with monitoring the Two-gate operations. The trawl would need to begin in December to be useful for the entire 2-Gates operational period.

20 mm Survey

Eight to ten 20mm surveys are conducted annually from March to July for the purpose of sampling post-larval delta smelt distribution and abundance. Comparison of post-Project survey data to pre-Project survey data for south Delta sites would be useful in determining the effects of operations on delta smelt spawning distribution and evaluating the success of the operations in preventing spawning in the south Delta (Figure 2-11).



DFG Bay Delta website 2008

Figure 2-11 IEP Interior Delta Monitoring Stations for Fisheries Surveys

Mossdale Kodiak Trawl Survey

The Mossdale Kodiak Trawl is conducted on the San Joaquin River at Mossdale (just upstream of the Old River channel bifurcation) and is used to monitor the outmigration of juvenile fall-run Chinook salmon and steelhead from the San Joaquin River system, as well as to monitor the abundance of other fishes in the San Joaquin River. Frequency of sampling has ranged from three to five days a week and sampling occurs throughout the year. Daily catch is based on a series of 10-minute tows occurring within each sampling day. Prior to 1994 fish were captured with an otter trawl and the sampling period was limited spring time only and the number of days a week the trawl operated varied. The Mossdale Trawl is also an import recovery tool for CWT-tagged fish released as part of the VAMP studies. For the purposes of the 2-Gates Monitoring Plan, the Mossdale Trawl data is important for determining the timing of the salmon outmigration from the San Joaquin River. The Head of Old River Barrier (HORB) is installed and operated during VAMP to prevent salmon from moving into Old River. This is another important feature to consider when interpreting monitoring results. When the barrier is closed, very few fish move into Old River, but continue into the Delta down the main stem San Joaquin River past Stockton. When the barrier is open, or not installed, fish can move into Old River, then down the Grant Line Canal toward the CVP and SWP intakes. Knowing the timing of the outmigration and the dates of installation and closing and opening of the HORB provides useful information to interpret the salvage of San Joaquin salmon and steelhead at the fish facilities related to the 2-Gates operations.

Longfin Smelt Larval Survey

This survey was initiated in January 2009 and runs every other week from January to mid-March. The gear is effective at sampling larval delta and longfin smelt and would therefore be useful for monitoring the distribution of larvae in the south and central Delta during the gate operations period. Data from this survey would be compared to the results of the particle tracking model to determine whether the modeled gate operations effects are representative of the actual effects. This comparison would be important in determining the success of the Project in reducing larval entrainment as there is no measure of larval entrainment at the CWP and SWP.

Salvage Monitoring

Existing salvage monitoring would be sufficient for evaluating the effectiveness of gate operations at preventing entrainment of adult and juvenile delta smelt. Salvage densities during Project operations would be compared to pre-Project densities to determine if gate closure is successful at reducing entrainment of smelt and if the salvage densities of any other species are affected by gate operations.

Water Quality and Flow Monitoring

Ongoing monitoring of water quality conditions occur at key Delta sites for agricultural use, municipal and industrial use and fish and wildlife. There are numerous stations in the vicinity of the Project that can be used to monitor flow or water quality (See Figure 2-8). Permanent flow monitoring sites are also available.

2.7.6 New / Added Monitoring Programs to Evaluate 2-Gates Operations

Existing monitoring programs could provide much, but not all, of the data needed to operate and evaluate the effects of the Project. New monitoring efforts would be needed to fill the gaps. New monitoring may be a new program specifically for the 2-Gates Project or an expansion of the sampling regimen of an existing program. Additional sites could be added to existing monitoring programs or the frequency of sampling could be increased. The following paragraphs describe additions to existing programs or new programs to be added to monitor the effects of the 2-Gates Project.

2.7.6.1 Spring Kodiak Trawl

The Spring Kodiak Trawl would be expanded to twice per week and would start in December and continue through March at existing sites in the San Joaquin River at sites 809, 812 and 815 and 906, in Old River at sites 901, 902, and 918 and in Middle River (Site 914) (Figure 2-11). The existing Kodiak Trawl protocol presently begins too late in the season after delta and longfin smelt spawning migrations have begun and gate operations would have started. In addition a high frequency of sampling is required to provide current data on the location of migrating smelt and salmonids in the south and central Delta. Frequent sampling by Kodiak Trawl from December through March at sites in the south and central Delta would be used to detect the presences or absence of migrating adult delta smelt and longfin smelt. More frequent kodiak trawl data would allow project managers to evaluate how the distribution of migrating smelt is changing as a result of gate operations.

2.7.6.2 Salmon/Steelhead studies

Salmon migration studies were conducted during the winter of 2008 – 2009 by releasing and tracking acoustic-tagged juvenile salmon into the north-central Delta. Similar-type studies were coordinated through East Bay Municipal Utilities District (EBMUD) on the Mokelumne River and under VAMP on the San Joaquin River. Methods employed on these studies would work to evaluate the effects of the 2-Gates Project on juvenile salmon movement in through the Delta.

North Delta Hydrodynamic and Juvenile Salmon Migration Study

The USGS, DWR, and the California Bay-Delta Authority teamed up to conduct a coordinated monitoring study of juvenile salmon movements in the Sacramento-San Joaquin Delta in 2008. A system of detection stations (continuously recording hydrophone arrays) were installed at strategic locations to monitor potential migration pathways from the Sacramento River near Walnut Grove into the central and western Delta. Acoustic Doppler Channel Profilers were deployed to evaluate secondary circulation patterns near the junction of the Sacramento River with the Delta Cross Channel and Georgiana Slough. Twelve lots of 400 fish tagged with uniquely coded acoustic tags were planned for release. A proposed study for 2009-2010 would re-deploy a similar array of listening stations throughout the Sacramento River and central Delta. This array of listening stations could be used and integrated with monitoring studies to evaluate the effects of the 2-Gates Project.

Mokelumne River Juvenile Salmon Migration Study

EBMUD developed a proposal to conduct a parallel monitoring effort on the Mokelumne River in 2008 by releasing acoustically tagged salmon and adding recording stations in the Mokelumne River upstream of the Delta to integrate with Sacramento River Juvenile Salmon Migration Study.

San Joaquin River Salmon Monitoring Plan - VAMP

In 2008, VAMP conducted acoustic monitoring of juveniles salmon migration from two releases each from Durham Ferry and Stockton in the San Joaquin River during the VAMP period. Study results were inconclusive because of equipment malfunction. However, hydrophone stations were deployed to estimate overall survival to Chipps Island and to compare overall survival from fish that took the main stem San Joaquin River route compared to the Old River route through the central Delta. The study did document sites where losses to predators were high. These sites were identified by the cessation of movement of the tracked fish that stopped because when they wee eaten by the predators.

Particular attention is to be paid to migration routes from the San Joaquin River to document migration routes, delays and timing for juvenile salmon or steelhead traveling into the Delta via Old River or in the main stem

San Joaquin River. The 2-Gates Project could impede movement for fish using Old River as their migration route from the San Joaquin River. Salmon in the main stem San Joaquin could be diverted toward the 2-Gates sites either through Turner or Columbia cuts and then into Middle River. Hydrophone sites for the 2-Gates Project could be used to embellish the knowledge accumulated from tracking tagged fish movement from the San Joaquin River system during 2009.

For the purpose of evaluating the effects of 2-Gates operations on juvenile salmon movement, continuously recording hydrophone stations would be installed at the following locations: both sides of each gate, Victoria Canal and Middle River, Woodward Cut at Middle River, Rock Slough west of Old River, False River at the west side of Frank's Tract and Dutch Slough east of Piper Slough.

Close coordination between 2-Gates Project monitoring and other acoustic tagging programs planned for deployment in 2009 would benefit all parties. Coordination would be necessary to standardize study protocols, equipment compatibility, tag codes and data collection and information dissemination. While the objective of the 2-Gates monitoring is to determine how the 2-Gates Project would affect the migration of juvenile salmon and steelhead and other fishes through the Old River and Connection Slough channels, integrating the 2-Gates monitoring with the other migration studies would greatly enhance the value of the information coming from any single study.

2.7.6.3 Predator Monitoring

A boat-mounted DIDSON camera would be used to scan the areas near the gates for large predators (striped bass, largemouth bass, catfish, and Sacramento pikeminnow). DIDSON cameras image through turbid water by using sound waves. A trailer able boat-mounted camera would be mobile enough to monitor conditions on both sides of the gates for either closed or open gates. Similar aquatic habitat in similar channels to the area around the gate structures in Old River and Connection Slough would also be imaged as a comparison to the sites with gate structures.

Predator fish would be captured by hook and line angling or gill netting in the vicinity of the gates and acoustically tagged and tracked to monitor behavior and movement during gate operations.

The boat-mounted DIDSON cameras may also detect the presence of other large fish, such as green or white sturgeon that may approach the gate during operations.

2.7.7 Data Collection, Handling, Storage and Disposition

For all IEP or other cooperating program elements all data would be collected in accordance with established sampling protocols. For new program elements written protocols would be developed based on the needs and considerations for the Project. New protocols would be provided to The Metropolitan Water District of Southern California for review and comment. All data would be collected to the highest standard of accuracy.

All data would be carefully entered and stored in compatible databases. These include the University of California tracking consortium database, and other databases as appropriate. Databases would be protected and copied with copies stored in a different location than the original.

2.7.8 Quality Assurance/Quality Control

Quality assurance and control procedures would include written protocols and staff training. Data would undergo quality checks by visually scanning entries and performing value checks on data as it is entered. Data would be flagged that is outside a range of established values for a given parameter. Key features would be used in fish identification and verification. Procedures would be peer-reviewed prior to implementation. Written protocols would be developed for all sampling and monitoring, and data handling and provided

during staff trainings to ensure all data are collected according to established standards. Field data would be checked at collection by a second or third party.

2.7.8.1 Analyses Framework

In order to close the adaptive management feedback loop, a framework would be developed to analyze the data that is collected, communicate the results, and make decisions to adapt operations and monitoring. Elements to be considered include:

- Defining the operational triggers for gate operations
- Defining desired conditions for each objective and hypothesis
- Defining thresholds for management response and types of response
- Obtaining baseline data from existing or additional monitoring programs
- Refinement to a conceptual model of the relationship between hydrodynamics, turbidity, and fish response based on new data
- Management response –adjustments in 2-Gates operations and/or water facility operations

Statistical analyses may utilize a variety of programs including (i.e., S+, R, Origin, PRIMER, and JMP, Excel or others). Results would be compiled from field data collection or downloaded from field data loggers or summarized from reports provided from ongoing CWT monitoring programs in the Delta (e.g., Chipps Island Trawl, Salvage Collection). Analyses would be presented in their respective studies.

2.7.8.2 Products and Dissemination of Results and Findings

A monthly progress report would accompany each invoice detailing decisions, progress made, meetings held and potential or anticipated problems in meeting product delivery schedules. Summary reports would be made available as results are compiled. Other reports may take the form of a quarterly e-mail status updates, presentations at science conferences, and annual drafts and final reports. If suitable, some study element reports may be developed and submitted for peer-reviewed publications to broadly disseminate findings for the benefit of other water projects.

2.7.8.3 Feedback to Operations Groups

Result of the real-time 2-Gates monitoring effort would be provided to the Water Operations Management Team (WOMT) and the SWG for incorporation into the decision making process for operation of the SWP and CVP facilities and to the entity responsible for operating the gates. The steps to provide this feedback and any criteria to support recommended actions need to be developed.

2.7.8.4 Feasibility Issues

Study Elements

This study was planned with most appropriate techniques and methods available, but it does not guarantee definitive findings of the 2-Gates Project effects on delta smelt, salmon, steelhead, green sturgeon or longfin smelt. Each experimental release of tagged salmon or steelhead, or other fish is an extremely labor-intensive effort and, in order to be successful, has to be closely coordinated with numerous other monitoring programs from various organizations (IEP sampling programs, CDFG Hatchery Operations, VAMP, Sacramento River salmon migration studies, Mokelumne River salmon studies, and CCWD, state and federal screen operation programs). Some elements of the proposed Project are feasible and similar projects have occurred with good

success in other Central Valley rivers and areas of the Delta. These include past tagging and tracking projects performed by the USGS, VAMP, and EBMUD (Workman et al. 2008) as well as a variety of consultants working for these entities

Three additional study elements are included:

- **Delta smelt larval fish entrainment at the CVP/SWP.** Intake-water volumes are so high and larval fish densities are so low that plankton nets would be unlikely to capture them. This would require very high effort to process sufficient samples to find larval delta smelt. Attempts to conduct successful pilot studies in the past have met with failure.
- **Adult Salmon Migration Route Selection and Delay.** Tagging adult salmon in the western Delta may not provide any information for evaluating the Two-Gate Project because fish captured in the western Delta could come from the Sacramento, Mokelumne or San Joaquin Rivers. Salmon from the Sacramento or Mokelumne rivers are unlikely to migrate past the Gate structures. San Joaquin salmon do not have to migrate past the gate structures. Even if salmon do pass the gate structures, the nature of salmon migration through the Delta is both non-linear and non-sequential. Salmon typically make large excursions up and downstream prior to committing to a river system. Therefore, the ability to determine if a delay is caused by a gate structure, and if so what the significance of the delay is, would be difficult without a substantial amount of data.
- **Sturgeon Tagging for Passage.** Capturing sturgeon requires a huge effort for CDFG tagging studies in San Pablo and Suisun Bay, especially given the low densities of sturgeon. Fish that are tagged in San Pablo Bay are more than twenty miles from the Project site. Sturgeon tagged in Suisun or San Pablo bays may not move upstream and may move toward the ocean. The probability that a few sturgeon tagged sturgeon would move past the gates is very low.
- Conditions may develop that are beyond the control of the any of the experiments and include water project operations, natural events or disasters, such as a flood event or a levee break. Large changes in Delta inflow conditions or in export activity may obscure effects resulting from 2-Gates Project operations. Based upon findings from the first year of monitoring the design of studies in subsequent years may require revisiting each study element and developing a new study design along with a proposal, schedule and budget.

2.7.8.5 Environmental Monitoring and Control Actions

The Project would utilize the existing DWR, USGS, and Reclamation monitoring stations and real-time monitoring network (see http://www.delta.dfg.ca.gov/baydelta/monitoring/) and would supplement existing designated monitoring sites with additional monitoring equipment and constituent measurement capabilities. New monitoring stations would be provided in close proximity to the gates and equipped with equipment and capabilities equivalent to that provided at the existing stations. The above agencies would continue to monitor existing stations under the 2-Gates Project. At new station locations, monitoring would be conducted by the USGS or DWR.

The objective of the monitoring program is to detect when triggers are reached for closing or opening the Project gates to protect delta smelt while also considering salmon and sturgeon movements. The operational procedures in Section 2.5 describe these criteria, or triggers, for operating the gates as informed with monitoring data. Further, by continuously monitoring salinity, turbidity, temperature, dissolved oxygen, and chlorophyll-a in selected regions of the Delta, the monitoring program provides important information to assess habitat conditions in real-time, during both operation and non-operation of the gates.

The monitoring for the 2-Gates Project is adaptable as conditions and concerns warrant. If additional monitoring is needed either beforehand or during operations, such monitoring can be conducted. Further, if

conditions change in the Delta around the gates, the gates can be opened within minutes, and be removed if deemed necessary.

The monitoring program would also provide information about potential effects on listed fish when the gates are closed. This information would address water quality, hindrance of fish passage when the gates are closed and open, and whether the base of the gates may be a potential barrier for sturgeon. However, water quality and fish monitoring would be in place to detect triggers for closing or opening the two gates and for avoiding adverse effects on fish, as explained below.

Ongoing and New Monitoring Parameters

FLOW

Flow conditions on the Sacramento and San Joaquin Rivers, and Old and Middle Rivers would be monitored and the gates operated based on flow conditions. For example, gates are expected to remain open if Old and Middle River flows are >-3000 cfs. Flows would also be monitored for oncoming turbidity events. Flows in Old and Middle Rivers and elsewhere would be monitored by USGS.

ELECTRICAL CONDUCTIVITY

Electrical conductivity (EC) (a water quality [salinity] measure) >400 µmhos is positively correlated to the presence of delta smelt, and is a particularly important measure in the central and western Delta region downstream of the gates. Along with certain turbidity levels cited below, these conditions would suggest delta smelt approaching the Project gates and trigger gate closure.

TURBIDITY

Turbidity >12 Nephelometric Turbidity Units (NTU) is positively correlated to the presence of delta smelt, and it is an important measure in the central and western Delta region west of the gates. Along with electrical conductivity levels cited above, these conditions would suggest delta smelt approaching the area and trigger gate closure.

WATER TEMPERATURE

Since water temperature is an important metric for delta smelt and other pelagic and anadromous fish (fish that are born in fresh water, migrate to the ocean to grow into adults, and then return to fresh water to spawn), it would be measured at all locations where monitoring takes place for the Project gates.

DISSOLVED OXYGEN

Dissolved oxygen would be monitored in the channel segments on either side of the closed gates and temporary tidal backwaters to watch for degradation as indicated by low dissolved oxygen, which could suffocate fish or block their movements.

CHLOROPHYLL-A

Chlorophyll-a would be monitored due to concern about potential nuisance levels of algae.

DAILY SENSITIVE FISH SALVAGE

- **Adult delta smelt.** DFG would monitor adult delta smelt in the catch of Spring Kodiak Trawl (SKT) tows near the gates, particularly at stations 902, 914 and 915, which are closest to the two gates. Presence at Stations 914 or 915 would indicate higher risk of entrainment into the pumps and alerts to watch for increased salvage. Larval and juvenile longfin smelt would be monitored by the DFG's winter 20 mm

survey, particularly at Stations 902, 914, and 915, which are closest to the gates. Presence at Stations 914 or 915 would indicate higher risk of entrainment into the pumps and is an alert for the onset of increased salvage.

- **Salmon.** USGS studies during the winter of 2008/09 would release about 5,000 radio-tagged juvenile salmon into the north-central Delta. Some of these fish may travel to the vicinity of the gates, in which case existing listening stations along the way would record their location and timing. In particular, these fish would pass from Sacramento River through the Delta Cross Channel into Mokelumne River, or into Georgiana Slough and then into Mokelumne River. The fish would serve as surrogates for naturally spawned or hatchery-reared salmon emigrating from the Sacramento and Mokelumne River upstream of the Delta.

  Listening devices would detect these radio-tagged fish in the lower Mokelumne watershed. Monitoring data would then be collected on subsequent movements into San Joaquin River and either seaward or into Old or Middle rivers and nearer to the gates. Data would also be collected on the number, if any, and portion of those fish exiting the Mokelumne that entered Old or Middle rivers. Whether the gates were open or closed would depend on conditions of the moment.

Fish Passage and Predation

DIDSON cameras would be used to evaluate fish passage. DIDSON cameras would be installed on the downstream side of each gate to monitor two conditions:

- Whether sturgeon or other migratory fish pass the gate when open or closed, or if they persist there when a gate is closed.
- Predator fish accumulation behind the gate abutments.

One DIDSON camera would be installed on each side of the abutment for each gate, for a total of two DIDSON cameras for sturgeon monitoring per gate.

Continuously recording listening devices would be installed on both sides of each gate to detect the presence of any radio-tagged salmon. A listening device would also be installed in Old River at the south end of Bacon Island to detect salmon passing upstream or entering from the south.

Existing Monitoring Stations

Much of the monitoring in support of the 2-Gates Project is ongoing as part of various monitoring programs. Data would be downloaded from the Internet and put into reports relating to trigger levels. Additional constituent measurement to meet the needs of 2-Gates monitoring would be added to the ongoing monitoring stations. Compilations and analysis of data at these stations would occur during December through March. More limited use of the Project gates from April through June would also require data collection and analysis.

The following stations would be monitored as part of ongoing programs at locations with gear and data acquisition and reporting systems already installed or with new equipment, data acquisition, and telemetry systems at the same location. As a part of the 2-Gates monitoring program, existing stations would be monitored for electrical conductivity, turbidity, temperature, dissolved oxygen and chlorophyll-a. Two stations would be specifically monitored for flow. Daily salvage would continue to be monitored at the Skinner and Tracy Fish Facilities.

Figures 2-7 and 2-8 and Table 2-5 provide key monitoring locations in the Delta operated by DWR, Reclamation, and USGS for fisheries, water supply, and water quality purposes. Table 2-5 also shows existing and proposed monitoring capabilities. The monitoring program for the 2-Gates Project would utilize or

supplement monitoring capabilities of existing stations, or add new stations with specific data gathering capabilities. A number of the monitoring stations in Figures 2-7 and 2-8 are collocated.

Table 2-5 Locations and Capabilities of Monitoring Stations Supporting Operations of the 2-Gates Project

					Measures				
Existing or New Monitoring Locations	USBR	DWR	USGS	Flow	Electrical Conductivity	Turbidity	Water Temp	Dissolved Oxygen	Chlorophyll -a
Existing Monitoring Stations									
Sacramento River at Rio Vista (RIO)			●	E	E				
Sacramento River at Freeport (FPT)		●		E		E			
Sacramento River at Hood (HOO)		●	●	E	E	E			
Sacramento River at Collinsville (COL)	●		●	E	E	N	N	N	N
Delta Cross Channel (DCC)			●	E	E				
Georgiana Slough (GEO)			●	E					
San Joaquin River at Jersey Point (JPT)		●	●	E	E	E	N	N	N
San Joaquin River at Prisoners Point (PRI)	●		●	E	E	E	E	N	N
False River (FAL)			●	E	E	N	E	N	N
Holland Cut (HOL)			●	E	E	N	E	N	N
Old River at Franks Tract (OSJ)			●	E	E	N	E	N	N
Old River at Quimby Island (ORQ)			●	E	E	N	E	N	N
Old River at Bacon Island (OLD)		●	●	E	E	N	N	N	N
Middle River at Bacon Island (MID)		●	●	E	E	N	N	N	N
Middle River at Columbia Cut (MRC)			●	E	E	N	N	N	N
Victoria Canal (VIC)			●	E	N	N	N	E	N
Clifton Court Gates (CCG)			●	E	E	N	N	N	N
San Joaquin River at Mossdale (MOS)		●		E	E	N	N	N	E
Mokelumne River at Andrus Island (MOK)			●	E					
New Monitoring Stations									
San Joaquin River at Oulton Point (OUL)					N	N	N	N	N
N of Old River Gate (ORN)					N	N	N	N	N
S of Old River Gate (ORS)					N	N	N	N	N
W of Connection Slough Gate (CSW)					N	N	N	N	N
E of Connection Slough Gate (CSE)					N	N	N	N	N

Note:
"E" = existing monitoring activity
"N" = new monitoring activity

New Monitoring Stations

New monitoring stations would be installed as deemed critical to the data needs for opening and closing of the gates, and monitoring aquatic ecosystem conditions. New stations would involve channel bottom-sensing equipment and cable connections to data gathering and telemetry equipment concealed at the shoreline to provide reliable off-site monitoring. Monitoring stations would not result in adverse environmental impacts, and their installation and use is not assessed further in this MND/EA.

2.8 ENVIRONMENTAL PROTECTION MEASURES SCHEDULE

This section summarizes the features of the Project that incorporate design and construction approaches to reduce the environmental impacts. Each of these elements is also identified, if appropriate in the environmental analyses in Section 4.

2.8.1 Avoidance of Sensitive Resources

Qualified biologists and archaeologists have been working closely with the Project engineers to design the Project in the least environmentally damaging manner. Sensitive biological and cultural resources have been identified and avoided to the extent feasible. Avoidance measures also would be used in the field during construction as a result of preconstruction surveys or at the direction of construction inspectors. If required, the construction would be coordinated through a specialist familiar with the resource issue being avoided. The locations of all sensitive resources and the methods to avoid them would be illustrated on the construction drawings.

2.8.2 Compensation for Potential Impacts on Sensitive Aquatic Species

Project construction and operations have been designed to reduce or eliminate potential impacts on aquatic species. Further, the Project contains augmentations to existing monitoring programs to inform day-to-day operations of Project facilities and further reduce adverse impacts to pelagic and anadromous species. Significant impacts on aquatic species have not been identified in this MND/EA; therefore, no mitigation measures are required under CEQA or NEPA. The Project is subject to the permitting requirements of the USFWS, NMFS, and DFG, and these agencies may impose measures to compensate for less than significant impacts to sensitive aquatic species as part of the permitting process. The Project Proponents will comply with the requirements identified by these regulatory agencies, and if requested, will provide compensatory mitigation as directed by these agencies. Permitting requirements could include the implementation of measures such as the purchase of mitigation credits, habitat restoration, or financial contributions to restoration programs.

2.8.3 Erosion, Sediment Control, and Spill Prevention Measures

Erosion is the process of soil particles being displaced and transported by wind or water. Installation of the gates would result in sediment being disrupted and create increased turbidity within the areas where dredging would occur. Areas along the levees where sheets would be installed or where materials or equipment would be stored would disturb soil and vegetation, exposing sites to possible erosion. Best Management Practices (BMPs) would be undertaken in accordance with the California Code of Regulations. Spill prevention measures detailed in the Storm Water Pollution Prevention Plan (SWPPP), as required under the National Pollutant Discharge Elimination System (NPDES) permit mandated by the Central Valley Regional Water Quality Control Board (CVRWQCB), would be developed to prevent or minimize soil erosion and protect against storm water runoff (for more information on the contents of a SWPPP see Section 2.5.4 below). In addition, the contractor would be required to make special provisions to prevent contamination, related to fuel or oil spills from construction vehicles, and to designate specific areas for vehicle fueling, oil changing, and washout of concrete trucks with controls to eliminate runoff.

The following standard erosion and sediment control measures and practices would be used during and after construction to ensure that impacts from soil erosion and sedimentation are less than significant:

- Minimize site disturbance
- Perform initial cleanup
- Compact subsurface backfill material
- Leave topsoil in roughened condition
- Construct water bars
- Perform seeding and mulching
- Install erosion control blankets
- Install silt fencing and straw bale dikes
- Conduct daily inspections and periodic maintenance of erosion and sediment control measures

These measures are routinely implemented in the construction industry and have been proven successful for similar projects.

The following measures have been incorporated into the Project design and operations plan in order to minimize impacts on water quality and aquatic species from in-channel construction:

- The dikes on either side of the barge that supports the operable gates would be constructed of sheet piles. This would minimize impacts by:
  - Minimizing the amount of dredging that is necessary along the bottom of Connection Slough and Old River, thus reducing the amount of soft bottom habitat loss, turbidity caused by dredging, dredged material, and the dredge disposal area required.
  - Minimizing the amount of turbidity resulting from in-water construction activities by reducing the footprint area of dikes connecting the barge-gate to adjoining levees and reducing in-channel excavation only to that directly under the barge-gate.
  - Reducing predation because sheet piles provide less habitat structure for predator fish in the vicinity of the gates.
- While the barge-gates would be removed the first year, the gravel rock bedding, other rock fill, and submerged sheet pile below the -13-foot elevation submerged barge and some of the sheet pile would remain in place for the five-year Project duration. This would minimize the disruption to the bottom of Old River and Connection Slough and would minimize potential impacts on aquatic species.

2.8.4 Turbidity Control

For the construction phase (late summer to early winter 2009) and the removal in 2014, turbidity control performance measures identified in Section 4 would be observed, subject to the approval of the applicable resource agencies (USFWS, NMFS, RWQCB and DFG). The primary turbidity control method would be the reduction or cessation of activities (e.g.; dredging) contributing to the increase in local turbidity.

2.8.5 Bay Area Air Quality Management District (BAAQMD) and San Joaquin Valley Air Pollution Control District (SJVAPCD) Emission Control Measures

The following measures are required by the BAAQMD and SJVAPCD during construction and would be incorporated into contract specifications.

- Diesel emission control measures
- Fugitive dust control measures
- Diesel Particulate Matter Emissions Control Measures
- Greenhouse Gas Reduction Measures

2.8.6 Plans

2.8.6.1 Storm Water Pollution Prevention Plan (SWPPP)

A SWPPP is being developed and would be submitted to the Central Valley Regional Water Quality Control Board in compliance with National Pollutant Discharge Elimination System (NPDES) regulations. The SWPPP would be completed before construction began. The SWPPP would identify activities that may cause pollutant discharge (including sediment) during storms and the BMPs that would be employed to control pollutant discharge. Construction techniques would be identified to reduce the potential for runoff, including minimizing site disturbance, controlling water flow over construction sites, stabilizing bare soil, and ensuring proper site cleanup. In addition, the SWPPP would specify the erosion and sedimentation control measures to be implemented, such as silt fences, trench plugs, terraces, water bars, and seeding and mulching.

The SWPPP also would specify spill prevention countermeasures, identify the types of materials used for equipment operation (mainly vehicle fluids such as fuel and hydraulic fluids), and identify measures to prevent or materials available to clean up hazardous material and waste spills. Typical measures could include prohibiting the placement of oily or greasy substances originating from the contractor's construction or operations where they would later enter a stream or watercourse; storing and transporting fuel in appropriate safety containers, mixing and loading hazardous materials in an accepted manner to prevent spills or leakage, and disposing of used containers in accordance with regulatory standards. Emergency procedures for responding to spills also would be identified in the SWPPP.

The SWPPP would be included in the contract specifications.

2.8.6.2 Restoration Plan

A restoration plan would be developed, as required by applicable regulatory agencies, and would be completed prior to the onset of construction. The restoration plan would identify areas that would be restored and restoration methods. Seed mixes, schedules, success criteria, and success monitoring for restoration of wetlands, streams, and drainages would be identified. The restoration plan would be included in the contract specifications.

2.9 MITIGATION MEASURES

Specific mitigation measures have been identified as part of the environmental impact analysis conducted in Section 4 and would be implemented as part of the Project; the detailed measures are included in Section 4 relate to biological, cultural, recreational and transportation resource impacts.

2.10 REQUIRED PERMITS AND ENVIRONMENTAL APPROVALS

This section summarizes the environmental and regulatory permits and requirements that have been identified and the general approach to meet those requirement.

2.10.1 California Environmental Quality Act

This MND/EA is being prepared to identify impacts resulting from the Project and mitigation needed to reduce impacts to a less than significant level. DWR is the lead agency under CEQA and will serve as the Project owner and operator. The Draft MND/EA will be circulated for public review, and DWR will consider public comments before determining whether to approve the Project based on the conclusions of the MND/EA.

2.10.2 National Environmental Policy Act

Reclamation is the lead agency for the EA and if appropriate will issue a "Finding of No Significant Impact" as it pertains to NEPA.

2.10.3 U.S. Army Corps of Engineers/ U.S. Coast Guard

Section 404 of the Clean Water Act (CWA) requires project proponents to obtain a permit from the U.S. Army Corps of Engineers (Corps) for activities that involve placement of dredged or fill material into waters of the U.S. The CWA requires the Corps, when issuing the permit, to follow the requirements of the U.S. Environmental Protection Agency's (EPA's) guidelines for implementing Section 404(b)(1) of the CWA. EPA's guidelines prohibit discharges of dredged or fill material into waters of the U.S., if a practicable alternative to the proposed project exists that would have less adverse impacts on the aquatic ecosystem, so long as that alternative does not have other significant adverse environmental impacts.

As described below, a 401 permit would be obtained from the CVRWQCB prior to implementation of the Project.

Public notifications associated with the Corps permit will also satisfy notifications required for the USCG.

Section 10 of the Rivers and Harbors Act of 1899 requires authorization from the Secretary of the Army, acting through the Corps, for the construction of any structure in or over any navigable water of the U.S. Structures or work outside the limits defined for navigable waters of the U.S. require Section 10 permits if the structure or work affects the course, location, or condition of the water body. The law applies to any dredging or disposal of dredged materials, excavation, filling, rechannelization, or any other modification of a navigable water of the U.S., and applies to all structures, from the smallest floating dock to the largest commercial undertaking. It further includes, without limitation, any wharf, dolphin, weir, boom breakwater, jetty, groin, bank protection (e.g. riprap, revetment, bulkhead), mooring structures such as pilings, aerial or subaqueous power transmission lines, intake or outfall pipes, permanently moored floating vessel, tunnel, artificial canal, boat ramp, aids to navigation, and any other permanent, or semi-permanent obstacle or obstruction.

2.10.4 U.S. Fish and Wildlife and National Marine Fisheries Service

A Biological Assessment (BA) has been prepared and is available for submission in draft form to the USFWS and NMFS for review. Their review of the BA could result in a letter of concurrence or a Biological Opinion stating their conclusions regarding the Project's effects on federally listed species.

2.10.5 California State Historic Preservation Office

Section 106 of the National Historic Preservation Act, as codified in 36 Code of Federal Regulations 800.4, requires Reclamation to consult with the California State Historic Preservation Officer for resources that are eligible for listing as a historic resource.

2.10.6 California Central Valley Regional Water Quality Control Board

Pursuant to the Clean Water Act Section 401, any applicant for a federal license or permit for activities that may result in any discharge into waters of the U.S. shall provide the permitting agency (Corps) with a certification from the respective state. The CVRWQCB has permitting authority for the State of California. A 401 permit application will be completed to comply with this requirement upon completion of the MND/EA.

2.10.7 California Department of Fish and Game

2.10.7.1 Streambed Alteration Agreement

Fish and Game Code (Section 1602) requires an entity to notify DFG of any proposed activity that may substantially modify a river, stream, or lake.

2.10.7.2 Consistency Determination (2081.1 Permit) or 2081(b) Permits

These permits allow compliance with CESA either through determination of federal consistency (2081.1) or via a direct take permit (2081(b)).

2.10.8 State Lands Commission

The State Lands Commission (SLC) has a regulatory authority over land that is owned by the State of California. Old River is owned by the State, and its use would require a lease agreement, permit or easement from the SLC prior to dredging or placement of fill on this land. Connection Slough is not under the jurisdiction of the SLC.

2.11 ALTERNATIVES CONSIDERED

The 2-Gates Project analyzed in this MND/EA was developed after extensive consideration of other alternatives, including other barrier alternatives and placing barriers at other locations.

2.11.1 Other Barrier Alternatives

Other barriers alternatives considered but eliminated from further consideration are as follows:

- Two barriers were considered on Old River at Quimby Island (similar to the DWR proposal in Bulletin 76, 1960). Model studies showed that this project would have provided about equivalent protection to delta smelt at about the same cost as the Project, but would have less favorable foundation conditions.
- Four barriers were considered on Connection Slough, Woodward and Railroad Cuts and on Old River upstream of the Clifton Court Forebay. Model studies indicated that this alternative would have been more costly, and resulted in increased water export reductions due to important channel capacity constraints.

2.11.2 Barriers at Other Locations

Other barrier locations were evaluated as individual elements of overall barrier gate systems to provide fisheries protection, as listed below; these locations were eliminated from further consideration:

- Selective weir removal on Paradise Cut was discussed to allow additional flows to pass down Old River, but was found to be ineffective in biasing flows downstream on Old River and in overcoming reverse flows.
- A weir on the San Joaquin River downstream of the head of Old River was considered to push additional San Joaquin River flows down Old River and attempt to bias flows in a downstream direction. It was found to be ineffective in biasing flows downstream on Old River and in overcoming reverse flows.
- Clifton Court Forebay gate re-operations were tested in an attempt to divert enough water on ebb tide to bias flows downstream on Old River and potentially overcome reverse flows. This operation was ineffective in overcoming reverse flows in Old and Middle rivers.

2.11.3 Design Considerations and Site-Specific Alternatives

Study areas at Old River and Connection Slough were initially established as a basis for evaluating specific gate locations. Both the Old River and Connection Slough study areas were approximately 2,000 feet in length. The study areas along Old River and Connection Slough were selected so that a gate across these portions of the river could effectively preclude sensitive aquatic species from moving toward the south Delta where DWR and Reclamation operate their export pumps. Selecting study areas north or south of the chosen Old River or Connection Slough study areas would result in less favorable soil conditions and require that several reaches of river be gated to effectively achieve the same objective. This would result in a much greater construction footprint impact, additional costs, and no additional fish protection benefits.

The proposed gate locations within the study areas were selected based on geotechnical, constructability, wetland, sensitive plants as well as other site considerations. A key geotechnical consideration included insuring that the sites were not located on excessively large deposits of silt and peat that would be less stable for gate construction. Bathymetry studies at Connection Slough indicated a relatively uniform man made channel configuration. Bathymetry at Old River exhibited extensive variability within the study area. The Old River bathymetry suggested that the site be selected at a location where the channel was not extensively deep to avoid deep cut and fill within the river and to find a location where the channel was relatively uniform. The location of the gate at Connection Slough needed to ensure an adequate queuing area for water vessel traffic relative to the bridge crossing from Bacon to Mandeville Islands. Additionally, the site selected at Old River minimized impacts to upland wetland areas.

Two engineering design alternatives were evaluated for the purpose of gate construction. Both options include an operable, barge-mounted gate that would be installed at the center of the water channel to block water flow when closed and tied into the adjacent levees with a connecting dike. There were two alternatives evaluated for the cutoff dike: rock and sheet pile. The rock dike option would place large rock between the barge located in the center of the channel to the levees on either side of the barge. The sheet pile dike option would use standard steel sheet piles driven into the channel soils to tie the barge located in the center of the channel to the adjacent levees on each side of the barge. Either dike option would utilize operable gates that can be opened as required to protect sensitive aquatic species and to afford vessel passage.

Use of the sheet piles offers the following benefits:

- No dredging of soft peat where sheets would be required. Underwater soft peat soils must be dredged before rocks can be placed or rock would be placed on top of the peat, which creates a marginally stable foundation for the rack.

- Sheet piles would minimally affect existing adjacent levees. The heavy weight of rocks could result in impacts to existing levees since the weight of the rock could result in levee instability. Use of rock gates could result in greater potential for levee failure and flood impacts. The engineering design has indicated that sheet piles would need to be installed within the adjacent levees for approximately 50 feet on either side of the gate to buttress the levees.
- Sheet piles provide a much more reliable barrier than rocks given their impact to the supporting foundation soils is minimal, and unlike rock, once installed they would not settle and deform. Once installed sheet piles would be certain to function as designed, whereas rock barriers may require continuous "dressing" to replace rock as it settles into the foundation soils.
- Sheet piles may be removed with less disruption to the aquatic environment as compared to using rocks.
- Sheet piles are less attractive to fish predators than rock. Predator fish are able to hide within rock barriers. Use of sheets reduces hiding locations for predator fish and this in turn reduces impacts to sensitive fish that may still tend to move towards the gates.

The 2-Gates Project has selected sheet pile dikes as the preferred engineering design.

The 2-Gates Project is to be implemented as soon as possible to provide additional protection to delta smelt. Given the time needed to process environmental documents and permits as well as secure required equipment, it is anticipated that the Project could be implemented as early as the fall of 2009.

The 2-Gates Project provides the most effective alternative in reducing aquatic species entrainment originating in the south Delta from reaching export pumps. While 4-Gate plans were considered, those proposals resulted in greater environmental impacts and would take considerably more time to construct and therefore did not meet the Project purpose and need. The Project, consisting of barrier-gate systems on Old River between Holland Tract and Bacon Island and at the east end of Connection Slough, was considered relative to a variety of other gate locations and operating plans and was selected based on an expected lowering of delta smelt related impacts compared to any other alternative.

2.11.4 No Action Alternative

This alternative would continue SWP and CVP pumping operations under current conditions including the controls listed in the RPAs in the recent OCAP BO. No additional protection would be available through structural means for protecting delta smelt. Water quality would continue to be degraded by low pumping levels and water supplies could continue to be restricted. This alternative was carried forward for detailed evaluation in compliance with NEPA requirements, although it does not meet the Project objectives.

2.12 ANALYSIS CONSIDERATIONS

For purposes of environmental documentation, the above gate operations are evaluated considering (1) historical water management activities as existing environmental conditions (before the court-ordered modification by Judge Wanger and the issuance of the OCAP BO by the USFWS) and (2) the range of water management activities that will occur as limited by the RPAs listed in the OCAP BO. These RPAs are summarized in Table x-x along with the related actions anticipated to occur as a result of the 2-Gates Project.

SECTION 3

Related Projects Considered in the Cumulative Impact Analysis

Both the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) require the analysis of the cumulative impacts of a proposed project in combination with those of other related projects (CEQA Guidelines Section 15065(a)(3) and CEQA Regulations Sections 1508.7 and 1508.8). Cumulative impacts refer to two or more individual impacts that, when considered together, are considerable or that compound or increase other environmental impacts. A cumulative impact is the change in the environment that results from the incremental impact of a project when added to other closely related past, present, or reasonably foreseeable future projects. Cumulative impacts can result from individually minor but collectively significant impacts taking place over time.

The following projects were identified after consultation with relevant federal, state, and local agencies and review of other current environmental documents being prepared in the vicinity of the Project. The cumulative impacts of these projects in combination with the 2-Gates Project are addressed in Section 4.

3.1 CALIFORNIA DEPARTMENT OF WATER RESOURCES – BAY-DELTA CONSERVATION PLAN

The Bay-Delta Conservation Plan (BDCP) is being developed as a collaborative process to set near-term and long-term approaches to meet the following objectives: (1) providing for the conservation of covered species and their habitats, (2) addressing the requirements of the federal and state endangered species laws, and (3) improving water supply reliability. Specifically, the BDCP would serve as a habitat conservation plan that satisfies the requirements of Section 10 of the federal Endangered Species Act (ESA) and provide the basis for consultations between the U.S. Bureau of Reclamation (Reclamation), U.S. Fish and Wildlife Service (USFWS), and National Marine Fisheries Service (NMFS) under Section 7 of the ESA. The BDCP would also provide the basis for compliance with State law under the Natural Communities Conservation Planning Act and/or the California Endangered Species Act. Successful completion of the plan approval process will result in long-term "take" authorizations for covered activities, including certain water operations of the State Water Project (SWP) and Central Valley Project (CVP), and operations of certain Mirant Delta power plants. The plan is expected to achieve these objectives through a number of actions: habitat restoration and enhancement to increase the quality and quantity of habitat in the Delta; other conservation actions to help address a number of stressors on covered species; conveyance facilities to enhance operational flexibility and water supply reliability; water operations; and a comprehensive monitoring, assessment and adaptive management program.

The planning area for the BDCP will consist of the aquatic ecosystems and natural communities, and potentially adjacent riparian and floodplain natural communities, within the Statutory Delta. The Statutory Delta includes parts of Yolo, Solano, Contra Costa, San Joaquin, and Sacramento counties. However, it may be necessary for the BDCP to include conservation actions outside of the Statutory Delta that advance the goals and objectives of the BDCP within the Delta, including as appropriate, conservation actions in the Suisun Marsh, Suisun Bay, and areas upstream of the Delta.

The covered species that are the initial focus of the BDCP include certain aquatic species such as:

- Central Valley steelhead (*Oncorhynchus mykiss*)
- Central Valley Chinook salmon (*Oncorhynchus tshawytscha*) (spring-run and fall/late fall-runs)
- Sacramento River Chinook salmon (*Oncorhynchus tshawytscha*) (winter-run)
- Delta smelt (*Hypomesus transpacificus*)
- Green sturgeon (*Acipenser medirostris*)
- White sturgeon (*Acipenser transmontanus*)
- Splittail (*Pogonichthys macrolepidotus*)
- Longfin smelt (*Spirinchus thaleichthys*)

Other species that will be considered for inclusion in the BDCP include, but may not be limited to:

- Swainson's hawk (*Buteo swainsoni*)
- Bank swallow (*Riparia riparia*)
- Giant garter snake (*Thamnophis gigas*)
- Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)

An Environmental Impact Report/Environmental Impact Statement (EIR/EIS) is currently being developed assessing the potential impacts of implementation of the BDCP. The EIR/EIS will analyze the impacts of alternative conservation actions including improved water conveyance infrastructure in the Delta (e.g., dual or isolated conveyance systems). New dual or isolated conveyance systems would require a canal from the Sacramento River to the SWP Harvey O. Banks and the CVP C.W. Jones pumping plants near Tracy. The EIR/EIS will also analyze the impacts of alternative water operations and management actions to achieve conservation and water supply reliability goals. A Notice of Preparation was prepared in March 2008. A public draft is expected to be released toward the end of 2009, with acceptance of the plan at the end of 2010. Given the complexity of the BDCP, it is likely that its implementation would be outside of the five-year horizon established for the 2-Gates Project.

3.2 CALIFORNIA DEPARTMENT OF WATER RESOURCES AND U.S. BUREAU OF RECLAMATION – FRANKS TRACT PROJECT

This project involves constructing a new flow control facility in the Franks Tract area of the Delta, approximately 3 miles north of the Old River site. The new facility would provide the California Department of Water Resources (DWR) and Reclamation with the operational flexibility to better manage hydrodynamic conditions and salinity concentration in the central and south Delta and thereby improve water quality and fish habitat conditions. The project involves installing and operating flow control gates on up to two Delta waterways (Three Mile Slough and West False River) to protect fish resources and reduce seawater salinity intrusion into the Delta. Four flow control gate locations on Three Mile Slough are under consideration: (1) approximately 700 feet east of the State Route 160 bridge; (2) approximately 4,100 feet from the bridge; (3) approximately 8,600 feet north of the southwestern corner of Twitchell Island along Three Mile Slough, and (4) approximately 1,600 feet north of the southwestern corner of Twitchell Island along Three Mile Slough. On West False River, only one flow control gate location is being considered, approximately 1,800 feet east of the confluence with the San Joaquin River. The EIS/EIR for this project is currently under development. A Notice of Preparation was published September 18, 2008. Potential environmental effects of the project include direct effects to the hydrodynamic characteristics and circulation of Delta waterways which would

affect the movement and habitat of Delta fish species of concern, including delta smelt, longfin smelt, and Chinook salmon. The project could also result in temporary and/or permanent loss of habitat supporting special-status plant or wildlife species, wetlands, or aquatic species residing in the project area. Vessel passage and navigation also could be impeded by the gates, although the control structure would include a boat passage facility for commercial and recreation boats.

3.3 CALIFORNIA DEPARTMENT OF WATER RESOURCES AND U.S. BUREAU OF RECLAMATION – SOUTH DELTA IMPROVEMENTS PROGRAM

The South Delta Improvements Program (SDIP) is a series of interrelated actions to manage water levels and water quality, protect fish and provide increased flexibility for operations of the CVP and the SWP. The specific actions include the following: (1) replace four seasonal rock gates with permanent operable flow gates on Middle River, Grantline Canal, Old River (near the city of Tracy), and at the head of Old River, (2) improve flow conditions in south Delta channels with limited dredging in Middle River, Old River, and West Canal, (3) extend 24 existing local agricultural diversions in the south Delta to deeper water to limit the necessity for more frequent gate operations, and (4) increase the permitted diversion capacity at the SWP Clifton Court Forebay (CCF) to allow more operational flexibility to increase diversion rates when the increase will not harm the Delta's fisheries or local agricultural users.

The SDIP has three objectives:

- Reduce the movement of San Joaquin River watershed Central Valley fall-/late fall–run juvenile Chinook salmon into the south Delta via Old River;
- Maintain adequate water levels and water quality available for agricultural diversions in the south Delta, downstream of the head of Old River; and
- Increase water deliveries and delivery reliability for SWP and CVP water contractors south of the Delta and provide opportunities to convey water for fish and wildlife purposes by increasing the maximum diversion through the existing intake gates at CCF to 8,500 cfs.

The SDIP will meet these objectives by providing increased operational flexibility and the ability to respond to real-time fish conditions while improving water supply reliability. The four gates will be operated from April through November on an as-needed basis to protect water levels and water quality for local agricultural diversions. The gates on Middle River, Old River near Tracy and Grantline Canal will increase circulation in local south Delta channels, thereby improving water quality and dissolved oxygen levels beyond the existing conditions provided by the rock gates. The gate at the head of Old River will normally be closed from September through October, as needed, to improve dissolved oxygen content on the stretch of the San Joaquin River from Old River to the Stockton Deep Water Ship Channel for in-migrating adult salmon during the pre-spawning period. Also, the gate at the head of Old River will be closed from mid-April through mid-May during the out-migration period for San Joaquin River salmon smelts to impede the fish from migrating into the interior south Delta, where they could be exposed to further loss from the effects of local agricultural diversions and the operation of CVP and SWP export facilities.

Operation of the gates outside of these "pre-set" periods will only be on an as-needed basis subject to prior approval by state and federal fish and wildlife agencies.

DWR and Reclamation will utilize specific protective measures during times when permanent south Delta gates are constructed and dredging/diversion relocations are conducted to ensure no harm is caused to Delta fisheries.

The permanent gates (except the Middle River gate) will feature boat locks to avoid any potential adverse effects to Delta boaters. This will be a net improvement to the existing rock gates, which have seasonal boat ramps at gate sites. No adverse effects to boating or recreation are expected from SDIP.

Detailed hydrodynamic and water quality studies of SDIP have concluded that there will not be any significant adverse effects to Bay-Delta water quality from SDIP implementation. In addition, DWR and Reclamation will work to identify and implement additional actions that may be needed to provide for the continuous improvement in water quality called for in the California Bay-Delta Program Authority Program.

SDIP has completed the final EIS/EIR and has entered into the permitting phase. Prior to obtaining the required permits, the USFWS and NMFS must issue biological opinions, which are currently expected to be completed by spring of 2009. After permits have been acquired, DWR will proceed with construction, expected to begin in 2010.

3.4 CONTRA COSTA WATER DISTRICT – WATER QUALITY IMPROVEMENT PROJECTS

3.4.1 Alternative Intake Project

The Alternative Intake Project is a drinking water quality improvement project that would protect and improve delivered water quality for Contra Costa Water District (CCWD) customers by enabling the CCWD to relocate some of its existing diversions to Victoria Canal, a Delta location with better source water quality than is currently available at its Old River and Rock Slough intakes. The alternative intake would divert up to 250 cfs from a new intake on Victoria Canal; however, the project would not increase CCWD's total Delta diversion capacity and would not change demands or the quantity of water delivered to its service area each year.

The project includes a new, screened water intake and pump station located along the lower third of Victoria Canal, on Victoria Island in the central Delta, and a buried pipeline that would extend 12,000 to 14,000 feet from the new intake directly across Victoria Island and beneath Old River and tie into CCWD's existing Old River conveyance system on Byron Tract. The project would also involve adding a new point of diversion to certain existing water rights held by CCWD and Reclamation. The EIR/EIS for this project was completed and record of decision signed in May 2008. This project is currently under construction and is expected to be operational in 2010.

3.4.2 Contra Costa Canal Replacement Project

The project involves replacing the unlined portion of the Contra Costa Canal, approximately 3.97 miles in length, with a buried pipeline within Reclamation's existing right-of-way. The project site is located in the south Delta in eastern Contra Costa County, in the city of Oakley or its sphere of influence. The purpose of this project is to eliminate shallow groundwater seepage from entering the Canal, eliminate non-engineered berms and improve safety and security in a growing urban area.

An Initial Study/Mitigated Negative Declaration was adopted by the CCWD Board of Directors in November 2006 and Reclamation completed an Environmental Assessment and Finding of No Significant Impact for this project in July 2007. No significant impacts are anticipated from this project. In addition the USFWS has issued a non-jeopardy biological opinion on the delta smelt and determined that the project will not result in the adverse modification or destruction of delta smelt critical habitat. CCWD is planning to construct the first 2,000 feet of the Canal Replacement Project from Pumping Plant No. 1 to Marsh Creek in 2009. Ultimately, CCWD will replace the entire 21,000 feet of the unlined canal.

3.4.3 Contra Costa Water District and U.S. Bureau of Reclamation – Los Vaqueros Reservoir Expansion Project

Expansion of the Los Vaqueros Reservoir from 100,000 acre-feet to as large as 275,000 acre-feet is being evaluated for the ability to protect and restore Delta fisheries and improve Bay Area water quality and reliability. The Draft EIS/EIR was issued in February 2009, and a Final EIS/EIR is expected to be issued in September 2010.

With an expanded reservoir, the Bay Area would have a more reliable supply of higher quality water when faced with water shortages caused by drought, emergencies in the Delta, or regulatory restrictions on Delta pumping. An expanded reservoir could also provide water supplies for environmental water management in the Delta to support fish protection, habitat management and other environmental water needs. In 2007, key decision-makers became increasingly convinced of the need to expand the reservoir as one of many timely actions needed to protect the Delta and the Bay Area's water supplies, and Governor Schwarzenegger specifically named the reservoir expansion in his proposals to upgrade the state's water infrastructure.

The environmental effects of the expansion project have been evaluated in an EIS/EIR. The expansion project is being designed to create environmental and water supply reliability benefits without creating any associated impacts on the Delta ecosystem or water quality. General effects of the reservoir expansion may include a net shift in timing of Delta export pumping to periods of less fishery sensitivity, and from drier years to wetter years. These effects would help reduce or mitigate for other cumulative impacts on the Delta ecosystem and water quality. Project construction is expected to commence as early as 2012.

3.5 CENTRAL VALLEY PROJECT IMPROVEMENT ACT REQUIRED PROGRAM

The Central Valley Project Improvement Act includes a requirement for Reclamation to develop and implement a program to mitigate fishery impacts resulting from the operation of Pumping Plant No. 1. The program may include a fish screen at Rock Slough (just south of the Old River site), modified operations, or other measures to mitigate fishery impacts. Reclamation is required to develop a fish mitigation program (including the possible installation of a fish screen at the headworks) by December 31, 2008. CCWD and Reclamation are in the process of seeking an extension of the December 31, 2008 requirement. Construction and operation of the 2-Gates Project would provide further justification for this extension.

3.6 SACRAMENTO COUNTY WATER AGENCY AND EAST BAY MUNICIPAL UTILITIES DISTRICT – FREEPORT REGIONAL WATER PROJECT

The Freeport Regional Water Project is a cooperative effort of Sacramento County Water Agency (SCWA) and East Bay Municipal Utilities District (EBMUD) to supply surface water from the Sacramento River to customers in central Sacramento County and in Alameda and Contra Costa counties. The project will provide SCWA with up to 85 million gallons of water per day (mgd) which will in turn be supplied to customers in central Sacramento County to supplement groundwater use in the central part of the county. Sacramento will begin receiving water from this project in 2011 after construction of the Vineyard Surface Water Treatment Plant is completed. EBMUD will use up to 100 mgd of water during dry years only, estimated to be three out of every 10 years, as a supplemental water source to complement existing conservation programs. EBMUD will be able to receive water from the Project by the end of 2009. An EIR/EIS was completed for this project in July 2005. Significant, unavoidable impacts of the project were determined to be short-term increases in construction noise in the project area during the day, an exposure of noise-sensitive land uses to general construction noise at night, and an increase in ambient noise levels in the project area due to facility operations. Construction for this project is currently underway and is expected to be completed in July 2009. The project is expected to be operational beginning December 2009.

3.7 OTHER POTENTIAL PROJECTS

Reclamation has considered constructing a barrier-gate near the head of Georgiana Slough to block highly turbid waters from entering the central Delta. If pursued and implemented, this could be tested as a complementary action to the 2-Gates Project at a future date.

While not currently a part of the proposed Project, and not evaluated in this MND/EA, the Old River gate could be operated in conjunction with potentially modified Delta Cross Channel gate operations or upstream reservoir releases to provide additional flow to the San Joaquin River, and help push conditions favorable to smelt in a seaward direction.

Other construction projects in Contra Costa County are listed in Table 3-1. No related projects were identified for San Joaquin County.

Table 3-1 Other Projects—Approved, Proposed, or under Construction

			Proposed/Existing Use		
Project Name	Status	Acreage	Residential Units	Industrial SF	Commercial SF
Cypress Grove	Under construction	147	637	—	—
Dutch Slough Properties	Proposed	320	Approximately 1,275	—	Approximately 100,000
East Cypress Corridor Specific Plan	Proposed	2,546	5,759	166,356 (5.7 acres)	638,600
Summer Lake (formerly Cypress Lake and Country Club)	Under construction (although changes have been proposed for the northern, as-yet-undeveloped portion of the project site)	678 [a]	1,330 [b] (with an additional 119 units proposed)	166,356 (5.7 acres)	10,000 [d]
Tuscany Estates (formerly Baldocchi property)	Approved	24	100	—	—
Dutch Slough Community Park(formerly Emerson Dairy)	Planning	55	—	—	—
Lindquist Landing project on Holland Tract Road	Planning	19	Add 50,000 sq feet boat storage	—	—
Dutch Slough Wetland Restoration Project (DWR)	Planning	1,166	1,166	—	—
Holland Tract Wetlands Project Wildlands Inc.	Construction expected starting in 2009	263	263	109	
Ironhouse Sanitary District Waste Water Expansion Project, 8 Million Gallon per day Tertiary Treatment Plant	Construction schedule to begin in 2009 and online in 2011	—	—	—	—

[a] This acreage is included in the acreage shown for the East Cypress Corridor Specific Plan.
[b] These units are included in the total number of units shown for the East Cypress Corridor Specific Plan.
[c] This industrial development is included in the development shown for the East Cypress Corridor Specific Plan.
[d] This commercial square footage is included in the development shown for the East Cypress Corridor Specific Plan.

Source: Data compiled by EDAW 2005/CCWD 2008

SECTION 4

Environmental Baseline

Project Title

2-Gates Demonstration Project

Lead Agency Name and Address

California Department of Water Resources
1416 9th Street
Sacramento, CA 95814
Mailing Address:
P.O. Box 942836

Sacramento, CA 94236
U.S. Bureau of Reclamation
2800 Cottage Way, MP-152
Sacramento, CA 95825

Contact Person

TBD
Bay-Delta Office, South Delta Branch
California Department of Water Resources
(916) 653-7247
marshall@water.ca.gov

TBD
Regional Environmental Officer
U.S. Bureau of Reclamation – Mid-Pacific Region
(916) 978-5025
sfry@mp.usbr.gov

Project Location

The Old River and Connection Slough sites are located in the central Sacramento-San Joaquin Delta (Delta), approximately 13 and 16 miles northwest of Stockton, and 4.8 and 6.8 miles north and northwest of Discovery Bay, respectively. Project construction would occur in both Contra Costa and San Joaquin counties. The Old River site is located on Old River between Holland Tract and Bacon Island, about 3 miles south of Franks Tract and about 1 mile north of the confluence of Old River and Rock Slough. The Connection Slough site is located about 3.5 miles southeast of Franks Tract between Mandeville Island and Bacon Island and between Middle River and Little Mandeville Island.

Project Applicant's Name and Address

Bay-Delta Office
California Department of Water Resources
1416 9th Street, Room 215-34
Sacramento, CA 95814

Mailing Address
PO Box 942836
Sacramento, CA 94236-0001

U.S. Bureau of Reclamation – Mid-Pacific Region
2800 Cottage Way, MP-150
Sacramento, CA 95825-1898

General Plan Designation

In Contra Costa County, the Old River is designated as Water (WA). San Joaquin County designates all waterways as Resource Conservation (RC). The construction area in Contra Costa County just west of Old River is designated as Delta Recreation (DR). The construction area in San Joaquin County to the east is designated General Agriculture (A/G). The areas on either side of Connection Slough are designated as A/G.

Zoning

Old River and Connection Slough are waterways and as such do not have zoning designations. The construction area in Contra Costa County just west of Old River is zoned General Agriculture, 5-acre minimum parcel size (A-2). The construction area in San Joaquin County to the east is zoned General Agriculture, 80-acre minimum parcel size (AG-80). The areas on either side of Connection Slough are designated as AG-80.

Description of Project

The 2-Gates Project is a temporary and cost-effective project that would install and operate removable gates in two key channels (Old River and Connection Slough) in the central Delta in order to control flows and thereby help prevent entrainment of delta smelt (*Hypomesus transpacificus*) and other sensitive aquatic species at the State Water Project (SWP) and Central Valley Project (CVP) export pumps. A detailed description of the Project is included in Section 2 of this Mitigated Negative Declaration/Environmental Assessment (MND/EA).

Existing Land Uses and Setting

Both the Old River and Connection Slough sites are located in a rural area characterized by agricultural land uses. Bacon Island and Mandeville Island are actively farmed, and land surrounding the agricultural fields is regularly disked. Portions of Holland Tract are under cultivation, but the fields in the study area are fallow. Adjacent fields on Holland Tract are used as rangeland for cattle. Maintenance dredging occurs in the agricultural ditches on all islands. The proposed alternate storage site on Holland Tract is grazed by cattle. Several unused structures (old farmhouses) are located on Bacon Island near the Old River site and a large barn is located on Holland Tract near the site. A structure is visible on aerial photography at Mandeville Island near the access bridge. Levees have been constructed along both banks of Old River and Connection Slough. The roads on the Old River levees are private. The road on the Bacon Island side of Connection Slough is public, while the road on Mandeville is private.

Other Public Agencies Whose Approval is Required: (e.g., Permits, Financing Approval, or Participation Agreement)

U.S. Army Corps of Engineers (Corps), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), California State Historic Preservation Office (SHPO), California Department of Fish and Game (DFG), State Lands Commission (SLC), and Central Valley Regional Water Quality Control Board (CVRWQCB).

Environmental Factors Potentially Affected

The Project would not result in any impacts in the areas listed below that would be considered a "Potentially Significant Impact"; as indicated by the checklist on the following pages, the Project has been designed to reduce potential impacts to less than significant, and mitigation measures have been identified that would reduce other impacts to less than significant.

☐ Aesthetics	☐ Agricultural Resources	☐ Air Quality
☐ Biological Resources	☐ Cultural Resources	☐ Geology/Soils
☐ Hazards and Hazardous Materials	☐ Hydrology/Water Quality	☐ Land Use/Planning
☐ Mineral Resources	☐ Noise	☐ Population/Housing
☐ Public Services	☐ Recreation	☐ Transportation/Traffic
☐ Utilities/Service Systems	☐ Mandatory Findings of Significance	

Environmental Determination

On the basis of this initial evaluation:

I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared. ☐

I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions to the project have been made by or agreed to by the applicant. A MITIGATED NEGATIVE DECLARATION will be prepared. ☒

I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required. ☐

I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed. ☐

I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR, including revisions or mitigation measures that are imposed upon the Project, nothing further is required. ☐

Name Signature	Date

EVALUATION OF ENVIRONMENTAL IMPACTS

1. A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the Project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on Project-specific factors as well as general standards (e.g., the Project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).
2. All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.
3. Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.
4. "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from "Earlier Analyses," as described in (5) below, may be cross-referenced).
5. Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:
    a. Earlier Analysis Used. Identify and state where they are available for review.
    b. Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.
    c. Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures, which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the Project.
6. Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.
7. Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.
8. This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.
9. The explanation of each issue should identify:
    a. the significance criteria or threshold, if any, used to evaluate each question; and
    b. the mitigation measure identified, if any, to reduce the impact to less than significant.

4.1 AESTHETICS

Issues & Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
a. Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐
b. Damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☒	☐
c. Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐
d. Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☒	☐	☐

4.1.1 Environmental Setting

Visual resources consist of the natural and manmade features that give a particular environment its aesthetic qualities. These features may be natural appearing or modified by human activities. Together, they form the overall impression of an area, referred to as its landscape character. Landforms, water surfaces, vegetation, and manmade features are treated as characteristic of an area if they are inherent to the formation, structure, and function of the landscape. Landscape character is evaluated to assess whether a proposed project would appear compatible with the existing setting or would contrast noticeably with the setting and appear out of place.

Visual resources also have a social setting, which includes public values, goals, awareness, and concern regarding visual quality. Social setting is addressed as visual sensitivity or the relative degree of public interest in visual resources and concern over adverse changes in the quality of that resource. Visual sensitivity is key in assessing how important an effect on the visual resource would be and whether it represents a significant impact. Recreational uses are generally considered to have high visual sensitivity, as are views from scenic routes or corridors, or along scenic highways and wilderness areas. The primary areas of concern generally are associated with changes to prominent topographic features, changes in the character of an area with high visual sensitivity, removal of vegetation, or blockage of public views of a visually sensitive landscape.

Both the Old River and Connection Slough sites are located in a sparsely developed rural area characterized primarily by agricultural uses, although some wetlands are present in the areas surrounding the river channels. A bridge over Connection Slough is located about 0.3 mile west of the Connection Slough site, and several marinas are located nearby (one is approximately 0.8 miles south and one is about 1.75 miles southwest of the Old River Site). Power lines are present along the adjacent roads, and scattered buildings associated with agricultural uses are located nearby. The surrounding islands contain a combination of fallow land and land that is actively farmed with row crops. Topography is generally flat, although the adjacent islands are considerably lower than the tops of the adjacent levees. Both the Old River and Connection Slough river channels have been modified with rock-lined levees. The immediate Project vicinity does not contain trees or visually distinctive characteristics.

The Old River site is not accessible to the public by road, but the Connection Slough site is located at the terminus of North Bacon Island Road (Figure 2-2), which is designated by the San Joaquin County General Plan (1992) as a scenic route. State Route (SR) 4 is designated as a scenic route by both San Joaquin and Contra Costa counties (San Joaquin County 1992, Contra Costa County 2005), but it is more than 6 miles south of the Project sites, and these sites would not be visible from this location. The Open Space Element of

the Contra Costa General Plan (2005) identifies the Old River as a scenic waterway. The Old River and Connection Slough sites are accessible by boaters, but the levees limit views of the surrounding areas from the water.

4.1.2 Regulatory Setting

No federal or state regulations are related to the aesthetic impacts of the Project. Both the Contra Costa and San Joaquin County General Plans contain policies intended to preserve the aesthetic qualities of the Delta. The Resources Element of the San Joaquin County General Plan (1992) specifies that:

- Views of waterways…from public land and public roadways shall be protected.
- Outstanding scenic vistas shall be preserved and public access provided to them whenever possible.
- Development proposals along scenic routes are not to detract from the visual and recreational experience along the route.

The Open Space Element of the Contra Costa County General Plan (2005) includes the following goal:

- To preserve the scenic qualities of the San Francisco Bay/Delta estuary system and the Sacramento-San Joaquin River/Delta shoreline.

Policies include:

- In order to conserve the scenic beauty of the County, developers shall generally be required to restore the natural contours and vegetation of the land after grading and other land disturbances. Public and private projects shall be designed to minimize damages to significant trees and other visual landmarks.
- Maintenance of the scenic waterways of the County shall be ensured through public protection of the marshes and riparian vegetation along the shorelines and delta levees, as otherwise specified in this Plan.
- Physical and visual public access to established scenic routes shall be protected.

4.1.3 Impacts and Mitigation Measures

4.1.3.1 No Project

No changes to the aesthetic qualities of the Project sites would result from the No Project alternative because no development would occur.

4.1.3.2 2-Gates Project

a. Have a substantial adverse effect on a scenic vista.

Less than Significant. A scenic vista is usually considered a rural area containing natural visual elements that can be seen from a distance. A scenic vista can be affected by directly reducing the scenic quality of the vista or by blocking views of the scenic resource. Important factors in determining if a proposed project will block views include its height, mass, and location relative to surrounding land uses and travel corridors. The Old River is identified as a scenic waterway by Contra Costa County, and Connection Slough is near the terminus of the portion of Bacon Island Road that is designated as a scenic route by San Joaquin County; therefore, views of Old River from a distance and views from Bacon Island Road could be considered scenic vistas. The Old River site is not accessible to the public by road, and Bacon Island Road, which is a scenic route, is approximately 2.5 miles east of the Old River site. Therefore, the Project components at this site would not be visible from Bacon Island Road, and it would not restrict or diminish views of a scenic vista.

The Connection Slough site would be visible from Bacon Island Road; however, this area is quite remote, and there is limited public use because land on either side of Connection Slough is private land in agricultural use; moreover, the gate structure would affect only a small portion of the river channel and the gates would not extend above the levees. The Project components would be visible to boaters, but they would not restrict views of the surrounding areas because of the levees, which block views of the much lower land on the adjacent islands. The gate structures would affect views of the river channels in the immediate vicinity, but these immediate views are not considered a scenic vista. Moreover, the river channels have already been modified with riprap-lined levees and only a small portion of the rivers would be affected. The potential disposal area on Holland Tract is fallowed farmland currently used for cattle grazing and is not considered a scenic vista, nor is the area on Bacon Island where dredged material disposal could occur. Any impacts on scenic vistas would not be substantial.

b. Damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway

Less than Significant. Both the Old River and Connection Slough sites already have been modified by the addition of riprap-lined levees. Vegetation is regularly cleared from the levees as part of ongoing maintenance; thus, the limited vegetation that is present is not considered a scenic resource. The Project would not require tree removal, and the Project area would be restored to its previous condition once construction was completed.

c. Substantially degrade the existing visual character or quality of the site and its surroundings

Less than Significant. The Project would not substantially degrade the existing visual character or quality of the site and its surroundings. As noted above, both river channels have been altered through the addition of rock-lined levees, and the installation of the Project facilities would affect only a small portion of the rivers. Moreover, the gates would be locked open from July to November, and thus would not be in place during much of the time when most recreational boaters are present.

d. Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area

Less than Significant with Mitigation Incorporated. The operator house would include fluorescent lights. The operator would control three sets of flood lights, allowing the eastern and western gates and boat ramp to be illuminated. Channel marker lights would be self-contained solar-powered lights. The flood lights are the primary source of light, but the light would be directed on the gates and boat ramps and would affect only a limited area at each of the sites. The ramp surface would consist of precast concrete deck panels to provide access around the Project facilities for recreational boaters, and the gates would be constructed of steel. The surfaces would not be highly reflective and would not constitute a substantial source of glare that would affect daytime views. Although the nearest receptors are located 4,120 feet from the Old River site, if Project lighting was visible from this location it would adversely affect nighttime views. The following mitigation measure would mitigate this impact to less than significant:

Mitigation Measure AES-1: All Project lights would be directed downward toward gates and boat ramps and would be shielded to reduce visibility from neighboring properties. Exposed bulbs will be prohibited.

4.1.3.3 Cumulative Impacts

The Project's impacts would be highly localized and affect only a small portion of the Delta. No other projects would affect views in the immediate vicinity of the Old River and Connection Slough sites, and no cumulative impacts would occur.

4.2 AGRICULTURAL RESOURCES

Issues & Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model prepared by the California Department of Conservation as an optional model to use in assessing impacts on agricultural farmland. Would the Project:				
e. 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 in the California Resources Agency, to non-agricultural use?	☐	☐	☒	☐
f. Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☒	☐
g. Involve other changes in the existing environment which, due to their location or nature, could individually or cumulatively result in loss of Farmland, to non-agricultural use?	☐	☐	☒	☐

4.2.1 Environmental Setting

The California Department of Conservation (CDOC) has the primary responsibility for regulation and reporting related to California agricultural lands. The United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service (SCS), has defined Important Farmlands based upon a number of factors, including the physical and chemical characteristics of the land and the suitability of the land for producing crops (refer to Table 4.2-1 for the definitions that are relevant to the proposed Project). Important Farmlands are afforded special protection due to their importance to agricultural production.

Table 4.2-1 Important Farmland Definitions

Farmland Category	Definition
Prime Farmland	Prime Farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses (the land could be cropland, pastureland, rangeland, forest land, or other land, but not urban built-up land or water). It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods. In general, Prime Farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks.
Unique Farmland	Unique Farmland is land other than Prime Farmland that is used for the production of specific high value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods.
Farmland of Statewide Importance	This is land, in addition to Prime and Unique Farmlands, that is of statewide importance for the production of food, feed, fiber, forage, and oil seed crops. Criteria for defining and delineating this land are to be determined by the appropriate State agency or agencies. Generally, additional farmlands of statewide importance include those that are nearly Prime Farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as Prime Farmlands if conditions are favorable.
Farmland of Local Importance	In some local areas there is concern for certain additional farmlands for the production of food, feed, fiber, forage, and oilseed crops, even though these lands are not identified as having national or statewide importance. Where appropriate, these lands are to be identified by the local agency or agencies concerned.

Source: CDOC undated.

Note: The definitions for Prime Farmland, Unique Farmland, Farmland of Statewide Importance, and Farmland of Local Importance were developed by the USDA-SCS as part of the nationwide Land Inventory and Monitoring (LIM) system. The LIM definitions have been modified for use in California with the most significant modification being that Prime Farmland and Farmland of Statewide Importance must be irrigated.

Both the Old River and Connection Slough sites are bordered by Important Farmland (CDOC 2008). The portion of Holland Tract that adjoins the Old River site is a combination of Prime Farmland and Farmland of Statewide Importance. Parts of Holland Tract are under cultivation; but in the vicinity of the Old River site, the fields are fallow and are used for cattle grazing. The proposed alternate storage site on Holland Tract is currently grazed by cattle and is classified as Farmland of Local Importance. The portion of Bacon Island that is just west of the Old River site contains Prime Farmland and is currently in agricultural production (row crops). The Connection Slough site is bordered by Prime Farmland on Mandeville Island, and a combination of Prime Farmland, Farmland of Statewide Importance, and Farmland of Local Importance on the Bacon Island side. The latter designation applies to the proposed dredged materials disposal site on Bacon Island. With the exception of this site, the areas surrounding the Connection Slough site are actively farmed with row crops. The lands surrounding the Connection Slough site are under Williamson Act contracts; those surrounding the Old River site are not. The lands surrounding both sites are zoned for agricultural purposes. The construction area in Contra Costa County just west of Old River is zoned General Agriculture, 5-acre minimum parcel size (A-2). The construction area in San Joaquin County to the east is zoned General Agriculture, 80-acre minimum parcel size (AG-80). The areas on either side of Connection Slough are designated as AG-80.

4.2.2 Regulatory Setting

The Farmland Protection Policy Act (7 United States Code [USC] 4201) is the federal statute that provides the basis for the policy of avoiding impacts on agricultural resources from federal programs. The Act does not prohibit federal agencies from undertaking actions that convert farmland to nonagricultural use, but only requires that they "identify and take into account the adverse effects of federal programs on the preservation of farmland; consider alternative actions, as appropriate, that could lessen such adverse effects; and assure that such federal programs, to the extent practicable, are compatible with state (and local) programs and policies to protect farmland" (7 USC 4202[b]).

As noted above, the CDOC has the primary responsibility for regulation and reporting related to California agricultural lands

The Williamson Act, formally known as the California Land Conservation Act of 1965 (Government Code Sections 51200–51297.4, as amended), enables local governments to enter into contracts with private landowners that restrict specific parcels of land to agricultural or related open-space use. In return, these landowners receive property tax assessments that are based upon farming and open space uses rather than other potentially higher tax bases.)

Contra Costa and San Joaquin counties regulate land use through zoning and general plan designations, which specify allowable uses, as well as through general plan policies, described below.

CONTRA COSTA COUNTY GENERAL PLAN, CONSERVATION ELEMENT

8-32. Agriculture shall be protected to assure a balance in land use.

SAN JOAQUIN COUNTY GENERAL PLAN, RESOURCES CHAPTER

5. Agricultural areas shall be used primarily for crop production, ranching, and grazing. All agricultural support activities and non-farm uses shall be compatible with agricultural operations and shall satisfy the following criteria:

a. The use requires a location in an agricultural area because of unusual site area requirements, operational characteristics, resource orientation, or because it is providing a service to the surrounding agricultural areas.

b. The operational characteristics of the use will not have a detrimental impact on the management or use of surrounding agricultural properties.

c. The use will be sited to minimize any disruption to the surrounding agricultural operations.

d. The use will not significantly impact transportation facilities, increase air pollution, or increase fuel consumption.

4.2.3 Impacts and Mitigation Measures

4.2.3.1 No Project

The No Project alternative would not affect agricultural resources because no development would occur.

4.2.3.2 2-Gates Project

h. 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 in the California Resources Agency, to non-agricultural use

Less than Significant. Most construction would occur in the river channels or on the adjacent banks that are not used for agricultural purposes. About half of the laydown and construction support areas would be located on the levees, while the balance would be in fallow fields at the base of the levees. These areas are not currently in agricultural production. All areas would be returned to their prior condition once construction is complete. The approximately 7-acre area on northeast Bacon Island that would be used for the storage of dredged material is classified as Farmland of Local Importance, which is not considered "Farmland" under CEQA and NEPA; moreover, use of this site for storage would not remove soils, and would help offset the land subsidence that results from the decomposition of organic carbon in the peat soils. The potential storage area on Holland Tract also is classified as Farmland of Local Importance and is currently fallow. It would be used only temporarily and would not result in the loss of agricultural soils. The Project would not permanently convert Farmland to non-agricultural use at either the Old River or Connection Slough sites.

i. Conflict with existing zoning for agricultural use, or a Williamson Act contract

Less than Significant. With the exception of temporary construction areas, the Project would be constructed primarily within river channels or on existing levees. Disturbed areas would be restored upon the completion of construction. Farming would be able to continue unimpeded both during and after construction. Any dust generated by the Project would be minimized by adherence to the dust suppression methods required for construction in both Contra Costa and San Joaquin counties (refer to Section 4.3, Air Quality). The Project would not require any activities that would conflict with existing zoning for agricultural use or a Williamson Act contract.

j. Involve other changes in the existing environment which, due to their location or nature, could individually or cumulatively result in loss of Farmland, to non-agricultural use

Less than Significant. The Project would install operable gates on river channels that are occasionally used by farm vessels, but access would be maintained at all times; therefore, farmers would continue to be able to access their lands by boat. The Project would not involve other changes in the existing environment which, due to their location or nature, could individually or cumulatively result in loss of Farmland, to non-agricultural use.

4.2.3.3 Cumulative Impacts

The Project would not result in the permanent loss of Farmland, conflict with agricultural zoning or Williamson Act contracts, or otherwise result in the loss of farmland; therefore, no cumulative impacts would occur.

4.3 AIR QUALITY

Issues & Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Where available, the significance criteria established by the applicable air quality management or pollution control district may be relied upon to make the following determinations. Would the Project:				
k. Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
l. Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐
m. Result in a cumulatively considerable net increase of any criteria pollutant for which the Project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☒	☐
n. Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
o. Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒

4.3.1 Environmental Setting

4.3.1.1 Introduction

The Old River site is located on the boundary between Contra Costa County, which is in the San Francisco Bay Area Air Basin, and San Joaquin County, which is in the San Joaquin Valley Air Basin. These air basins are under the jurisdiction of the Bay Area Air Quality Management District (BAAQMD) and the San Joaquin Valley Air Pollution Control District (SJVAPCD), respectively. The Connection Slough site is wholly in the San Joaquin Valley Air Basin.

State and federal laws define criteria emissions to include the following: Reactive or volatile organic compounds (ROC or VOC), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), respirable particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$). During the installation of Project components, the Project would temporarily cause criteria emissions from the combustion of fossil fuels (i.e., diesel, gasoline) used to run construction equipment and vehicles, both onsite and offsite. Installation activities also would cause emissions of fugitive dust, primarily as PM_{10}. During operations, emissions would result primarily from vehicle trips generated by the gate operations and the potential use of diesel-powered generators at each of the Project sites. Because the Project would request that Pacific Gas & Electric Company (PG&E) provide electric power, the generators would be used as back-up source of power. However, it may take some time before PG&E is able to connect the Project facilities to the electric grid and the generators would be used until this occurred.

The potential for impacts on climate change associated with greenhouse gas emissions is discussed in Section 5.

4.3.1.2 Meteorology

In summer, northwest winds to the west of the Pacific coastline are drawn into the interior through the Golden Gate and over the lower portions of the San Francisco Peninsula. This channeling of the flow through the Golden Gate produces a jet that sweeps eastward but widens downstream producing southwest winds at Berkeley and northwest winds at San Jose; a branch curves eastward through the Carquinez Strait and into the Central Valley. In winter, the Bay Area experiences periods of storminess and moderate-to-strong winds and periods of stagnation with very light winds. Winter stagnation episodes are characterized by outflow from the

Central Valley, nighttime drainage flows in coastal valleys, weak onshore flows in the afternoon and otherwise light and variable winds (BAAQMD 2008b). Annual average wind speeds in the central Bay Area are 8.7 miles per hour (mph) or 3.9 meters per second (m/s). Annual average wind speeds in the Stockton area are 7.5 mph or 3.3 m/s. In the Project area, typical wind speed is about 8.1 mph or 3.6 m/s. The Project area climate is characterized by moderately wet winters and dry summers. About 90 percent of the annual total rainfall is received between November and April period. Between June and September, normal rainfall is typically less than 0.1 inch (BAAQMD 2008b). Temperatures in the Project area average about 60 degrees Fahrenheit (°F) annually, with summer highs in the 80s and winter lows in the 40s. Precipitation averages about 18 inches per year, although annual precipitation varies markedly from year to year (CSW 2008).

4.3.1.3 Ambient Air Quality

The BAAQMD and SJVAPCD each operate a regional air monitoring network, together comprising over 50 monitoring stations that collectively measure the ambient concentrations of the six criteria air pollutants described above: O_3, NO_2, SO_2, CO, PM_{10}, and $PM_{2.5}$.

Not all monitoring stations are fully instrumented for of all the above pollutants. For this assessment, BAAQMD's Bethel Island station data is used as historic and representative since it is located only 4.3 miles northwest (upwind) of the Old River site and monitors all but one pollutant ($PM_{2.5}$), while SJVAPCD's Stockton station is 15 miles east (downwind). Existing and probable future air quality in the Project area can generally be inferred from ambient air quality measurements taken at the Bethel Island site. Table 4.3-1 is a six-year summary of historic monitoring data (2002 to 2007) obtained by the Bethel Island station except for $PM_{2.5}$, which is data from the BAAQMD's Concord monitoring station (BAAQMD 2008a).

During the period from 2002 to 2007, there were no daily violations of state or federal ambient air quality standards for nitrogen dioxide, sulfur dioxide, or carbon monoxide recorded at the Bethel Island station (BAAQMD 2008a); however, there were exceedances of ozone, PM_{10} and $PM_{2.5}$ standards. Table 4.3-2 shows the incidence of daily violations of ambient ozone, PM_{10} and $PM_{2.5}$ standards for the six-year period.

Table 4.3-1 Ambient Air Quality Summary for Bethel Island 2002 to 2007, Maximums

Pollutant	Period	Units	2007	2006	2005	2004	2003	2002
Ozone (O_3)	1-hour max	ppmv	0.093	0.116	0.089	0.100	0.090	0.110
	8-hour max	ppmv	0.078	0.090	0.077	0.080	0.080	0.100
	3-year avg	ppmv	0.073	0.073	0.072	0.075	0.079	0.079
Nitrogen Dioxide (NO_2)	1-hour max	ppmv	0.048	0.044	0.038	0.030	0.050	0.040
	Annual avg	ppmv	0.008	0.008	0.007	0.008	0.009	0.010
Sulfur Dioxide (SO_2)	24-hour max	ppmv	0.005	0.007	0.006	0.006	0.006	0.009
	Annual avg	ppmv	0.002	0.002	0.002	0.002	0.002	0.003
Carbon Monoxide (CO)	1-hour max	ppmv	1.1	1.3	1.1	1.2	1.6	1.7
	8-hour max	ppmv	0.8	1.0	0.9	0.9	0.9	1.3
Particulates (as PM_{10})	24-hour max	$\mu g/m^3$	49.0	84.0	64.0	42.0	51.0	58.0
	Annual avg	$\mu g/m^3$	18.8	19.4	18.5	19.5	19.4	23.8
Particulates (as $PM_{2.5}$)	24-hour max	$\mu g/m^3$	46.2	62.1	48.9	74.0	50.0	77.0
	Annual avg	$\mu g/m^3$	8.4	9.3	9.0	10.7	9.7	13.3

Source: BAAQMD 2008a

Notes:

Bethel Island, Concord for PM2.5
ppmv = parts per million by volume
$\mu g/m^3$ = micrograms per cubic meter

Table 4.3-2 Ozone, PM_{10} and $PM_{2.5}$ Standard Violation Days for Bethel Island, 2002 to 2007

Pollutant	Standard	Total	2007	2006	2005	2004	2003	2002
Ozone (O_3)	Federal	4	0	1	0	0	0	3
	California	21	4	14	2	1	0	0
Particulates (as PM_{10})	Federal	0	0	0	0	0	0	0
	California	6	0	1	1	0	1	3
Particulates (as $PM_{2.5}$)	Federal	17	7	5	0	1	0	4
	California	0	0	0	0	0	0	0

Source: BAAQMD 2008a

4.3.1.4 Sensitive Receptors

Certain population groups are considered more sensitive to air pollution and odors than others, in particular, children, elderly, and acutely ill and chronically ill persons, especially those with cardio respiratory diseases such as asthma and bronchitis. Sensitive receptors (land uses) indicate locations where such individuals are typically found, namely schools, daycare centers, hospitals, convalescent homes, residences of sensitive persons, and parks with active recreational uses, such as youth sports.

Persons engaged in strenuous work or physical exercise also have increased sensitivity to poor air quality. Residential areas are considered more sensitive to air quality conditions than commercial and industrial areas, because people generally spend longer periods of time at their residences, resulting in greater exposure to ambient air quality conditions. Recreational uses such as parks are also considered sensitive, due to the greater exposure to ambient air quality conditions and because the presence of pollution detracts from the recreational experience.

The Project sites are located in a sparsely populated rural (agricultural) area. The nearest house is approximately 600 feet (183 meters) south of the Old River site; however, it is unoccupied. The next nearest receptor is a marina with live-aboard boat owners approximately 0.8 mile south of the Old River site. It is not known whether the marina, which is outside the immediate vicinity (i.e., 1,000 feet or 305 meters) of the Old River site, houses potentially sensitive persons.

4.3.2 Regulatory Setting

4.3.2.1 State and National Ambient Air Quality Standards

The Clean Air Act of 1970 (CAA), as amended 1977 and 1990, 42 USC 7401 et seq.) established national ambient air quality standards (NAAQS) and delegates the enforcement of these standards to the states. In California, the California Air Resources Board (CARB) is responsible for enforcing air pollution regulations. The CARB has in turn delegated the responsibility of regulating stationary emission sources to local air agencies (i.e., BAAQMD and SJVAPCD). In areas that exceed the NAAQS, the CAA requires preparation of a State Implementation Plan (SIP), detailing how the states will attain the standards within mandated time frames. As shown in Table 4.3-3, California ambient air quality standards (CAAQS) tend to be at least as protective as national standards and are often more stringent.

Air districts in California are required to monitor air pollutant levels to assure that NAAQS and CAAQS are met and, in the event that they are not, to develop strategies to meet these standards. Depending on whether the standards are met or exceeded, the local air basin is classified as being in "attainment" or "non-attainment."

The air pollutants of most concern in the Bay Area are ozone and particulate matter. The San Francisco Bay Area and San Joaquin Valley Air Basins are in NAAQS attainment except for the following federal standards shown in Table 4.3-3 (CARB 2007a, 2008a):

- 8-hour ozone – Non-attainment
- 24-hour PM10 – Non-attainment (Contra Costa County - Unclassified)
- 24-hour PM2.5 – Non-attainment (Contra Costa County - Unclassified)
- The San Francisco Bay Area Air Basin is a "Serious" area for ozone and originally had to attain the federal 1-hour ozone standard by 1999.
- The San Joaquin Valley is an "Extreme" area for ozone and plans to attain the federal 1-hour ozone standard by 2010.

On April 30, 2007, the Governing Board of the SJVAPCD voted to request the U.S. Environmental Protection Agency (EPA) to reclassify the San Joaquin Valley Air Basin as extreme non-attainment for the federal 8-hour ozone standards. The CARB, on June 14, 2007, approved this request. This request must be forwarded to EPA by the CARB and would become effective upon EPA final rulemaking after a notice and comment process; it is not yet in effect (SJVAPCD 2007a).

Table 4.3-3 State and Federal Ambient Air Quality Standards

		California Standards		Federal Standards	
Pollutant	Averaging Time	ppmv	µg/m³	ppmv	µg/m³
Ozone (O_3)	1-hour	0.09	177	--	--
	8-hour	0.07	137	0.075	147
Nitrogen Dioxide (NO_2)	1-hour	0.18	338	--	--
	Annual	0.03	56	0.053	100
Sulfur Dioxide (SO_2)	1-hour	0.25	655	--	--
	3-hour (secondary)	--	--	0.50	1,309
	24-hour	0.04	105	0.14	367
	Annual	--	--	0.03	79
Carbon Monoxide (CO)	1-hour	20	22,898	35	40,071
	8-hour	9	10,304	9	10,304
	Lake Tahoe (8-hour)	6	6,869	--	--
Particulates (as PM_{10})	24-hour	--	50	--	150
	Annual	--	20	--	--
Particulates (as $PM_{2.5}$)	24-hour	--	--	--	35
	Annual	--	12	--	15
Lead (Pb)	30-day	--	1.5	--	--
	90-day	--	--	--	1.5
Sulfates (as SO_4)	24-hour	--	25	none	none
Hydrogen Sulfide (H_2S)	1-hour	0.03	42	none	none
Vinyl Chloride (C_2H_3Cl)	24-hour	0.01	26	none	none
Visibility Reducing Particles	8-hour	Extinction coefficient of 0.23 per km; visibility of 10 miles or more (0.07 to 30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70%.		none	None

Source: (CARB 2008a)

Notes:
Standard Temperature = 25 degrees Celsius
Standard Molar Volume = 24.465 liter/g-mole
For gases, µg/m3 calculated from ppmv based on molecular weight and standard conditions
ppmv = parts per million by volume
µg/m³ = micrograms per cubic meter

The San Francisco Bay Area and San Joaquin Valley Air Basins are in CAAQS attainment except for the following state standards shown in Table 4.3-3 (BAAQMD 2008a, SJVAPCD 2008):

- 8-hour ozone – Non-attainment
- 1-hour ozone – Non-attainment
- Annual PM_{10} – Non-attainment
- 24-hour PM_{10} – Non-attainment
- Annual $PM_{2.5}$ – Non-attainment
- 1-hour hydrogen sulfide - Unclassified
- 8-hour visibility reducing particles – Unclassified

Similar to the federal CAA, the California Clean Air Act also classifies areas according to pollution levels. Under the California Clean Air Act, the Bay Area is a "Serious" ozone non-attainment area and a state PM_{10} and $PM_{2.5}$ non-attainment area. The San Joaquin Valley is an "Extreme" ozone non-attainment area, in addition to being a state PM_{10} and $PM_{2.5}$ non-attainment area.

4.3.2.2 Regional Plans

For the San Francisco Bay Area Air Basin, the Association of Bay Area Governments (ABAG), the Metropolitan Transportation Commission (MTC), and BAAQMD jointly prepare the Bay Area Clean Air Plan and Ozone Attainment Plan (BAAQMD 2000, 2001).

For the San Joaquin Valley Air Basin, the Extreme Ozone Attainment Demonstration Plan is prepared by the SJVAPCD, in conjunction with the CARB, the EPA, and the eight regional Transportation Planning Agencies (SJVAPCD 2005).

These plans contain control strategies that demonstrate attainment with the national ambient air quality standards by the deadlines established in the CAA.

4.3.2.3 Air Toxics Control Measures

On July 26, 2007, the CARB adopted a regulation to reduce diesel particulate matter and nitrogen oxide emissions from in use (existing) off-road heavy-duty diesel vehicles in California. The regulation will require fleet owners to accelerate turnover to cleaner engines and install exhaust retrofits.

4.3.2.4 Senate Bill 656

Senate Bill (SB) 656 is a planning requirement that calls for a plan and strategy for reducing $PM_{2.5}$ and PM_{10}. This bill requires the CARB to identify, develop, and adopt a list of control measures to reduce the emissions of $PM_{2.5}$ and PM_{10} from new and existing stationary, mobile, and area sources. The BAAQMD and SJVAPCD have developed particulate matter control measures and submitted plans to the CARB that include lists of measures to reduce particulate matter. Under the plans, the Districts are required to continue to assess $PM_{2.5}$ and PM_{10} emissions and their impacts. For construction emissions of fugitive PM_{10}, the Districts have adopted a number of feasible control measures that can be reasonably implemented to significantly reduce fugitive PM_{10} emissions from construction. In general, the Districts' approach to CEQA analyses of construction impacts is to emphasize implementation of effective and comprehensive control measures rather than detailed quantification of emissions.

4.3.2.5 Toxic Air Contaminants

A project with the potential to expose sensitive receptors (including residential areas) or the general public to substantial levels of toxic air contaminants, as designated by the CARB under 17 CCR Section 93001, listed in the BAAQMD 2003 Annual Report Appendix A: Toxic Air Contaminants (BAAQMD 2003), and

similarly, in the SJVAPCD 2006 Annual Report on the District's Toxics Program (SJVAPCD 2006), would be deemed to have a significant impact. This includes projects that would locate receptors near existing sources of toxic air contaminants, as well as projects that would place sources of toxic air contaminants near existing receptors.

Proposed projects that have the potential to expose the public to toxic air contaminants in excess of the following thresholds would be considered to have a significant air quality impact. These thresholds, which are based on the BAAQMD Risk Management Policy for Diesel-Fueled Engines (2002) and SJVAPCD Assessment Guidance (2002), are as follows:

- Probability of contracting cancer for the Maximally Exposed Individual (MEI) exceeds ten in one million. The MEI is a hypothetical person exposed for 70 years continuously (24 hours per day, 365 days per year).
- Ground-level concentrations of non-carcinogenic toxic air contaminants would result in a Hazard Index greater than one for the MEI.

Diesel particulate matter is considered a toxic air contaminant in California (BAAQMD 2003, SJVAPCD 2006). The impact assessment includes a screening-level Health Risk Assessment for diesel particulate matter impacts on sensitive receptors from construction equipment.

4.3.2.6 General Conformity

Section 176(c) of the CAA contains the General Conformity Rule (40 CFR 51.850-860 and 40 CFR 93.150-160). The General Conformity Rule requires that a federal agency responsible for a proposed action (i.e., Project) in a NAAQS non-attainment or maintenance area endeavor to ensure that the proposed action conforms to the applicable state implementation plan (SIP). This means that federally supported or funded activities shall not: 1) cause or contribute to any new air quality standard violation, 2) increase the frequency or severity of any existing standard violation, or 3) delay the timely attainment of any standard, interim emission reduction, or other milestone. Emissions of attainment pollutants are exempt from the General Conformity Rule. A federal action would comply with an applicable SIP if it does not exceed identified annual emission de minimis thresholds, the magnitudes of which are based on the severity of the non-attainment rating of the Project region. Actions that exceed these thresholds are required to conduct in depth conformity determinations.

Contra Costa and San Joaquin counties are in federal and state non-attainment for ozone, PM_{10}, and $PM_{2.5}$. Thus, the emissions of non-attainment pollutants NO_X, ROC, PM_{10}, and $PM_{2.5}$ would be subject to the General Conformity Rule. As discussed below under Impacts and Mitigation Measures, Project emissions would be below BAAQMD and SJVAPCD annual significance thresholds for non-attainment pollutants, thus, the de minimis requirement is satisfied.

4.3.3 Impacts and Mitigation Measures

4.3.3.1 No Project

No air quality impacts would result from the No Project alternative because no construction would occur.

4.3.3.2 2-Gates Project

The only source of direct emissions during operation of the Project would be associated with vehicle trips required during infrequent periodic inspections and maintenance activities, personal vehicle trips by the gate operators when the gates are closed, and the temporary use of portable generators at each of the Project sites

until power could be obtained from PG&E. Emissions from these sources would be minor and intermittent and would not result in permanent air quality impacts, nor would they require permits from the BAAQMD or the SJVAPCD. Any impacts from operations would be negligible and less than significant. The impact assessment focuses on the emissions that would occur as a result of Project construction activities because these are the main source of emissions.

Methodology

Project construction emissions fall into three general categories: 1) onsite use of diesel-powered construction equipment, 2) onsite controlled (mitigated) fugitive dust generation from demolition and earthmoving activities, and 3) offsite vehicle traffic comprising project-related trucking and project worker commuting. Construction-related emissions are generally short-term in duration, but may still cause localized adverse air quality impacts.

The analysis of the Project's air quality impacts is based on equipment specifications and planning estimates for the construction (installation) phase of the Project as listed in Tables 4.3-4 and 4.3-5, respectively. A detailed air impact analysis associated with the complete removal of all Project components at the end of the demonstration project is not included, because emissions would be less than those required for installation.

Table 4.3-4 Construction Estimated Equipment List

Equipment Type	Manufacturers Model	Quantity	Horsepower
Off Road Construction (onsite)			
Loader	CAT 966G	2	233
Forklift	CAT TH83	2	109
Excavator	CAT 330	2	268
On Road Vehicles (offsite)			
Grove Boom Truck RT 522	RT 522	1	150
Flat Bed Truck	Chevy	1	250
Pick Up Truck	Chevy/Silverado	4	200
Fuel/Service Truck	Kenworth	1	225
Water Truck (3600 gallons)	Kenworth	1	400
Marine Vessels and Equipment (onsite)			
DB 24 (with Amclyde 28 crane)	CAT 3412	1	525
CB 8 (with Bucyrus-Erie 88B crane)	Cummins V1710	1	365
CB Doolittle (with Bucyrus-Erie 65D crane)	Cummins 855	1	280
Workboat	John Deer 400	3	600
Tugboat "Sarah Reed"	Cummins KTA38	2	1700
Dump Scow 5	CAT 3208	2	210
Flat Deck Material Barge	N/A	6	
Vibratory Hammer	APE 200/CAT C16	1	630
Generator 25KW	Rental	4	35

Source: Moffatt & Nichols

Table 4.3-5 Construction Planning Estimate

Project Pile Activity	Schedule			
	hours/day	days/week	months	hours
Dredging	24	7	0.2	146
Rock Placement	10	7	1.1	334
Pile Driving	10	7	2.1	637
Vessels Tending (concurrent)	12	7	2.4	874

Source: Moffatt & Nichol

Onsite Combustion Emissions. Table 4.3-6 shows estimated maximum fuel consumption for the Project based on equipment specifications and planning estimates for the construction activity provided by the contractor, assuming a brake specific fuel consumption (BSFC) of 0.051 gallons per brake horsepower-hour (BHP-hr) (AP-42, Table 3.3-1) (EPA 2006). If actual fuel consumption is lower, there would be correspondingly lower emissions. California ultra-low sulfur diesel fuel with a maximum sulfur content of 15 ppm by weight would be used in all diesel-powered equipment to minimize sulfur dioxide and particulate emissions.

Table 4.3-6 Estimated Maximum Fuel Consumption for Project

Project Activity	Hourly gal/hr	Daily gal/day	Project gallons
Off Road Construction	20	160	3,900
On Road Vehicles	20	120	3,900
Marine Vessels and Equipment	100	1,460	57,900
Maximum Rates	110	1,160	65,700

Source: Moffatt & Nichol

Notes:
BSFC = (7,000 BTU/BHP-hr) / (137,030 BTU/gal) = 0.051 gal/BHP-hr
AP-42 Table 3.3-1

Construction combustion emissions were estimated using the emission factors given in Table 4.3-7 for diesel nonroad equipment. For calculating emissions, EPA Tiered emission factors (40 CFR 89.112 & 13 CCR 2423) in grams per BHP-hr were converted to pounds per thousand gallons (mgal) burned, assuming a diesel default heat rate of 7,000 British thermal units (BTU) per BHP-hr and a higher heating value of 137,030 BTU per gallon (AP-42, Table 3.3-1) (EPA 2006). Average engine age (Tier) was estimated based on Annex 3, Table A-101 and Table A-84, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006 (EPA 2008). The age analysis yielded an estimated distribution of 31 percent Tier 3, 28 percent Tier 2, 19 percent Tier 1, and 22 percent Uncontrolled for 2010. The use of newer, less polluting Tier 1, 2, and 3 engines in the majority of construction equipment used onsite is a mitigating factor for combustion emissions of NO_X, ROC, CO, PM_{10}, and $PM_{2.5}$.

Onsite Fugitive Dust Emissions. PM_{10} in the form of fugitive dust is the pollutant of greatest concern with respect to construction activities. Fugitive PM_{10} emissions can result from a variety of construction activities, including excavation, grading, demolition, vehicle travel on paved and unpaved surfaces, and vehicle and equipment exhaust. Construction-related emissions can cause substantial increases in localized concentrations of PM_{10}. Particulate emissions from construction activities can lead to adverse health effects as well as nuisance concerns such as reduced visibility and soiling of exposed surfaces.

Table 4.3-7 Tiered Nonroad Diesel Emission Factors, Pounds per 1000 Gallons

Emittent	Precontrol lb/mgal	Tier 1 (96) lb/mgal	Tier 2 (01) lb/mgal	Tier 3 (06) lb/mgal	Composite lb/mgal
Oxides of Nitrogen (as NO_2)	604.2	297.8	181.3	112.2	276.2
Hydrocarbons (ROC as CH_4)	47.5	43.2	25.9	17.3	30.2
Carbon Monoxide (CO)	129.5	366.8	112.2	112.2	164.0
Particulates (as PM_{10})	43.2	17.3	6.5	6.5	17.3
Sulfur Dioxide (SO_2)	0.2	0.2	0.2	0.2	0.2
Carbon Dioxide (GHG - CO_2)	22,485	22,485	22,485	22,485	22,485
Nitrous Oxide (GHG - N_2O)	0.6	0.6	0.6	0.6	0.6
Methane (GHG - CH_4)	1.3	1.3	1.3	1.3	1.3

Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006, EPA 2008; 40 CFR 89.112; 13 CCR 2423

Notes:
Nonroad Tier 1, 2, 3 per 40 CFR 89.112 & 13 CCR 2423
Precontrol NO_X, ROC, CO, PM_{10} per AP-42 Table 3.3-1
2010 engine age profile estimation based on Annex 3, Table A-101, Table A-84, US GHG Inventory
22% Precontrol (uncontrolled)
19% Tier 1
28% Tier 2
31% Tier 3
Default heat rate = 7,000 BTU/BHP-hr (AP-42 Table 3.3-1)
Diesel = 19,300 BTU/lb, 7.1 lb/gal (AP-42 Table 3.3-1)

Construction areas on Bacon Island, the Holland Tract, and Connection Slough would comprise 4.13, 4.13, and 2.75 acres, respectively, for a total of 11.02 acres. These areas were used to estimate fugitive dust emissions using the BAAQMD and SJVAPCD protocol described below.

Construction emissions of fugitive PM_{10} can vary greatly depending on the level of activity, the specific operations taking place, the equipment being operated, local soils, weather conditions, and other factors. Despite this variability in emissions, experience has shown that there are a number of feasible control measures that can be reasonably implemented to significantly reduce fugitive PM_{10} emissions from construction. The Districts' approach to CEQA analyses of construction impacts is to emphasize implementation of effective and comprehensive control measures rather than detailed quantification of emissions.

For land disturbance, fugitive dust (as PM_{10}) was estimated as 51 pounds per acre per day unmitigated (uncontrolled) as specified in the BAAQMD CEQA Guidelines (BAAQMD 1999), consistent with SJVAPCD Assessment Guidelines (SJVAPCD 2002), Section 3.3; AP-42 Chapter 13.2.3 "Heavy Construction Operations;" and AP-42 Chapter 13.2.2 "Unpaved Roads," Figure 13.2.2-2 (EPA 2006). For the BAAQMD and SJVAPCD control measures listed in Mitigation Section 4.3.3.3 below, an equivalent soil to moisture ratio of 5:1 was assumed for all feasible measures, which reduces fugitive dust emissions by 95 percent from uncontrolled levels.

Offsite Vehicle Emissions. A relatively small source of emissions compared to onsite equipment, offsite vehicle emissions consist of worker commute trips in light-duty vehicles (passenger cars and light trucks) to and from the Project sites, and heavy-duty truck emissions generally associated with hauling away debris and transporting materials and equipment to the site. Commuter trip estimates developed by Moffatt & Nichol were used as the basis using the emissions estimation methodology given in the BAAQMD CEQA Guidelines Section 3.4, Tables 10 and 11. Similarly, heavy-duty truck trip estimates developed by Moffatt & Nichol were translated into emissions utilizing CARB's EMFAC 2007 computer program (i.e., determination of emission factors).

Dispersion Modeling. For onsite emissions, EPA's SCREEN Version 96043 (EPA 1992) was used to model the gaussian dispersion of emissions to obtain ambient impacts. For combustion emissions from construction

equipment, a single equivalent point source (stack) was modeled to yield maximum potential downwind impact from the construction site, which is highly conservative and thus tends to overestimate impacts. Fugitive dust emissions were modeled as an equilateral area source with zero release height, which is also conservative and thus tends to overestimate impacts. For screening dispersion modeling, the annual average wind speed of 3.6 m/s (NOAA 2008) was assumed for neutral Stability Class D.

Appendix A, Air Quality Calculations, includes detailed calculation and modeling templates.

4.3.3.3 Impact Assessment

p. Conflict with or obstruct implementation of the applicable air quality plan

Less than Significant. The Project would not conflict with or obstruct any air quality plans of the BAAQMD or SJVAPCD (specifically, the BAAQMD Clean Air Plan and Ozone Attainment Plan [BAAQMD 2000] and the SJVAPCD Extreme Ozone Attainment Demonstration Plan [SJVAPCD 2005]) because general construction-related emissions (i.e., temporary sources) are accounted for in the emission inventories included in the plans, and each district requires the implementation of standard dust suppression measures. Therefore, the Project would not prevent attainment or maintenance of the ozone, particulate matter, and carbon monoxide standards within the Bay Area or San Joaquin Valley.

q. Violate any air quality standard or contribute substantially to an existing or projected air quality violation

Less than Significant. The Project would generate PM_{10} and $PM_{2.5}$, primarily through fugitive dust (PM_{10}) emissions during construction activities, and from PM_{10} and $PM_{2.5}$ emissions from diesel-powered construction equipment. The BAAQMD and SJVAPCD significance criteria for ozone precursors (NO_X and ROC) and PM_{10} emitted from Project activities are shown in Tables 4.3-8 and 4.3-9, respectively. For CO emissions, significance is defined as causing a violation of the state standard for CO of 9 ppm averaged over 8 hours or 20 ppm for 1 hour (BAAQMD 1999, SJVAPCD 2002).

Table 4.3-8 BAAQMD Thresholds of Significance

	Total Project	
Significance Criteria	tons/year	lbs/day
Oxides of Nitrogen (as NO_2)	15	80
Hydrocarbons (ROC as CH_4)	15	80
Particulates (as PM_{10})	15	80
Carbon Monoxide (CO)	Violation of CAAQS for CO	
Source: BAAQMD CEQA Guidelines, Table 3 (BAAQMD 1999)		

Table 4.3-9 SJVAPCD Thresholds of Significance

	Total Project	
Significance Criteria	tons/year	lbs/day
Oxides of Nitrogen (as NO_2)	10	n/a
Hydrocarbons (ROC as CH_4)	10	n/a
Carbon Monoxide (CO)	Violation of CAAQS for CO	
Source: Guide for Assessing and Mitigating Air Quality Impacts, Table 4-1 (SJVAPCD 2002)		

A preliminary screening impact analysis was performed, estimating the controlled[3] onsite, offsite, and total emissions from construction activities. The results are summarized in Tables 4.3-10, 4.3-11, and 4.3-12, respectively.

Table 4.3-10 Estimated Onsite Construction Criteria Emissions, Controlled

Project Emissions	tons	lbs/day	lbs/hour
Oxides of Nitrogen (as NO_2)	9.08	319.29	30.38
Hydrocarbons (ROC as CH_4)	0.99	34.91	3.32
Carbon Monoxide (CO)	5.39	189.58	18.04
Particulates (as PM_{10})	0.57	20.00	1.90
Sulfur Dioxide (SO_2)	0.01	0.23	0.02
Diesel Particulate Matter (DPM)	0.57	20.00	1.90
Fugitive Dust (as PM_{10})	1.43	28.10	2.81

Table 4.3-11 Estimated Offsite Construction Criteria Emissions, Controlled

Project Emissions	tons	lbs/day	lbs/hour
Oxides of Nitrogen (as NO_2)	0.24	4.65	2.33
Hydrocarbons (ROC as CH_4)	0.04	0.69	0.35
Carbon Monoxide (CO)	0.58	11.28	5.64
Particulates (as PM_{10})	0.06	1.24	0.62
Sulfur Dioxide (SO_2)	0.004	0.087	0.043
Diesel Particulate Matter (DPM)	0.0039	0.0767	0.0383
Fugitive Dust (as PM_{10})	1.67	32.69	16.34

Table 4.3-12 Estimated Total Construction Criteria Emissions, Controlled

Project Emissions	tons	lb/day	lb/hr
Oxides of Nitrogen (as NO_2)	9.31	323.94	32.71
Hydrocarbons (ROC as CH_4)	1.03	35.61	3.67
Carbon Monoxide (CO)	5.96	200.87	23.68
Particulates (as PM_{10})	0.63	21.24	2.52
Sulfur Dioxide (SO_2)	0.01	0.32	0.07
Diesel Particulate Matter (DPM)	0.57	20.08	1.94
Fugitive Dust (as PM_{10})	3.10	60.79	19.15

Although no SJVAPCD significance thresholds would be exceeded, daily emissions of NO_X and combined daily emissions of PM_{10} are over the BAAQMD levels of significance. Since Contra Costa and San Joaquin counties are in non-attainment for PM_{10} and $PM_{2.5}$, screening dispersion modeling was performed to determine whether state or federal ambient air quality standards would be exceeded solely due to Project activities against historic maximum background levels. The screening air quality impacts are shown in Table 4.3-13. A screening risk evaluation for diesel particulate matter for the construction period is shown in Table 4.3-14.

[3] "Controlled" means implementation of BAAQMD and/or SJVAPCD required emissions control measures. These measures are in Section 4.3.3.3.1.

The results of the screening analysis for criteria pollutants show that no exceedance of ambient air quality standards in the Project vicinity would result solely from Project activities. Notwithstanding Project-generated impacts, maximum background levels of particulate matter (PM_{10}, $PM_{2.5}$) already exceed state or federal standards as applicable in the Project vicinity. Therefore, the Project would contribute to these existing exceedances. The BAAQMD and SJVAPCD developed the following emission control measures for construction emissions that, when implemented, would prevent significant impacts.

Table 4.3-13 Estimated Construction Criteria Maximum Impacts, Controlled

Criteria Pollutant	Averaging Period	Modeled µg/m³	Back-ground µg/m³	Total µg/m3	California Standard µg/m³	California Standard Status	Federal Standard µg/m³	Federal Standard Status
Nitrogen Dioxide (NO_2)	1-hour max	6.3	94	100	338	Under	---	Under
	Annual avg	0.1	19	19	56	Under	100	Under
Sulfur Dioxide (SO_2)	1-hour max	0.0	59	59	655	Under	---	Under
	3-hour	0.0	53	53	---	Under	1309	Under
	24-hour	0.0	24	24	105	Under	367	Under
	Annual avg	0.0	7	7	---	Under	79	Under
Carbon Monoxide (CO)	1-hour max	23.3	1,946	1,969	22,898	Under	40,071	Under
	8-hour	16.3	1,488	1,504	10,304	Under	10,304	Under
Particulates (as PM_{10})	24-hour	0.49	84.0	84.5	50	Exceed	150	Under
	Annual avg	0.05	23.8	23.9	20	Exceed	---	Under
Particulates (as $PM_{2.5}$)	24-hour	0.49	77.0	77.5	---	Under	35	Exceed
	Annual avg	0.05	13.3	13.4	12	Exceed	15	Under
Fugitive Dust (as PM_{10})	24-hour	17.79	84.0	101.8	50	Exceed	150	Under
	Annual avg	1.99	23.8	25.8	20	Exceed	---	Under

Source: BAAQMD 2008a

Notes:
Background reference is Bethel Island 2002 to 2007 (Concord for $PM_{2.5}$)
Combustion emissions maximum impact at 1000 m (3281 ft), point or volume source.
Fugitive dust maximum impact at 158 m (518 ft), area source.
µg/m³ = micrograms per cubic meter

Table 4.3-14 Diesel Particulate Matter Screening Health Risk Assessment

Pollutant	Annual µg/m³	URV (µg/m³)$^{-1}$	Activity days	Annual MEI Correction	Cancer Risk
Diesel Particulate Matter (DPM)	0.05	3.00E-04	102	0.0040	5.5E-08

Source: California EPA, Office of Environmental Health Hazard Assessment, 2005

Notes:
µg/m³ = micrograms per cubic meter
URV = Unit Reference Value

Diesel Emissions Control Measures

The following requirements would be incorporated into contract specifications:

- To minimize potential diesel odor impacts on nearby receptors (pursuant to BAAQMD Regulation 1, Rule 301, and SJVAPCD Regulation IV, Rule 4102, Nuisance), construction equipment will be properly tuned. A schedule of tune-ups will be developed and performed for all equipment operating within the Project area. A log of required tune-ups will be maintained and a copy of the log will be submitted to the Project Environmental Compliance Officer (ECO) for review every 2,000 service hours.

- Fixed temporary sources of air emissions (such as portable pumps, compressors, generators, etc.) will be electrically powered unless the contractor submits documentation and receives approval from ECO that the use of such equipment is not practical, feasible, or available (generally contingent upon power line proximity, capacity, and accessibility). California ultra-low sulfur diesel fuel with maximum sulfur content of 15 ppm by weight, or an approved alternative fuel, will be used for onsite fixed equipment not using line power.
- To minimize diesel emission impacts, construction contracts will require off-road compression ignition equipment operators to reduce unnecessary idling with a two-minute time limit.
- On-road and off-road material hauling vehicles will shut off engines while queuing for loading and unloading for time periods longer that two minutes.
- Off-road diesel equipment will be fitted with verified diesel emission control systems (e.g., diesel oxidation catalysts) to the extent reasonably and economically feasible.
- Utilize alternative fuel equipment (i.e., compressed or liquefied natural gas, biodiesel, electric) to the extent reasonably and economically feasible.

Construction emissions of fugitive PM_{10} can vary greatly depending on the level of activity, the specific operations taking place, the equipment being operated, local soils, weather conditions, and other factors. Despite this variability in emissions, experience has shown that there are a number of feasible control measures that can be reasonably implemented to significantly reduce fugitive PM_{10} emissions from construction. The Districts' approach to CEQA analyses of construction impacts is to emphasize implementation of effective and comprehensive control measures rather than detailed quantification of emissions.

Dust Control Measures

To control emissions of particulate matter, the Project would implement the following fugitive dust and particulate matter emissions control measures suggested by the BAAQMD CEQA and SJVAPCD Assessment Guidelines as applicable (BAAQMD 1999, SJVAPCD 2002). The following controls will be implemented at the construction and staging sites as applicable

- Water all active construction areas at least twice daily as necessary and indicated by soil and air conditions.
- Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard.
- Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites.
- Sweep daily (with water sweepers) all paved access roads, parking areas and staging areas at construction sites.
- Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.
- All disturbed areas, including storage piles, which are not being actively utilized for construction purposes, will be effectively stabilized of dust emissions using water, chemical stabilizer/suppressant, covered with a tarp or other suitable cover or vegetative ground cover.
- All on-site unpaved roads and off-site unpaved access roads will be effectively stabilized of dust emissions using water or chemical stabilizer/suppressant.

- All land clearing, grubbing, scraping, excavation, land leveling, grading, cut & fill, and demolition activities will be effectively controlled of fugitive dust emissions utilizing application of water or by presoaking.
- When materials are transported off-site, all material will be covered, or effectively wetted to limit visible dust emissions, and at least six inches of freeboard space from the top of the container will be maintained.
- All operations will limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at the end of each workday. The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions. Use of blower devices is expressly forbidden.
- Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, said piles will be effectively stabilized of fugitive dust emissions utilizing sufficient water or chemical stabilizer/suppressant.

The estimated effectiveness of these control measures is quantified in Table 4.3-15.

Table 4.3-15 Estimated Fugitive Dust Emissions from Construction

Location	Area acres	Schedule days	Control percent	Uncontrolled		Controlled	
				lbs/day	lbs/year	lbs/day	lbs/year
Bacon Island	4.13	102	95%	211	21,496	11	1,075
Holland Tract	4.13	102	95%	211	21,496	11	1,075
Connection Slough	2.75	102	95%	140	14,331	7	717
Totals	11.02			562	57,322	28	2,866

Source: Fugitive dust (as PM_{10}) 51 lb/acre-day unmitigated, BAAQMD CEQA Guidelines, Section 3.3; BAAQMD Ref: AP-42 Chapter 13.2.3 "Heavy Construction Operations"; Mitigation Ref: AP-42 Chapter 13.2.2 "Unpaved Roads", Figure 13.2.2-2

Notes:
Soil moisture ratio = 5 (for all feasible mitigation measures)

Diesel Particulate Matter Emissions Control Measures

The Project will implement the following measures to reduce particulate matter emissions from diesel exhaust:

- Grid power will be used instead of diesel generators where it is feasible to connect to grid power (generally contingent upon power line proximity, capacity, and accessibility).
- The Project specifications will include 13 CCR Sections 2480 and 2485, which limit the idling of all diesel-fueled commercial vehicles (weighing over 10,000 pounds, both California- or non California-based trucks) to 30 seconds at a school or five minutes at any location. In addition, the use of diesel auxiliary power systems and main engines will be limited to five minutes when within 100 feet of homes or schools while the driver is resting.
- The Project specifications will include 17 CCR Section 93115, Airborne Toxic Control Measure for Stationary Compression Ignition Engines, which specifies fuel and fuel additive requirements; emission standards for operation of any stationary, diesel-fueled, compression-ignition engines; and operation restrictions within 500 feet of school grounds when school is in session.
- A schedule of low-emissions tune-ups will be developed and such tune-ups will be performed on all equipment, particularly for haul and delivery trucks.
- Low-sulfur (maximum sulfur content of 15 ppm by weight) fuels will be used in all stationary and mobile equipment.

r. Result in a cumulatively considerable net increase of any criteria pollutant for which the Project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)

Less than Significant. The Project would result in an incremental contribution to a cumulative effect for several criteria pollutants for which the San Francisco Bay Area and San Joaquin Valley Air Basins are in non-attainment under an applicable federal or state ambient air quality standard. However, that impact would not be cumulatively considerable. As shown in Table 4.3-8, the significance criteria in the BAAQMD CEQA Guidelines for Project operations are 80 pounds per day oxides of nitrogen, hydrocarbons, or particulate matter as PM_{10} or 15 tons per year oxides of nitrogen, hydrocarbons, or PM_{10} (BAAQMD 1999). Similarly, as shown in Table 4.3-9, the significance criteria in the SJVAPCD Assessment Guidelines for Project operations are 10 tons per year oxides of nitrogen or hydrocarbons with no daily significance thresholds defined (SJVAPCD 2002). As shown in Table 4.3-12, total NO_X construction emissions for the Project are estimated to be approximately 9.3 tons, total ROC emissions about 1.0 ton, and total PM_{10} emissions about 3.1 tons. All of these quantities are below the long-term annual significance thresholds of both Districts; only NO_X and PM_{10} exceed the short-term daily significance thresholds of the BAAQMD.

The San Francisco Bay Area and San Joaquin Valley Air Basins are in non-attainment of state and federal ozone, PM_{10}, and $PM_{2.5}$ standards for several different averaging times. As detailed in (b) above, the onsite operation of heavy equipment during construction would generate combustion emissions and fugitive dust emissions, resulting in a short-term incremental impact. Also detailed in (b), offsite vehicle emissions (trucks and worker vehicles) would also contribute to a short-term incremental impact in the region.

These incremental impacts were previously determined to be less than significant because the Project would implement the applicable fugitive dust and particulate matter emissions control measures contained in the BAAQMD CEQA Guidelines (BAAQMD 1999) and listed under (b). The use of newer, less polluting Tier 1, 2, and 3 engines in the majority of construction equipment used onsite is a measure for reducing combustion emissions of NO_X, ROC, CO, PM_{10}, and $PM_{2.5}$. Although not a mitigation measure per se, California ultra-low sulfur diesel fuel with a maximum sulfur content of 15 ppm by weight will be used in all diesel-powered equipment which minimizes sulfur dioxide and particulate emissions. The results of the screening analysis for criteria pollutants presented in (b) show that no exceedance of ambient air quality standards in the Project vicinity would result solely from Project activities. Thus, short-term emissions of NO_X and PM_{10} would be less than significant and not cumulatively considerable because the Project would comply with specific requirements in the Districts' approved air quality plans for attainment of ozone and particulate matter. In short, these regional plans address the existing and cumulative impact issues.

s. Expose sensitive receptors to substantial pollutant concentrations

Less than Significant. Construction emissions are transient and temporary, and BAAQMD and SJVAPCD control measures would be implemented as described previously. The Project would not expose sensitive receptors to substantial pollutant concentrations. The Project sites are located in a sparsely populated rural (agricultural) area. The nearest house relative to the Project sites is approximately 600 feet (183 meters) south of the Old River site; however, it is unoccupied. The next nearest receptor is a marina with live-aboard boat owners approximately 0.8 mile south (1,300 meters) of the Old River site. It is not known whether the marina, which is outside the immediate vicinity (i.e., 1000 feet or 305 meters) of the Old River site, houses potentially sensitive persons.

Construction activities would cause short-term emissions of NO_X, ROC, CO, SO_2, PM_{10}, and $PM_{2.5}$ from diesel-powered equipment and earthmoving (ground disturbance). The results of the screening analysis contained in (b) above shows that no exceedance of ambient air quality standards in the Project vicinity would result solely from Project activities. Notwithstanding Project-generated impacts, maximum background levels of particulate matter (PM_{10}, $PM_{2.5}$) already exceed state or federal standards as applicable in the Project vicinity.

Diesel particulate matter contain substances that are suspected carcinogens, along with pulmonary irritants and hazardous compounds that may affect sensitive receptors such as young children, senior citizens, or those susceptible to respiratory disease. Where construction activity occurs in proximity to long-term sensitive receptors, there could be a potential for unhealthful exposure of those receptors to diesel exhaust, including residential receptors. The results of the screening risk assessment contained in (b), analyses show that the probability of contracting cancer from diesel particulate matter, for the MEI is about 5.5×10^{-8}, which is less than the 10 in one million (1×10^{-5}) BAAQMD or SJVAPCD CEQA threshold and thus is less than significant.

t. Create objectionable odors affecting a substantial number of people

No Impact. California ultra-low sulfur diesel fuel with a maximum sulfur content of 15 ppm by weight would be used in all diesel-powered equipment which minimizes emissions of sulfurous gases (sulfur dioxide, hydrogen sulfide, carbon disulfide, and carbonyl sulfide). Moreover, the Project sites are located in an unpopulated area, and the nearest area potentially containing sensitive receptors is approximately 0.8 mile from the Old River site. Therefore, no objectionable odors are anticipated from construction activities or normal operation of the Project.

4.3.3.4 Cumulative Impacts

Cumulative impacts would be less than significant, as discussed under (c) above.

4.4 AQUATIC BIOLOGICAL RESOURCES

Issues & Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the Project:				
u. Have a substantial adverse impact, 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?	☐	☐	☒	☐
v. Have a substantial adverse impact on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
w. 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?	☐	☒	☐	☐
x. Interfere substantially with the movement of any resident or migratory fish or wildlife species or with established resident or migratory wildlife corridors, or impede the use of wildlife nursery sites?	☐	☐	☒	☐
y. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
z. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Communities Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

Note: Issues (b) and (c) are addressed in Section 4.5, Terrestrial Biological Resources.

4.4.1 Environmental Setting

4.4.1.1 Overview

The Project is located in the central Delta within and adjacent to the Old River and Connection Slough. The Delta comprises the estuary and associated islands, marsh and wetlands for the Sacramento and San Joaquin rivers. The Delta is one of the largest, most important estuarine systems for fish and waterfowl production on the Pacific Coast of the United States. This section addresses aquatic biological resources. Terrestrial biological resources are addressed in Section 4.5.

The Sacramento-San Joaquin Delta provides the habitats necessary to support a diverse assemblage of freshwater and estuarine species, many of them introduced. The fish fauna include resident and migratory fish. Resident fishes include native species such as delta smelt, longfin smelt, and Sacramento splittail, as well as introduced species such as catfish, largemouth bass, striped bass, crappie, and bluegill. Table 4.4-1 lists many of the typical fish species that use the Delta. The Delta's channels also serve as a migratory route and nursery area for Chinook salmon, steelhead trout, green sturgeon, white sturgeon, striped bass, and American shad. The Delta is a major rearing area for most of these species. The Delta habitats also support native and introduced species phytoplankton, zooplankton, and benthic macroinvertebrates. The aquatic ecosystem in the Delta has been highly modified by many factors including the construction of levees, channelization, introduced species, and water management activities (including local diversions and discharge and water transfers and exports). As a result of the combined modifications, declining population levels of several species have been identified as a concern.

Table 4.4-1 Typical Fish that Occupy the Delta

Common Name	Scientific Name	Native	Location	
			Delta	Central Valley Rivers
Lamprey (2 species}	*Lampetra spp.*	X	X	X
Chinook salmon	*Oncorhynchus tshawytacha*	X	X	X
Steelhead/rainbow trout	*Oncorhynchus mykiss*	X	X	X
White sturgeon	*Acipenser transmontanus*	X	X	X
Green sturgeon	*Acipenser medirostris*	X	X	X
Longfin smelt	*Spirinchus thaleichthys*	X	X	
Delta smelt	*Hypomesus transpacificus*	X	X	
Wakasagi	*Hypomesus nipponensis*		X	X
Sacramento sucker	*Catostomus occidentalis*	X	X	X
Sacramento pikeminnow	*Ptychocheilus grandis*	X	X	X
Splittail	*Pogonichthys macrolepidotus*	X	X	X
Sacramento blackfish	*Orthodon microlepidotus*	X	X	X
Hardhead	*Mylopharodon conocephalus*	X	X	X
Hitch	*Lavina exilicauda*	X	X	X
Golden shiner	*Notemigonus crysoleucas*		X	X
Fathead minnow	*Pimephales promelas*		X	X
Goldfish	*Carassius auratus*		X	X
Carp	*Cyprinus carpio*		X	X
Threadfin shad	*Dorosoma petenense*		X	X
American shad	*Alosa sapidissima*		X	X
Black bullhead	*Ictalurus melas*		X	X
Brown bullhead	*Ictalurus nebulosus*		X	X
White catfish	*Ictalurus catus*		X	X
Channel catftsh	*Ictalurus punctatus*		X	X
Mosquito fish	*Gambusia affinis*		X	X
Inland silverside	*Menidia audena*		X	X
Threespine stickleback	*Gasterosteus aculaetus*	X	X	X
Striped bass	*Morone saxatilis*		X	X
Bluegill	*Lepomis macrochirus*		X	X
Green sunfish	*Lepomis cyanellus*		X	X
Redear sunfish	*Lepomis microlophus*		X	X
Warmouth	*Lepomis gulosus*		X	X
White crappie	*Pomoxis annularis*		X	X
Black crappie	*Pomoxis nigromaculatus*		X	X
Largemouth bass	*Micropterus salmoides*		X	X
Spotted bass	*Micropterus punctulatus*		X	X
Smallmouth bass	*Micropterus dolomieui*		X	X
Bigscale logperch	*Percina macrolepida*		X	X
Yellowfin goby	*Acanthogobius flavimanus*		X	X
Chameleon goby	*Tridentiger trigonocephalus*		X	X
Prickly sculpin	*Coitus asper*	X	X	X
Tule perch	*Hysterocarpus traskii*	X	X	X

4.4.1.2 Critical Habitat

Under the federal ESA, the entire Delta has been designated as "critical habitat" for delta smelt, Central Valley steelhead, and green sturgeon and the Sacramento River along the north side of the Delta is designated as critical habitat for winter- and spring-run Chinook salmon. Critical habitat is defined in the ESA as the specific geographic area(s) that are essential to the conservation of a threatened or endangered species and that may require special management or protection. Critical habitat may include areas not currently occupied by the species but that are determined to be essential for its recovery. These areas have the physical and biological habitat features called "primary constituent elements" (PCEs) that species need to survive and reproduce. PCEs can include: cover or shelter; sites for reproduction and rearing of offspring; space for individual and population growth and normal behavior; migration corridors; and food, water and other nutritional or physiological requirements. Critical habitat designated for winter- (NMFS 1993) and spring-run Chinook salmon (NMFS 2005) does not include the Project sites. Critical habitat for Central Valley steelhead has been designated at the Project sites (NMFS 2005), principally as migration and juvenile rearing habitat. No designation has been made for Central Valley fall- or late fall-run Chinook salmon (federal species of concern) because critical habitat is designated only for federal threatened and endangered species. Critical habitat for delta smelt has been designated by USFWS at the Project sites. Critical habitat for the southern distinct population segment of North American green sturgeon was recently proposed by NMFS (2008) and includes the Project sites.

4.4.1.3 Essential Fish Habitat

Under the Magnuson-Stevens Fishery Conservation and Management Act, Essential Fish Habitat (EFH) is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 USC 1802[10]). The Pacific Fisheries Management Council (PFMC) designated EFH in their management plans. Two fishery management plans cover species that occur in the Project area and include the Delta as EFH. Chinook salmon are covered under the Pacific Coast Salmon Fisheries Management Plan. Freshwater EFH for Chinook salmon consists of four major habitat functions: (1) spawning and incubation, (2) juvenile rearing, (3) juvenile migration corridors, and (4) adult migration corridors and adult holding habitat. EFH includes those water bodies currently accessible (and in most cases, historically accessible) to fish. In the Delta near the Project area, EFH is designated for fall-run Chinook (adult migration and holding, juvenile migration, and possibly juvenile rearing) and late fall-run Chinook (intermittent adult holding or juvenile rearing). The Project area does not include EFH for winter-run or spring-run Chinook salmon, which pass to the north for spawning in the Sacramento Basin. Another species, the starry flounder (*Platichthys stellatus*), is covered under the Groundfish Management Plan; juveniles use the Delta as rearing habitat.

4.4.1.4 Phytoplankton

Phytoplankton are microscopic plants such as algae and diatoms that generally form the base of the aquatic food-chain. The recent trends in phytoplankton community structure and density have been identified as one of the concerns regarding the overall ecological health of the Delta (PPIC 2007, SWRCB 2008). These changes, as well as the collapse of several Delta fish populations, are being examined as part of the intensive Pelagic Organism Decline (POD) studies currently underway (Sommer et al. 2007, Baxter et al. 2008). Phytoplankton provide food for zooplankton (mostly copepods and cladocerans) and other pelagic (open water) and benthic (bottom-dwelling) herbivores. This food web is vital for the survival and growth of juvenile fish species. The decline in phytoplankton populations has been attributed to changes in water quality in the Delta and invasions of non-native planktivores, such as the overbite clam.

4.4.1.5 Zooplankton

Zooplankton are very small drifting animals, often crustaceans such as copepods, that inhabit the pelagic (open water) zone. Zooplankton are the primary consumers of phytoplankton in the Delta ecosystem, and are

frequently the sole prey item for fish larvae of most species. Therefore, they are a key component in the estuarine food-chain supporting larger fish and macroinvertebrates. The community structure of Delta zooplankton has been significantly modified by introduced species.

4.4.1.6 Benthic and Epibenthic Macroinvertebrates

Benthic macroinvertebrates, such as polychaete and oligochaete worms, are bottom-dwelling animals that generally live within the top foot of sediment in the channel beds of the Delta, Epibenthic macroinvertebrates, such as shrimp, amphipods, crabs and bivalve mollusks, typically exist at the sediment surface. The distribution of these organisms is greatly influenced by water quality, substrate type and hydrologic conditions (e.g. flow velocity, salinity). Burgeoning populations of introduced bivalves, such as the overbite clam (*Corbula amurensis*) and the Asiatic clam (*Corbicula fluminea*), can strip zooplankton and phytoplankton from the water column and in some places have shifted the food web from a pelagic-based planktonic system to a benthic-based system (PPIC 2007, Baxter et al. 2008). Many other introduced species have displaced native macroinvertebrates.

4.4.1.7 Fish

Many fish species inhabit the Delta for all or some portion of their life history. These fish utilize a wide range of aquatic habitats in the Delta, including open water (pelagic), bottom (benthic), and nearshore shallow water habitat. Delta fishes exhibit a variety of feeding habits among different species and life stages (Moyle 2002). Many species forage on plankton (principally zooplankton), especially during the larval and juvenile life stages. As they mature, some species shift to become benthic predators (e.g., juveniles of splittail and sturgeon) or bottom-feeding omnivores (e.g., adult Sacramento splittail). Some species, such as striped bass, become piscivores as large adults. Other species, such as delta smelt and longfin smelt, remain planktivorous throughout their lives.

The fish community inhabiting the Delta is diverse and fluctuates within and between years as a result of local environmental and regional oceanic conditions. The present fauna in the Delta and Suisun Bay includes about 40 freshwater, estuarine, and euryhaline marine species (organisms that are able to adapt to a wide range of salinities), about half of them introduced (Moyle 2002).

4.4.1.8 Special-Status Aquatic Species

Special-status aquatic species are those species that are legally protected or otherwise considered sensitive by federal or state agencies. Such species are designated by the federal ESA and CESA or by the California Fish and Game Code section relating to fully-protected species.

Table 4.4-2 summarizes the special-status aquatic species expected to occur at the Project site. Table 4-4-3 provides a summary of federal aquatic species of concern and state aquatic species of special concern on the USFWS species list for the Brentwood quadrangle that have been collected during studies conducted in the area.

Table 4.4-2 Potentially Affected State and Federally Listed and State-Listed Aquatic Species

		Listing Status[1]			
Common Name	Scientific Name	Federal	State	Critical Habitat in Central Delta	Essential Fish Habitat
Delta smelt	*Hypomesus transpacificus*	FT	ST	Yes	N/A
Longfin smelt	*Spirinchus thaleichthys*		SE	N/A	N/A
North American green sturgeon	*Acipenser medirostris*	FE		Yes	

Table 4.4-2 Potentially Affected State and Federally Listed and State-Listed Aquatic Species

Common Name	Scientific Name	Listing Status[1]		Critical Habitat in Central Delta	Essential Fish Habitat
		Federal	State		
Sacramento River winter-run chinook salmon	*Oncorhynchus tshawytscha*	FE (proposed for downlisting to FT)	SE	No	Yes
Central Valley spring-run chinook salmon	*Oncorhynchus tshawytscha*	FT	ST	No	Yes
Central Valley steelhead	*Oncorhynchus mykiss*	FT	--	Yes	No
Central Valley fall/late fall-run chinook salmon	*Oncorhynchus tshawytscha*	FC	SSC	N/A	Yes

Source: Data compiled by Entrix in 2009 from NMFS, USFWS and CDFG

Note: Species list for the Brentwood quadrangle, which includes the Project site.
[1]Listing status definitions: FT = federally listed as threatened; FE = federally listed as endangered; FC = federal candidate; ST = state listed as threatened; SE = state listed as endangered; SSC = state species of concern, N/A = not applicable.

Table 4.4-3 Potentially Affected Federal and State Aquatic Species of Concern

Common Name	Scientific Name	Listing Status[1]	
		Federal	State
River lamprey[2]	*Lampetra ayresi*	FSC	SSC
Pacific lamprey[2]	*Lampetra tridentata*	FSC	SSC
Sacramento splittail	*Pogonichthys macrolepidotus*	FSC	--

Source: Data compiled by ENTRIX in 2009 from NMFS, USFWS and CDFG

Note: Species list for the Brentwood quadrangle, which contains the Project site.
[1] Listing status definitions: FSC = federal species of concern; SSC = state species of concern.
[2] Specimen reported as "lamprey" and not identified to species.

4.4.1.9 Biological Characteristic of Species of Greatest Concern

The following section provides a brief summary of the existing conditions for some of the aquatic species of greatest concern.

Delta Smelt

The delta smelt is endemic to the Sacramento-San Joaquin Delta, including Suisun Bay, but is generally most abundant in the western Delta and eastern Suisun Bay (Honker Bay) (Moyle et al. 1992). Distribution varies seasonally with freshwater outflow. Generally, the species inhabits areas where inflowing fresh water from the Delta system meets salt water from the Pacific Ocean via San Francisco Bay, usually upstream of the two parts per thousand (ppt) salinity concentration. Habitat for delta smelt is typically open water, largely away from shorelines and vegetated inshore areas except perhaps during spawning. Their behavior suggests a preference for low-salinity areas with tidal currents (Moyle 2002).

Delta smelt are planktivorous throughout their lives, feeding mainly on copepods, cladocerans and amphipods (Moyle et al. 1992, Bennett 2005). Individuals generally live about one year, although a small proportion of the population may live into its second year. The population of delta smelt has declined substantially since the late 1970s. Since 2000, their populations have been at or near historic low values. One hypothesis for the decline of delta smelt and other pelagic species is food limitation, which may be due in part to introduced species of zooplankton (copepods) and consumers (clams) (Sommer et al. 2007).

The U.S. Fish and Wildlife Service (USFWS) listed the delta smelt as threatened effective April 5, 1993 (USFWS 1993). The delta smelt was listed as threatened by California Department of Fish and Game (DFG) on December 9, 1993. Critical habitat for delta smelt as defined by the USFWS (1994) encompasses Suisun Bay and the entire Delta. The primary constituent elements for delta smelt critical habitat include spawning habitat, larval and juvenile transport, rearing habitat, and adult migration. Because of the ongoing decline in the delta smelt indices, the species has been proposed for endangered status. The California Fish and Game Commission voted to list this species as endangered on March 4, 2009.

Longfin Smelt

The longfin smelt is a euryhaline (capable of tolerating a wide range of salinities), pelagic and anadromous species found in scattered bays and estuaries from California to Alaska (Moyle 2002). The Bay-Delta Estuary harbors the largest and southern-most self-sustaining population on the Pacific Coast. Longfin smelt are capable of living in freshwater, brackish, and marine environments over their two-year life-cycle. This population is at least partially anadromous, with adults migrating upstream from San Francisco Bay and sometimes the ocean to spawn in the Delta's freshwaters (Rosenfield and Baxter 2007).

Adult longfin smelt tend to aggregate in Suisun Bay and the western Delta in late fall, and then spawn in freshwater areas immediately upstream during winter and early spring. Longfin smelt eggs are adhesive and are probably released over a firm substrate (Moyle 2002). Longfin smelt larvae are buoyant and abundant in the upper portion of the water column usually from January through April. Larvae are frequently caught upstream of the Sacramento-San Joaquin River confluence in the Delta around Sherman Island (Baxter 1999, Dege and Brown 2004).

During their first year, juveniles disperse broadly throughout the western Delta around Sherman and Browns Islands towards Honker Bay. Rearing habitat for longfin smelt is typically open water, away from shorelines and vegetated inshore regions. Young juvenile longfin smelt feed primarily on copepods, while older juveniles and adult longfin smelt feed principally on opossum shrimp, *Neomysis americana, Acanthomysis* sp. and *Neomysis mercedis* when available (Hobbs et al. 2006). Adults and juveniles can be found in open waters of estuaries in the middle or near bottom of the water column (Moyle 2002). Maturity is reached at two years of age. Most longfin smelt live only two years; although females may live a third year, it is not certain if they spawn again.

Longfin smelt is not currently listed under the federal ESA; however, the species is listed under CESA as a species of special concern. Because the species is not listed, there is no designated critical habitat.

North American Green Sturgeon

Green sturgeon are among the largest of bony fishes, with a maximum fork length of 2.3 m and body weight of 159 kg (Moyle et al. 1992). They are slow-growing and long-lived (Emmett et al. 1991). The Sacramento River system has the southernmost reproductive population. Green sturgeon have not been documented using the San Joaquin River or its tributaries for spawning or rearing (DFG 2002).

Green sturgeon have always been uncommon within the Sacramento-San Joaquin River Delta (Moyle 2002) and reliable population estimates do not exist (Reclamation 2008). Green sturgeon juveniles are found throughout the Delta and San Francisco Bay, mostly in small numbers but sometimes in groups as large as one hundred fish as indicated by fish taken in trammel net sampling for DFG's white sturgeon assessments. Green sturgeon have also been taken in small boat trawls, striped bass sampling, and entrainment by water export facilities.

Spawning occurs well upstream in the Sacramento River from March to July, with a peak in mid-April to mid-June (Moyle et al. 1992). Little is known about larval rearing habitat requirements (NMFS 2008a).

Juveniles rear in fresh and estuarine waters for about one to four years before dispersing into salt water (Nakamoto et al. 1995, NMFS 2008a). Adults and subadults primarily inhabit the Delta and bays during summer months, most likely for feeding and growth (Kelly et al. 2007, Moser and Lindley 2007), but also enter the Delta and bays during their spring migration to the Sacramento River and during their winter outmigration from the Sacramento River to the ocean (NMFS 2008a). This species spends the majority of its life in the ocean (Moyle et al. 1992).

Green sturgeon are highly adapted for preying on benthic organisms, which they detect with a row of extremely sensitive barbels on the underside of their snouts. Adults captured in the Sacramento-San Joaquin Delta are benthic feeders on invertebrates including shrimp, mollusks, amphipods, and even small fish (Houston 1988, Moyle et al. 1992). The non-native overbite clam (*Potamocorbula amurensis*) has also been found in green sturgeon (Adams et al 2002).

On September 8, 2008, NMFS proposed critical habitat for the Southern DPS (NMFS 2008b). The Delta is identified as an important area for juvenile feeding, rearing, and growth prior to ocean migration, as well as a migration corridor between the Sacramento River system and the ocean (NMFS 2008a).

Chinook Salmon

This section describes the existing conditions relating to Chinook salmon in the Delta. Two listed runs of Chinook salmon seasonally occur within the Project area: the federally endangered Sacramento River winter-run Chinook, and the federally threatened Central Valley spring-run Chinook. Two other salmon runs are combined in the analysis because of their similar life history patterns: the Central Valley fall-run Chinook salmon and the Central Valley late fall-run Chinook salmon. Only the adult and juvenile (parr and smolt) life stages of Chinook salmon occur in the Project area in the Delta. The differences between these runs are principally in the timing of adult and juvenile migrations through the Delta, and the timing and location of spawning (which occurs well upstream of the Delta). Life history information about juvenile rearing patterns in the Delta is considered generally applicable to all runs.

Winter-Run Chinook Salmon

The Sacramento River winter-run Chinook salmon Evolutionarily Significant Unit (ESU) consists of a single population that is currently confined to spawning habitat below Keswick dam in the Sacramento River. The population utilizes rearing and migration habitats in the Sacramento River, Delta and San Francisco Bay, and the coastal waters of California.

Winter-run Chinook salmon tend to enter freshwater as immature fish, migrate far upriver, and delay spawning for weeks or months (stream-type life history) (Myers et al. 1998, Healey 1991, Groot and Margolis 1991). Adults migrate through San Francisco Bay and the Delta from November through June. Spawning occurs in the upper Sacramento River below Keswick dam from late-April through mid-August. Fry emerge mid-June through mid-October.

Winter-run juveniles emigrate into the Delta from October into June, with peak juvenile abundance generally from January to April. Distinct emigration pulses of both young-of-the-year (YOY) and yearling outmigrants appear to coincide with high precipitation and increased turbidity, which are correlated with high Sacramento River flows. Upon arrival in the Delta, winter-run Chinook salmon tend to rear in the more upstream freshwater portions of the Delta for about the first two months.

Within the Delta, juvenile Chinook salmon forage in shallow areas with protective cover, such as intertidal and subtidal mudflats, marshes, channels and sloughs (McDonald 1960, Dunford 1975). Juvenile Chinook salmon can follow the tidal cycle in their movements within the estuarine habitat, following the rising tide into shallow water habitats from the deeper main channels, and returning to the main channels when the tide

recedes (Levy and Northcote 1982, Levings 1982, Healey 1991). Cladocerans, copepods, amphipods, and larvae of diptera, as well as small arachnids and ants are common prey items (Kjelson et al. 1982, Sommer et al. 2001, MacFarlane and Norton 2002). Shallow water habitats are reported to be more productive than the main river channels, supporting higher growth rates, due to more favorable environmental conditions and higher prey availability and consumption rates (Sommer et al. 2001).

As juvenile Chinook salmon grow, they tend to school in the surface waters of the main and secondary channels and sloughs, following the tide into shallow water habitats to feed (Allen and Hassler 1986). In Suisun Marsh, Chinook salmon YOY outmigrants tend to remain close to the banks and vegetation, near protective cover, and in dead-end tidal channels (Moyle et al. 1986). Juvenile Chinook salmon exhibit a "diel" migration pattern, whereby they orient themselves to nearshore cover and structure during the day, but moving into more open waters at night (Kjelson et al. 1982). The fish also distributed themselves vertically in relation to ambient light. During the night, juveniles were distributed randomly in the water column, but would school up during the day.

Juvenile winter-run Chinook salmon migrate to sea after four to seven months of river life (ocean-type life history) (Myers et al. 1998, Healey 1991, Groot and Margolis 1991). Winter-run Chinook salmon mature at sea between two and four years of age (NMFS 1997a).

The Sacramento River winter-run Chinook salmon is listed as endangered. The ESU consists of only one population that is confined to the upper Sacramento River in California's Central Valley.

NMFS designated critical habitat for winter-run Chinook salmon as the Sacramento River from Keswick Dam (RM 302) to Chipps Island (RM 0) at the westward margin of the Sacramento-San Joaquin Delta, including Kimball Island, Winter Island, and Brown's Island; all waters from Chipps Island westward to the Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and the Carquinez Strait; all waters of San Pablo Bay westward of the Carquinez Bridge; and all waters of San Francisco Bay north of the San Francisco-Oakland Bay Bridge. Critical habitat for winter-run Chinook salmon does not include Old River or Connection Slough in the central Delta.

Central Valley spring-Run Chinook Salmon

Central Valley spring-run Chinook salmon ESU consists primarily of three populations in three tributary systems (Mill, Deer, and Butte creeks) and also the Feather River and Clear Creek, all within the Sacramento River Basin. The population utilizes rearing and migration habitats in the Sacramento River Basin Delta and San Francisco Bay and offshore ocean waters.

Spring-run Chinook salmon tend to enter freshwater as immature fish, migrate far upriver, and delay spawning for weeks or months (stream-type life history). (Myers et al. 1998, Healey 1991, Groot and Margolis 1991). Adult spawning migration through the Delta occurs from February through July (ENTRIX 2008). Spawning occurs in Sacramento River tributaries from late-September through mid-November. Fry emerge from the gravel from November to March and spend about 3 to 15 months in freshwater habitats prior to emigrating to the ocean (Kjelson et al. 1981). Spring-run Chinook salmon generally mature between two and four years of age.

In addition to rearing in natal streams, spring-run Chinook salmon juveniles rear in the lower part of non-natal tributaries and intermittent streams during the winter months (Maslin et al. 1997, Snider 2001). Emigration can be highly variable (DFG 1998). Some juveniles may begin outmigrating soon after emergence, whereas others over-summer and emigrate as yearlings with the onset of intense fall storms (DFG 1998). The emigration period for spring-run Chinook salmon extends from November to early May (DFG 1998). Emigration appears to coincide with high precipitation and high Sacramento River flows.

Central Valley spring-run Chinook salmon is listed as threatened. The ESU consists of spring-run Chinook salmon occurring in the Sacramento River Basin as previously listed (June 28, 2005, 70 FR 37160).

NMFS designated critical habitat for Central Valley spring-run Chinook salmon as the Sacramento River and specific tributaries occupied by spawning and rearing spring-run Chinook, as well as the Sacramento Delta Hydrologic Unit within the Sacramento-San Joaquin Delta. Critical habitat does not include Old River or Connection Slough in the central Delta.

Central Valley Fall/ Late Fall-Run Chinook Salmon

Central Valley fall/late fall-run Chinook salmon occur in the Sacramento River and its tributaries, Suisun Marsh, the San Joaquin River and five of its east-side tributaries including the Merced, Tuolumne, Stanislaus, Mokelumne, and Cosumnes rivers. Late fall-run Chinook salmon occur only in the Sacramento River and its tributaries (Moyle 2002). The Central Valley ESU is considered the southernmost native spawning population of Chinook salmon.

Fall-run Chinook are currently the most numerous of the Central Valley runs (Myers et al. 1998) and the only race that regularly spawns in the San Joaquin Basin. Late fall-run Chinook only occur in the Sacramento River where the population appears to be stable, despite its low abundance (NMFS 2008).

Fall-run are ocean-type Chinook that tend to enter freshwater as fully mature fish, migrate to lowland reaches of large rivers and tributaries, and spawn within a few days or weeks of arriving on the spawning grounds (Healey 1991, Moyle 2002). Late fall-run are mostly stream-type Chinook that enter freshwater as large older adults, migrate to mainstem reaches of tributaries, and then hold for one to three months before spawning (Moyle 2002). Adult immigration through the Delta generally occurs from August through November for fall-run and September through November for late fall-run. Fall-run Chinook spawn between late October to early December in tributaries of the Sacramento Basin and San Joaquin Basin. Late fall-run Chinook spawn from early January to April in Sacramento Basin tributaries (Moyle 2002).

Fall-run juveniles emerge from the gravel in spring and disperse downstream within a few months to rear in main river channels or the estuary before heading out to sea. Fall-run fry and juveniles use the Delta for rearing habitat between January and June, although it is not known what fraction of juvenile production rears in the Delta. Late fall-run juveniles rear for 7 to 13 months in main river channels, feeding on invertebrates and growing rapidly, before migrating to the ocean (Moyle 2002) during November through March.

The majority of fall-run juveniles emigrate through the Delta from February through June during the first few months following emergence, although some may remain in freshwater and migrate as yearlings. Following their long freshwater residence time, late fall-run juveniles emigrate from the Sacramento River through the Delta during November through March.

The fall/late fall-run of Central Valley Chinook salmon are classified as a Species of Concern (69 FR 19975). Because this species is not listed as threatened or endangered, no critical habitat has been determined.

Central Valley Steelhead

Steelhead is the anadromous form of rainbow trout (*Oncorhynchus mykiss*). Unlike other species of salmon, steelhead do not necessarily die after spawning. Populations in the Central Valley are found principally in the Sacramento River and its tributaries, as well as the Mokelumne River. Steelhead have also been documented in the Cosumnes, Calaveras and Stanislaus Rivers (Cramer 2000) on the San Joaquin System.

Adult steelhead enter the upstream rivers from July through May, with peaks in September and February. Adult migration through the Delta generally occurs from September through May, with the peak in December

through February. Steelhead historically used upper stream reaches and small tributaries, but now are confined to lower stream reaches below dams.

Adults spawn in the tributaries from December through April (McEwan and Jackson 1996, Busby et al. 1996). After spawning the surviving adults move downstream through the Delta and back toward the ocean from January through May. Yearling steelhead feed on various aquatic insects adjusting their seasonal diets to other aquatic and terrestrial insects or salmonid eggs. Juvenile steelhead generally emigrate from natal streams during fall through spring. They use tidal and non-tidal marshes and shallow Delta areas prior to seaward emigration.

Central Valley steelhead migrate to the ocean after spending one to three years in freshwater (McEwan and Jackson 1996). Once in the ocean, they remain for one to four years growing before returning to their natal streams to spawn. Rearing and ocean-emigrating steelhead use the lower reaches of the Sacramento River and the Delta including tidal marsh areas, non-tidal freshwater marshes, and other shallow water areas.

The Delta may provide rearing habitat for juvenile steelhead (McEwan and Jackson 1996). Juvenile steelhead rear and forage in the south Delta or use the area for transit during seaward migration. Shoreline areas and associated vegetation are important habitat for foraging and cover from predators. Simplified channel habitats, especially those managed primarily for water conveyance and recreation, do not provide the most suitable habitats for maximum productivity.

The Central Valley steelhead Distinct Population Segment (DPS) is listed as federally threatened. Critical habitat for the Central Valley steelhead DPS includes 2,308 miles of stream habitat in the Central Valley including the Sacramento River and tributaries, San Joaquin River east side tributaries up to the Merced River, and an additional 254 square miles of estuary habitat in the San Francisco-San Pablo-Suisun Bay complex. Most all of the main south/central Delta waterways adjacent to the Project area are designated critical habitat.

4.4.1.10 Other Special Status Species

Sacramento Splittail

This endemic fish is a large minnow with a tolerance for saline waters (Moyle 2002). Once found throughout low elevation lakes and rivers of the Central Valley from Redding to Fresno, this native species now occurs in the lower reaches of the Sacramento and San Joaquin rivers and tributaries, the Delta, Suisun and Napa marshes, Sutter and Yolo bypasses, and tributaries of north San Pablo Bay. Although the Sacramento splittail is generally considered a freshwater species, the adults and subadults have an unusually high tolerance for saline waters.

The splittail generally spawns over beds of submerged vegetation in slow-moving waters. This can occur in dead-end sloughs or on flooded terrestrial lands. Spawning occurs from February through May. Hatched larvae remain is shallow, weedy areas until later in the summer when they move to deeper pelagic waters. Young splittail may occur in shallow and open waters in the Delta but are historically more abundant in the northern and western Delta (SWRCB 1999).

Splittail are benthic foragers that feed extensively on opossum shrimp (*Neomysis mercedis*) and opportunistically on earthworms, clams, insect larvae, and other invertebrates. They are preyed upon by striped bass and other predatory fish in the estuary.

The Sacramento splittail is a federal species of concern and a California species of special concern.

River Lamprey

The river lamprey is a federal species of concern and a California species of special concern. Its natural range is from southern Alaska to San Francisco Bay, including the Delta and adjacent rivers (Moyle et al. 1995). Adults migrate back into fresh water in the fall and spawn during the winter or spring months in small tributary streams. Specific habitat requirements of spawning adults are clean, gravelly riffles in permanent streams for spawning. The ammocoetes require sandy backwaters or stream edges in which to bury themselves, where water quality is continuously high and temperatures do not exceed 25°C.

River lampreys prey on a variety of fishes, but the most common prey seem to be herring and salmon. Unlike other species of lamprey in California, river lampreys typically attach to the back of the host fish, above the lateral line, where they feed on muscle tissue. Feeding continues even after the death of the prey. The effect of river lamprey predation on prey populations is minimal. River lampreys can apparently feed in either salt or fresh water.

4.4.2 Regulatory Setting

4.4.2.1 Federal

Federal Endangered Species Act

The ESA of 1973 protects plants and animals that are listed by the federal government as "endangered" or "threatened." The ESA is enforced by the USFWS and NMFS. NMFS' jurisdiction is limited to the protection of marine mammals and fishes and anadromous fishes; all other species are within the USFWS' jurisdiction. Section 9 makes it unlawful for anyone to "take" (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in such conduct) a listed animal, including significantly modifying its habitat. Section 7 of the ESA requires federal agencies to insure that any action authorized, funded or carried out by them is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of habitat critical to such species' survival.

Each federal agency must consult with the USFWS or NMFS, or both, regarding federal agency actions. The consultation is initiated when the federal agency determines that its action may affect a listed species and submits a written request for initiation to the USFWS or NMFS, along with the agency's biological assessment of its proposed action. If the USFWS or NMFS concurs with the action agency that the action is not likely to adversely affect a listed species, the action may be carried forward without further review under the ESA. Otherwise, the USFWS or NMFS, or both, must prepare a written biological opinion describing how the agency action will affect the listed species and its critical habitat. This Project will require a permit from the Corps under Section 404 of the Clean Water Act. This agency will provide the nexus for the Section 7 ESA consultation.

Clean Water Act

Section 404 of the (CWA) establishes a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. Activities regulated under this program include fills for development, water resource projects (e.g., dams and levees), infrastructure development (e.g., highways and airports), and conversion of wetlands to uplands for farming and forestry. Section 404 of the CWA authorizes the Corps to issue permits regulating the discharge of dredged or fill material into the waters of the United States, including wetlands. There are two basic types of Section 404 permits issued by the Corps, individual and general. An individual permit is usually required for potentially significant impacts, while a general permit (sometimes called a nationwide permit) can be granted for discharges with only minimal adverse effects. If threatened or endangered species may be affected by the proposed activity, the Corps will also

consult with the appropriate federal agency (e.g., USFWS) regarding effects to the species, as regulated under Section 7 of the ESA.

The state also has a role in the Section 404 process. California regulates discharges of fill and dredged material under Section 401 of the CWA and the Porter-Cologne Water Quality Control Act. The appropriate Regional Water Quality Control Board, in this case the Central Valley RWQCB, must issue a Water Quality Certification for discharges requiring Corps permits for fill and dredge discharges remains a core responsibility.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 USC 661 et seq.) requires federal agencies to consult with USFWS, or, in some instances, with NMFS and with state fish and wildlife resource agencies before undertaking or approving water projects that control or modify surface water. The purpose of this consultation is to ensure that wildlife concerns receive equal consideration water resource development projects and are coordinated with the features of these projects. The consultation is intended to promote the conservation of fish and wildlife resources by preventing their loss or damage and to provide for the development and improvement of fish and wildlife resources in connection with water projects. Federal agencies undertaking water projects are required to fully consider recommendations made by USFWS, NMFS, and state fish and wildlife resource agencies in project reports and to include measures to reduce impacts on fish and wildlife in project plans.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act established a management system for national marine and estuarine fishery resources. Pursuant to section 305(b)(2), all federal agencies are required to consult with NMFS regarding any action permitted, funded, or undertaken that may adversely affect "essential fish habitat (EFH)." Effects on habitat managed under any relevant Fishery Management Plans must also be considered. For this project, the EFH assessment is integrated into this MND/EA.

As discussed earlier, EFH is defined as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." This includes migratory routes to and from anadromous fish spawning grounds. The phrase "adversely affect" refers to the creation of any impact that reduces the quality or quantity of essential fish habitat. Federal activities that occur outside of an EFH but that may, nonetheless, have an impact on EFH waters and substrate must also be considered.

Chinook salmon are covered under the Pacific Salmon Fishery Management Plan and therefore have EFH designated. The Project area does include EFH for migrating and rearing fall-run and intermittently for holding or rearing late fall-run Chinook salmon. The Project area does not include EFH for winter-run or spring-run Chinook salmon, which pass to the north for spawning in the Sacramento Basin. Another species, the starry flounder (*Platichthys stellatus*), is covered under the Groundfish Management Plan.

4.4.2.2 State

California Endangered Species Act

CESA (Fish and Game Code Sections 2050 to 2097) is similar to the ESA. California's Fish and Game Commission is responsible for maintaining lists of threatened and endangered species under the CESA. CESA prohibits the take of listed and candidate (petitioned to be listed) species. DFG may authorize incidental take of listed species pursuant to a DFG-approved NCCP.

4.4.2.3 Local

Contra Costa County General Plan

Contra Costa County considers Connection Slough and Old River to be "Significant Ecological Resource Areas" (SERAs). SERAs are defined by one or more of the following characteristics: (1) areas containing rare, threatened and endangered species; (2) unique natural areas; and (3) wetlands and marshes.

The relevant policies of the Conservation Element are listed below:

> 8-3. Watersheds, natural waterways, and areas important for the maintenance of natural vegetation and wildlife populations shall be preserved and enhanced.
>
> 8-9. Areas determined to contain significant ecological resources, particularly those containing endangered species, shall be maintained in their natural state and carefully regulated to the maximum legal extent. Acquisition of the most ecologically sensitive properties within the County by appropriate public agencies shall be encouraged.
>
> 8-10. Any development located or proposed within significant ecological resource areas shall ensure that the resource is protected.
>
> 8-16. Native and/or sport fisheries shall be preserved and re-established in the streams within the County wherever possible.
>
> 8-79. Creeks and streams determined to be important and irreplaceable natural resources shall be retained in their natural state whenever possible to maintain water quality, wildlife diversity, aesthetic values, and recreation opportunities.
>
> 8-81. Fisheries in the streams within the County shall be preserved and re-established wherever possible.

San Joaquin County General Plan

San Joaquin County identifies both the Old River and Connection Slough sites as "Significant Natural Resource Areas" (Old River is Waterway and Riparian; Connection Slough is Waterway only).

The Resources Element contains the following policies that are relevant to the Project:

> 1. Resources of significant biological and ecological importance in San Joaquin County shall be protected. These include wetlands; riparian areas; rare, threatened and endangered species and their habitats as well as potentially rare or commercially important species; vernal pools; significant oak groves and heritage trees.
>
> 11. Fisheries shall be protected by:
>
> (b) designing and timing waterway projects to protect fish populations; and
>
> (c) operating water projects to provide adequate flows for spawning of anadromous fish.

4.4.3 Impacts and Mitigation Measures

4.4.3.1 No Project Alternative

Under the No Project alternative, none of the potentially adverse impacts would occur, nor would any of the benefits to delta smelt and other sensitive aquatic species.

4.4.3.2 2-Gates Project

aa. 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 the U.S. Fish and Wildlife Service

Construction is planned to occur in the late summer through fall when delta smelt, longfin smelt and winter- and spring-run Chinook salmon would not be present. Green sturgeon and juvenile steelhead have the potential to occur, but in low densities, at the construction sites during the construction period.

Operations impacts generally would be beneficial because the Project would reduce entrainment of aquatic species by the Delta export pumps. The periodic closures of the Project facilities would temporarily cause changes in water quality, migration routes, site-specific predation and the development of conditions conducive to spawning and rearing of delta smelt in some portions of the central and south Delta. Each of these impacts is discussed below on a species-by-species basis.

Delta Smelt

CONSTRUCTION

Less than Significant. Construction of the Project facilities would occur when adult delta smelt would not be present in Old River and Connection Slough. Barge-gate installation would be timed to occur when delta smelt are generally located in the west Delta.

Performance criteria would be used to comply with permit conditions as outlined in Section 2. Any additional turbidity caused by Project construction would be attenuated by slowing or suspending dredging operations to bring water quality criteria into compliance in the local area of construction and therefore would not result in the exposure of delta smelt in the west Delta to excessive turbidity during dredging operations and other in-water activities, such as sheet pile installation and barge placement.

Barges would be cleaned before they were submerged, and residual oils, lubricants, or other contaminants would be removed prior to their placement in the channels. Therefore, delta smelt would not be exposed to contaminants from this source. There is a potential for accidental spills to occur during construction, but all spills would be cleaned up in accordance with the spill prevention measures detailed in the Storm Water Pollution Prevention Plan (SWPPP) that would be required. Any effects would be temporary and limited to a small geographic area and would not substantially affect delta smelt populations.

Delta smelt feed primarily on pelagic copepods and other zooplankton, so the alteration or loss of benthic invertebrate habitat in the area being dredged or covered with rock fill would not affect food availability for this species.

OPERATIONS

Beneficial. During December through June under existing hydrodynamic conditions, all life stages of delta smelt would at some time be present at or near the gate locations. Adults would predominate in December through February, and other life stages would increase in abundance from February through June. Operation

of the gates would restrict the development of water quality characteristic that are correlated with pre-spawning delta smelt movement into the central and south Delta and prevent adult delta smelt from entering the Old River channels south of Franks Tract prior to spawning. The Project would substantially reduce the loss of individual delta smelt from entrainment because the Project would reduce and minimize the establishment of water quality conditions attractive to adult delta smelt in the south Delta. When the gate are closed, delta smelt would generally be unable to enter the south Delta by the most direct route, so they would spawn near Franks Tract, in the San Joaquin River, or in other areas more distant from the conveyance channels or the pumps. Because the gates would be operated to reduce entrainment of sensitive aquatic species (see Appendix E for further details), juvenile and larval delta smelt present in the area around Franks Tract would have a much lower probability of being entrained by the export the pumps and a higher probability to be transported westward into Suisun Bay. This action would reduce entrainment losses during the December through June period and contribute to the maintenance and recovery of the species. Results from the delta smelt adult behavioral and larval model simulations indicate a substantial benefit to adult, larval and juvenile delta smelt that would be present in the area in and around Franks Tract due to reduced entrainment into the conveyance channels leading to the pumps (see Appendix E).

Less than Significant. The Project's effects related to water quality, predation, spawning areas, rearing habitat, and adult migration patterns, are discussed below.

WATER QUALITY

As described in more detail in Section 4.9, the Project would result in two different types of changes to water quality. Minor changes in water quality immediately adjacent of the Project facilities would occur during operations of the gates. When closed, the gates would create temporary dead-end sloughs. Portions of channels adjacent to the Old River and Connection Slough barriers would receive reduced mixing, which could result in slightly degraded water quality in the form of somewhat reduced oxygen and minor changes in salinity, and may temporarily trap floating debris. This condition would persist approximately for the duration of the gate closure. These changes would be a less-than-significant impact to delta smelt. Project operations would also result in changes to water quality parameters adjacent to the "region of influence" in the central Delta, described in Section 2, and in waters in the south Delta. This would reduce the establishment of turbidity and salinity considered to be components of pre-spawning delta smelt habitat in areas where they would be subject to entrainment from the SWP and CVP export pumps. This would be a beneficial impact to delta smelt because entrainment would be reduced.

PREDATION

Predation impacts would be less than significant because gates would be operated frequently, thereby limiting the duration of this accumulation of prey; and only a very limited area would be temporarily affected.

SPAWNING

While the south Delta has been used for spawning prior to the 1980s, it is believed that the area is not currently an important source for production of delta smelt (CBD 2006); therefore, any impacts to spawning habitat and the access to potential spawning habitat would be less than significant. Impacts to overall spawning success would be beneficial since entrainment of pre-spawning delta smelt would be reduced. Moreover, under current conditions, most progeny produced in the central Delta have a high probability of being entrained at the pumps. Partial isolation of the central Delta spawning area from the south Delta and the partial isolation of other suitable habitat from the pumps would increase survival of the larval delta smelt and would benefit the species.

REARING HABITAT

Rearing habitat has been correlated with that of the location of the 2 ppt isohaline (X2). The CVP and SWP are required to maintain X2 at various points depending on water year type by SWRCB Water Right Decision 1641 (D-1641). These requirements would remain in place when the Project facilities are in operation. Thus, the Project operations would not affect rearing habitat.

ADULT MIGRATION

Adequate flow and suitable water quality is needed to be maintained to attract migrating adults in the Sacramento and San Joaquin River channels and their tributaries (USFWS 1994). Adult delta smelt begin migrating up the Sacramento and San Joaquin rivers and their tributaries in December triggered by the increase in turbidity and decrease in salinity associated with the onset of winter storms. Because of its location and hydrodynamic connections, the Project would not change flows in the Sacramento River or its upstream tributaries. When the gates are closed, the Project would temporarily alter the regional flow-path of water in some portions of the Delta region. Operation of the gates would tend to reduce the establishment of conditions conducive to adult delta smelt migration south and east of the "region of influence." Tidal operations of the gates would tend to restrict or preclude adult delta smelt south of Franks Tract via the Old River. The greatest change to flow rates would be found in the channels immediately adjacent to the Project facilities. On a more regional basis, water that would currently flow in the Old River or Connection Slough channels would be re-directed to other nearby north-south channels (e.g., Middle River). Delta smelt migration routes would be reduced in the Old River and Connection Slough channels and be re-routed to other adjacent Delta channels or to other portions of the Delta (generally north and west of the Project facilities and "region of influence") that had water quality characteristics that are attractive to adult delta smelt migration. When the gates are open, the Project would have an undetectable effect on Delta hydrology and water quality. If the Project gates and adjacent sheetpile dikes are removed at the end of the demonstration phase, the Project would have no effect on hydrology and water quality in the Delta. These changes were compared using historic flow and salinity data for the period 1991 to 2006. Detailed results are available in Appendix E.

North American Green Sturgeon

Green sturgeon may be infrequently present in the Old River and Connection Slough at any time of year. Adult and juvenile sturgeon forage throughout the Delta.

CONSTRUCTION

Less than Significant. Green sturgeon are found throughout the Delta during the construction period and are likely to occur at the Project locations. Underwater noise generated by dredging, rock placement, or pile driving would be transient, occurring during the daytime over a five-week period. The hearing sensitivity of green sturgeon is unknown. Noise from pile driving would be reduced by using vibratory hammers, which are generally much quieter than impact hammers (ICF Jones and Stokes and Illingworth and Rodkin, Inc. 2009). Rock placement would also generate underwater noise from equipment striking rock. The effects of pile driving have been assessed by NMFS and others (NMFS 2008d, Popper et al. 2006). Specific transient underwater noise associated with dredging, rock placement, surface machinery and topside activities on the barge decks would reach the same levels as from pile driving. Construction activities would not exceed NMFS's 2008 interim thresholds for sound pressure levels of 206 dB peak and 187 dB accumulated sound. The effects of noise would be transient and localized, and would be less than significant.

As discussed in Section 2, performance criteria would be used to comply with permit conditions, ensuring that impacts associated with turbidity and resuspension of channel sediments would be less than significant. Construction activities would not directly affect spawning, which occurs well upstream in the Sacramento River watershed from March through July, or offspring development occurring in the following months.

OPERATIONS

Less than Significant/Beneficial. The Project would result in changes to water quality, potential predation, access to spawning areas, rearing habitat, and adult migration patterns, as discussed below.

WATER QUALITY

Water quality impacts would be as described for delta smelt.

PREDATION

Proposed operations would prevent largemouth bass or striped bass from consistently utilizing the area. Thus, operations would lessen the overall effects of the structure to support predator habitat.

SPAWNING

Green sturgeon spawning occurs well upstream of the Delta so the Project structures and operations would have no effect on spawning activities. Adult green sturgeon in the Franks Tract area migrating to spawn in the Sacramento River would not be prevented from moving upstream into the Sacramento River. Movement of adult fish from the south Delta to the Sacramento River would be impaired, but not prevented. Project operations would not restrict movement elsewhere in the system to access upstream spawning habitat. Rather, the gates would impede movement directly into and out of the Old River from the Franks Tract area and collectively provide one of the two main routes up the San Joaquin River where spawning is not known to occur.

REARING HABITAT

Juveniles rear in fresh and estuarine waters for about one to four years before dispersing into the ocean (Nakamoto et al. 1995, NMFS 2008a). The Project would not substantially modify water quality or remove a substantial amount of soft-bottom habitat from the Delta and therefore would not significantly affect sturgeon rearing.

ADULT MIGRATION

Operation of the gates would tend to reduce entrainment into the south Delta from the Franks Tract area, which would be a beneficial impact.

Adults and subadults primarily inhabit the Delta and bays during summer months, most likely for feeding and growth (Kelly et al. 2007, Moser and Lindley 2007), but also enter the Delta and bays during their spring migration to the Sacramento River and during their winter outmigration from the Sacramento River to the ocean (NMFS 2008a). Project operations have the potential to impede sturgeon movement as they forage throughout the Delta and may affect their movement even during periods when the gates are open. Green sturgeon are bottom dwellers, mostly staying in contact with bottom sediments to forage. Gate structures could impede movement of bottom-dwelling fish that encounter the vertical side of the barges; however, to encourage fish to continue their movements, a sloping rock ramp would be installed on either side of both gates. The ramps would facilitate fish movement from the bed of the channel up to the deck of the barge where they can continue their movement up or down the channel when the gates are open. Moreover, neither barge-gate would prevent

access to other areas of the Delta, and green sturgeon could move around the gates by swimming a longer distance through other channels to reach other locations. Additionally, when the gates were open as they would be much of the time, sturgeon would be able to pass through the gate structures.

Chinook Salmon

CONSTRUCTION

Less than Significant. Adult spring- and winter-run and juvenile spring-, winter-, and fall-run Chinook salmon would not be present in the vicinity of the Project or in the Delta at any time during the construction period. Early migrating, adult fall-run Chinook salmon could be present in the construction period. Fall-run Chinook salmon are produced from both the Sacramento and San Joaquin river systems. Juvenile Chinook salmon from all runs could be present at the Project sites during the construction period; however, the tendency is that a substantially lower proportion of the Sacramento River-produced juveniles would be exposed to the Project construction activities compared to the proportion of the San Joaquin River late fall-run juvenile fish.

Construction impacts generally would be similar to those described for delta smelt; any salmon in the vicinity of construction activities would have the ability to move away. Any modification of the benthic community would have no significant adverse effect on juvenile winter- or spring-run Chinook because the affected area would be very small.

Existing riparian function is already degraded and very small in relation to the size of the channel in Old River or Connection Slough. Construction of the abutments would have no significant effect on juvenile salmonids in the Delta.

OPERATIONS

Less than Significant/Beneficial. Juvenile winter-, spring-, and fall-run Chinook salmon are likely to be present in the Delta during operations. Late fall-run juveniles are not anticipated to be in the Delta after March. Adult winter and spring-run Chinook migrate through the Delta during this time frame. The two salmon runs primarily use the Sacramento River side of the Delta.

WATER QUALITY

Water quality impacts near the Project facilities would be as described for delta smelt. Project operations in the late spring and early summer could slightly modify water quality that serves as a cue to out-migrating Chinook salmon, especially those emanating from the San Joaquin River tributaries and steams discharging directly into the Delta (e.g., Mokelumne River). Since Project operations would cease during the VAMP period (generally April 15 to May 15), the Project would not adversely impact water quality that serves as a cue to Chinook salmon outmigration during this period. Given the implementation of monitoring and adaptive management of the Project facilities before and after the VAMP period, impacts to out-migrating Chinook salmon would be less than significant.

PREDATION

Predation impacts near the Project facilities would be as described for delta smelt. Predation rates elsewhere in the Delta would be unaffected by the Project.

SPAWNING

Chinook salmon spawning occurs outside of the Delta; therefore, the Project would not affect Chinook salmon spawning.

REARING HABITAT

The principal rearing habitat for juvenile Chinook salmon in the Delta is shallow areas with protective cover, such as intertidal and subtidal mudflats, marshes, channels and sloughs (McDonald 1960, Dunford 1975). The Project site does not provide of this type of habitat since the sites are deeper open channels with steep-sided levees at each bank. Therefore, the Project would have a less-than-significant effect on the availability of rearing Chinook salmon habitat.

Juvenile Chinook salmon move through the Delta to reach high quality rearing habitat (and eventually the ocean). The timing of this movement varies for each run. Juvenile Chinook salmon from the San Joaquin River watershed and the Mokelumne River and juvenile Chinook from the Sacramento River watershed using portions of the central Delta while moving toward higher quality rearing habitat would encounter both positive and negative changes in hydrology from the changes in entrainment flows from the SWP and CVP pumps. Under certain hydrologic conditions, the gates would be effective at reducing the entrainment of juvenile Chinook salmon and other pelagic fish from the western and central portions of the delta to the pumps while under other hydrologic conditions operations of the gates provides little benefit. Operations of the gates would be scheduled to minimize adverse effects on the movement of juvenile Chinook salmon. (See Section 4.9 and Appendix E for more information about local and regional hydrologic effects.) The peak of this downstream movement of juvenile Chinook salmon near the Project site occurs during the VAMP period. The gates would be open during this period to minimize the effects on juvenile Chinook salmon movement toward higher quality rearing habitat. Project operations from March through June are timed with tidal cycles. This would not impede juvenile Chinook salmon that follow the same cycle in their movements within the Delta and other estuarine habitats. Given the implementation of monitoring and adaptive management of the Project facilities before and after the VAMP period, impacts to out-migrating Chinook salmon would be less than significant.

ADULT MIGRATION

Adult Chinook salmon move through the Delta to reach spawning habitat in the Sacramento and San Joaquin River watersheds. The timing of this movement varies for each run. Because of the strength of their swimming characteristics and the timing of the upward migration the Project would have little to no adverse effect on Sacramento River spring and winter run Chinook salmon. Likewise, because of the location of the Project and its ability to reduce localized entrainment from the SWP and CVP pumps, the Project would have less-than-significant effects on fall and late-fall Chinook salmon runs from the Sacramento River.

When closed, the gates would act as temporary barriers to movement through Old River and Connection Slough, thus limiting the movement of fall-run Chinook salmon adults upstream to their spawning grounds in the San Joaquin River tributaries and streams directly discharging into the Delta (e.g., Mokelumne River).

Steelhead

Steelhead are encountered in the Delta during most of the year, but they are present primarily from November through June, with a peak in February to March. Juvenile outmigration peaks from March through May, which has some overlap with their peak appearance in salvage at the pumps. Juveniles from the Sacramento River system, Mokelumne and Stanislaus rivers migrate downstream through the Delta from November through June. Adult steelhead migrate through the Delta from September through May. The effects of operations on juvenile and adult steelhead are variable depending on the river system of origin. Effects of gate operations on San Joaquin and Mokelumne River fish are also discussed below.

CONSTRUCTION IMPACTS

Less than Significant. The effects on steelhead would be similar to the effects on early fall and fall-run Chinook salmon.

OPERATIONS IMPACTS

Less than Significant/Beneficial. Juvenile steelhead would be expected to be within or passing through the Project area during operations.

WATER QUALITY

Water quality impacts would be as described for Chinook salmon.

PREDATION

Predation impacts would be as described for Chinook salmon.

SPAWNING

Steelhead spawning occurs outside of the Delta. The Project would not affect steelhead spawning.

REARING HABITAT

Steelhead rearing habitat and movement are similar to those described for Chinook salmon. Impacts to steelhead rearing would be as described for Chinook salmon.

ADULT MIGRATION

Adult steelhead migration generally occurs from August through March. Most adults headed for the Sacramento and Mokelumne River tributaries would not be affected by the operation of the Project facilities. Adults headed up the San Joaquin River tributaries would use the main San Joaquin River channel for their upstream migration, and some adults would use the other major pathway up Old River before reconnecting with the San Joaquin River at the head of Old River. Other deviations occur and can result in adult fish moving throughout the interior channels of the south-central Delta. Tidal and episodic gate openings would facilitate the upstream migration of adult steelhead that have been delayed in the area.

Post-spawning steelhead from the Feather, American, and other Sacramento rivers would not be substantially affected by Project operations since a majority of the fish would move down the Sacramento River channel. Some fish move down Georgiana Slough or through the Delta Cross Channel when it is open and into the Lower Mokelumne River system. Project-related changes in hydrology would not substantially affect adult steelhead outmigration. When closed, the gates would act as barriers to movement through these channels and thus prevent direct movement of San Joaquin River and Mokelumne River steelhead adults through Connection Slough to the east Delta or to the San Joaquin River or through Old River to the San Joaquin River. Adults could still move up the San Joaquin River or through Middle River. The gates would pose an obstacle to migrating adults moving through the Central Delta. However, most adults would use the main river channel for their upstream migration and, in doing so, avoid the gates. Implementation of mitigation monitoring and adaptive management of the Project facilities before and after the VAMP period would assure that impacts to outmigrating steelhead would be less than significant.

Longfin Smelt

CONSTRUCTION

Less than Significant. Adult and juvenile longfin smelt would typically not be present in the Old River and Connection Slough during the construction period. Impacts generally would be as described for delta smelt, although relatively few longfin smelt appear to utilize Old and Middle rivers based on DFG trawl data, so impacts would be lessened.

OPERATIONS

Less than Significant/Beneficial. Juvenile and adult longfin smelt could be present during operations.

WATER QUALITY

Water quality impacts would be as described for delta smelt.

PREDATION

Predation impacts would be as described for delta smelt.

SPAWNING

Since longfin smelt tend to aggregate in Suisun Bay and the western Delta in late fall, and then spawn in freshwater areas immediately upstream between the confluence of the Sacramento and San Joaquin Rivers up to Rio Vista on the Sacramento River and Medford Island on the San Joaquin River during winter and early spring, the reduced entrainment from the Project would reduce impacts to longfin spawning.

REARING HABITAT

Longfin smelt larvae are generally located slightly upstream of the Sacramento-San Joaquin River confluence in the Delta near Sherman Island (Baxter 1999, Dege and Brown 2004). Juveniles migrate further downstream to Suisun Bay and low-salinity habitats for growth and rearing (Moyle 2002). During gate operations, adult longfin smelt, eggs, and larvae would be in the Project area and would be subject to reduced entrainment by the SWP and CVP pumps. When the gates are closed, the structures would prevent juvenile longfin smelt from being entrained from the Franks Tract area into the conveyance channels of Old and Middle Rivers and being carried directly to the CVP and SWP pumps. As with delta smelt, this Project would benefit longfin smelt by substantially reducing the entrainment effect on habitats north and west of the gates and thereby reducing the number of larval and juvenile fish being drawn south towards the pumps and entrained.

ADULT MIGRATION

Adult longfin smelt are at risk from entrainment at the SWP and CVP pumps for in the late fall and winter. Project operations would prevent direct movement of fish past these gates into Old and Middle Rivers from the Franks Tract area. If adult longfin smelt were to encounter the closed gates during their migration, then these smelt would have to move about the Delta following other routes, but these direct connections between Franks Tract and the pumps would be severed, which would be a beneficial impact.

bb. 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 the U.S. Fish and Wildlife Service

This issue is addressed in Section 4.5, Terrestrial Biological Resources.

cc. 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

This issue is addressed in Section 4.5, Terrestrial Biological Resources.

dd. 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

Construction Impacts

Less than Significant. Most aquatic species would flee the area to avoid the construction activity and human activity.

Dredging could entrain and injure resident and migratory fish if they are in the construction area during periods of construction. This is not expected, however, because the density of fish would be low and fish would avoid the area due to human activity (e.g., noise and lights). Aquatic species could be exposed to the indirect effects of dredging, including the potential release of additional sediment. However, the suspension of sediments would be controlled to avoid this impact as detailed in Section 2 and would not impede movement.

Barge placement could entrain a small amount of aquatic species in the water used to ballast the barge. Direct harm or mortality due to crushing between the barge and the foundation material would not occur due to the slow rate of submersion and the ability of fish to avoid the local area.

Dredged areas backfilled with rock would alter bottom habitat from soft sediment to hard substrate. Exposed rock foundation would increase local hard habitat structure in the channels and cover soft mud or peat substrate habitat. The soft bottom habitat is important to the development of larval and juvenile life forms, but it is a common in-channel habitat type in the Delta, and the small reduction in the habitat would not be a limiting factor to the reproduction and rearing of aquatic species.

Operational Impacts

Less than Significant. The Old River and Connection Slough are two of many channels available for the migration of movement routes available to aquatic species. Movement of migratory fish and other aquatic species does occur in other channels in the Delta (e.g., the Middle River). At some times of each year, the Project would slightly alter the flow rate, flow direction, and water quality of portions of the Delta, resulting in temporary, localized changes in entrainment of species in the eastern and southern Delta. This would not impede movement of migratory fish because of the brief duration and magnitude of the change (refer to Appendix E). Moreover, alternative routes are available to fish moving through the eastern and southern Delta via the mainstem of the San Joaquin River or the Middle River, and fish would move into other areas of suitable habitat. The Project would not interfere with the movement of aquatic species elsewhere in the Sacramento-San Joaquin River watersheds.

To encourage fish to continue their movements, rock ramps on a 5:1 slope would be installed on either side of both gates. The ramps would facilitate fish movement from the bed of the channel up to the deck of the barge where they can continue their movement up or down the channel.

Water quality impacts would be beneficial, or slight increases in salinity would occur during limited periods, and water quality would equalize once the gates were open. Such changes would not substantially affect aquatic species. Water quality is discussed in more detail in Section 4.9, Hydrology and Water Quality.

Beneficial. Native and important introduced fish that normally occupy some portions of the central and southern Delta would have reduced entrainment by the SWP and CVP pumps when the gates were closed.

Aquatic resources that move between the south and central Delta via Old River or Connection Slough, either naturally or by entrainment, would be prevented from such movement when the gates were closed. Plankton and other weak-swimming aquatic organisms that occupy the central Delta are subject to entrainment at the pumps under current conditions. The Project would substantially reduce this loss because native and important introduced fish would generally be unable to enter the south Delta by the most direct route.

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

No Impact. The Project would not conflict with any of the policies or goals described in the Contra Costa County or San Joaquin County General Plans because Project design (e.g., the use of sheet pile rather than rock for the dikes adjacent to the operable gates; implementation of performance criteria for turbidity during construction) and operational features (e.g., tidal operations from March through June) would be implemented that would avoid significant impacts. The Project would not cause changes in the ability to comply with regional or statewide water quality criteria or water management policies (e.g., D-1641). Additionally, the Project is intended to protect sensitive aquatic resources and therefore is consistent with policies that stress the preservation and enhancement of sensitive biological resources.

ff. 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. The East Contra Costa County Habitat Conservation Plan boundaries exclude the 2-Gates Project area. The San Joaquin Multi-Species Conservation Plan (SJMSCP) covers all of San Joaquin County, so portions of the Project fall within the SJMSCP area. The proposed Project activities, however, would not be "covered activities" under the SJMSCP, and the Project would not conflict with the goals of the plan.

4.4.3.3 Cumulative Impacts

The 2-Gates Project is a demonstration project and as such is designed with considerable operational flexibility. Because of this flexibility and the planned coordination with SWP and CVP pumping and other planned or future projects within the south Delta, cumulative impacts of the Project in combination with other projects would be less than significant or beneficial through the reduction in entrainment.

Bay Delta Conservation Plan (BDCP)

At this time it is anticipated that the Bay Delta Conservation Plan (BDCP) is in the planning and concept development phase. The planning phase will not become final before the end of 2010 with implementation to follow. Given the complexity of this plan and the need for public review and acceptance, it is unlikely that it will be completed and implemented prior to the five-year horizon established for the proposed Project. However, since the Project and the BDCP have similar objectives (i.e., providing for the conservation of ESA-listed species and their habitats [specifically delta smelt] and improving water supply reliability) it is expected that the two projects would be complementary and that cumulative impacts would be beneficial.

Franks Tract Project

It is anticipated that the combined facilities provided by the Project and the Franks Tract Project would provide greater operational flexibility to better manage hydrodynamic conditions and salinity concentration in the central and south Delta, thereby improving water quality and fish habitat conditions. In addition, it is anticipated that the cumulative impact of the combined operations of the Project and the Franks Tract Project would reduce the likelihood of entrainment of delta smelt from the Franks Tract area. Therefore, cumulative operational impacts would be beneficial. Since the construction periods would not overlap cumulative construction impacts would not occur.

South Delta Improvements Program (SDIP)

The Project and the SDIP would generally be operated during different times of the year. SDIP would be operated from April through November, and Project would be operated from December through June. Therefore, adverse cumulative effects would not occur. Both projects are anticipated to provide greater operational flexibility to protect ESA-listed fish and provide for water supply reliability, and overall cumulative impacts would be beneficial.

CCWD – Water Quality Improvement Projects

The Project may result in cumulative hydrologic changes in south Delta channel flows and related changes in water quality in conjunction with CCWD's water quality improvement projects. Incremental impacts of the Project combined with CCWD's projects to overall Delta channel flows are anticipated to be minimal due to the operational flexibility of both projects. Cumulative changes in channel flows may affect salinity in the south Delta, although these impacts are considered to be less than significant because the Project would implement monitoring to ensure that adverse impacts do not occur.

Los Vaqueros Reservoir Expansion Project

Both the Los Vaqueros Project and the Project are intended to improve water supply reliability while benefiting the Delta ecosystem. General effects of the reservoir expansion may include a net shift in timing of Delta export pumping to periods of less fishery sensitivity, and from dryer years to wetter years. The Project is intended to reduce the entrainment of delta smelt in south Delta pumps. The projects have complementary objectives, and overall cumulative impacts would be beneficial.

CVPIA Required Program

The CVPIA includes a requirement for Reclamation to develop and implement a program to mitigate fishery impacts resulting from the operation of Pumping Plant No. 1. The program may include a fish screen at Rock Slough (just south of the Old River site) modified operations, or other measures to mitigate fishery impacts. The Project would be operated in a flexible manner that would allow coordinated operations in conjunction with the CVPIA program requirements. Both projects are intended to result in beneficial impacts to aquatic species, and cumulative impacts are expected to be beneficial.

Freeport Regional Water Project

The Freeport Regional Water Project is a water supply project for customers in central Sacramento County and in Alameda and Contra Costa counties in the EBMUD service area. This project includes a water intake/pumping plant located on the Sacramento River near Freeport, and a 17-mile pipeline to convey water from the river through Sacramento County to the Folsom South Canal. Construction is nearly completed. This project would not affect aquatic resources in the Delta; therefore, no cumulative impacts would occur.

4.5 TERRESTRIAL BIOLOGICAL RESOURCES

Issues & Supporting Information Sources	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
gg. 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 the U.S. Fish and Wildlife Service?	☐	☒	☐	☐
hh. 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 the U.S. Fish and Wildlife Service?	☐	☒	☐	☐
ii. 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?	☐	☒	☐	☐
jj. 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?	☐	☐	☒	☐
kk. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
ll. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

The terrestrial biological resources investigation for the Project is based on surveys conducted in the Project area on Bacon Island and Holland Tract. In the case of Mandeville, the resource assessment is provisional, based on a review of aerial photography and binocular-aided visual scans of the riverbank from Bacon Island. From that, preliminary assumptions were made about the types of habitats present and estimates of their size and location. For all sites within the Project area, the following pertinent documents were used:

- California Natural Diversity Database list for Project area (CNDDB September 2008)
- California Native Plant Society's (CNPS) plant list for the Brentwood, Jersey Island, Woodward Island, and Bouldin Island 7.5-minute quadrangles, via electronic inventory (CNPS September 2008)
- USFWS endangered and threatened species list for the Brentwood, Jersey Island, Woodward Island, and Bouldin Island 7.5-minute quadrangles (USFWS 2008)
- DFG Special Status Species List (DFG 2008)
- Action Specific Implementation Plan for the Contra Costa Canal Replacement Project, CCWD, March 2007
- Preliminary Delineation of Waters of the United States for the Delta Wetlands Project, (Jones & Stokes, December 2001), and correspondence from the Natural Resources Conservation Service (April 2, 2002), Jones & Stokes (April 19, 2002) and the Sacramento District of the Army Corps of Engineers (Corps May 20, 2002) concerning jurisdictional areas on Holland Tract, Bacon Island, Bouldin Island and Webb Tract

Mosaic Associates conducted preliminary wetland delineations at the Old River, Connection Slough, and the Holland Alternate Storage sites on Holland Tract and Bacon Island. The field work for the preliminary delineation at Mandeville Island will be conducted prior to Project construction. Delineations were carried out on August 1 and 8, 2008; and September 9, 23 and 29, 2008. The preliminary delineation, "Delineation and Preliminary Jurisdictional Determination of Wetlands and Other Waters of the U.S. Under Section 404 of the Clean Water Act for the Proposed Two-Gates Project Area, Contra Costa and San Joaquin Counties, California" (Mosaic Associates, September 2008), is included in Appendix B.

An inventory of habitats present within the study areas defined for the Project and an assessment of the presence of habitats suitable for terrestrial special-status species were conducted by Mosaic Associates on August 1 and 8, 2008; and September 9, 23 and 29, 2008. Maps of habitats are depicted in Figures 4.5-1, 4.5-2, and 4.5-3.

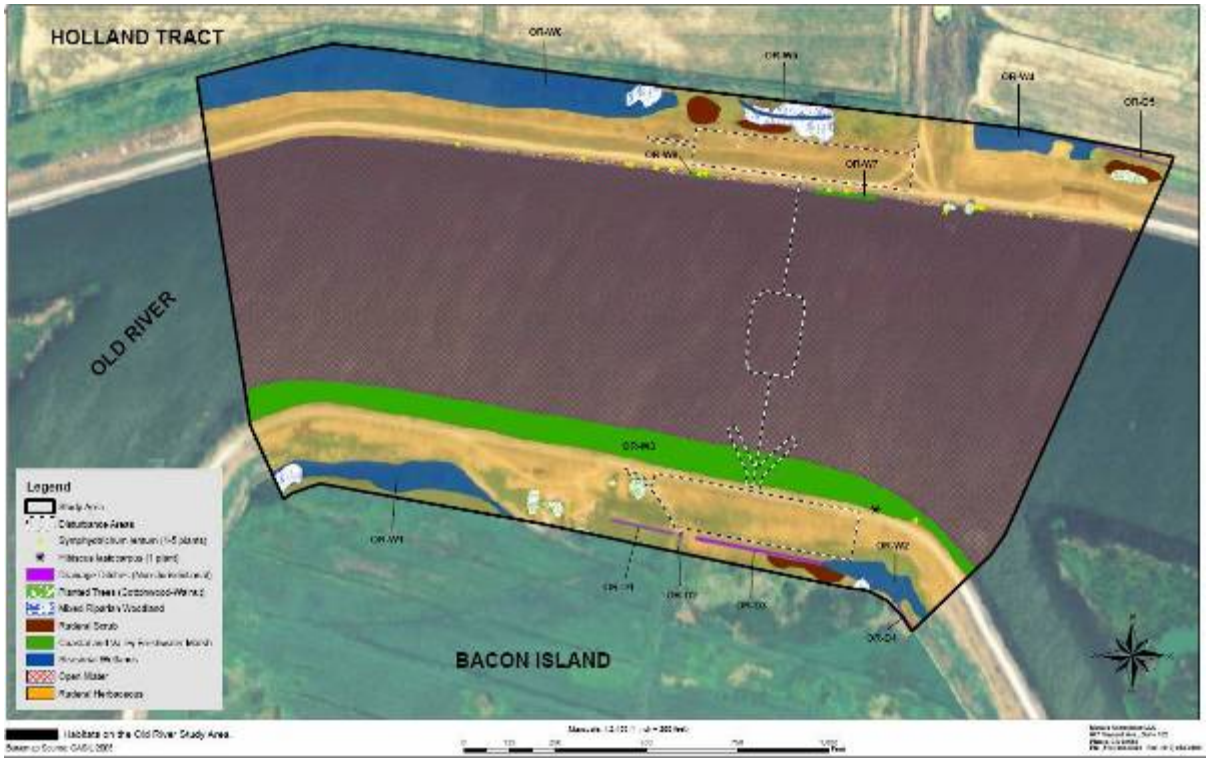


Figure 4.5-1 Habitats on the Old River Study Area

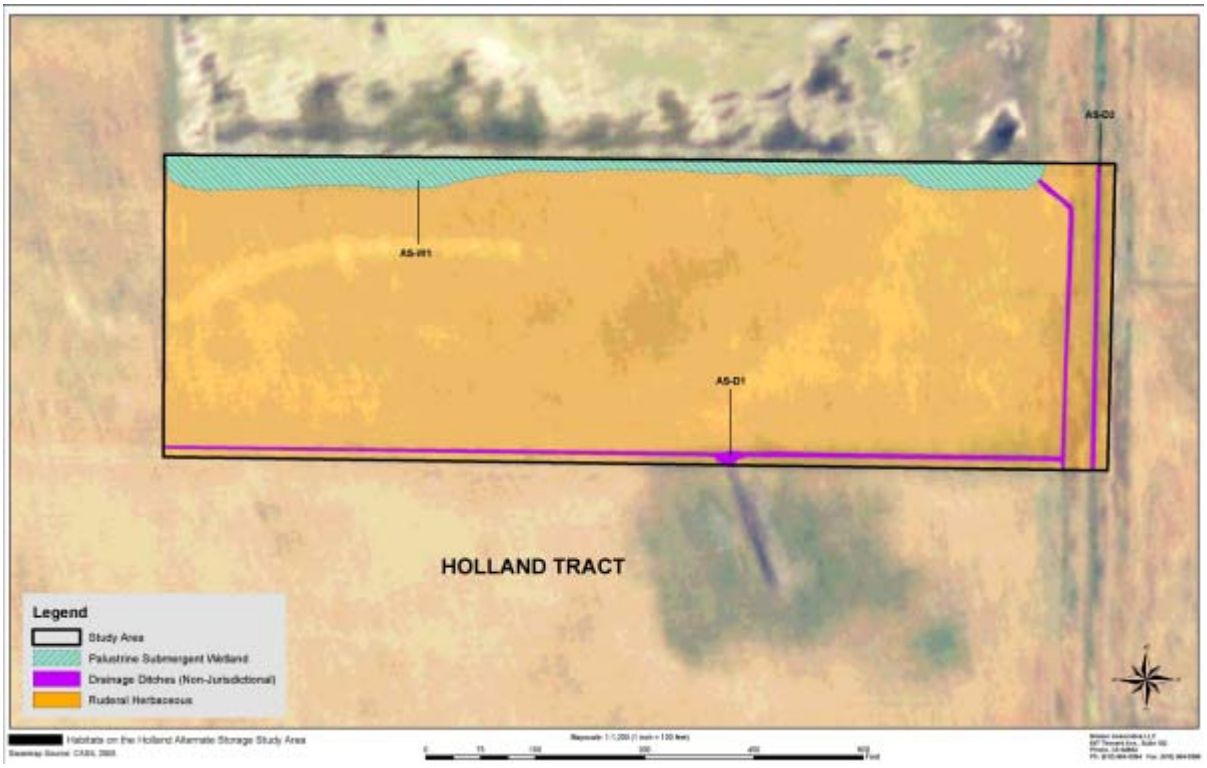


Figure 4.5-2 Habitats on the Holland Alternate Study Area

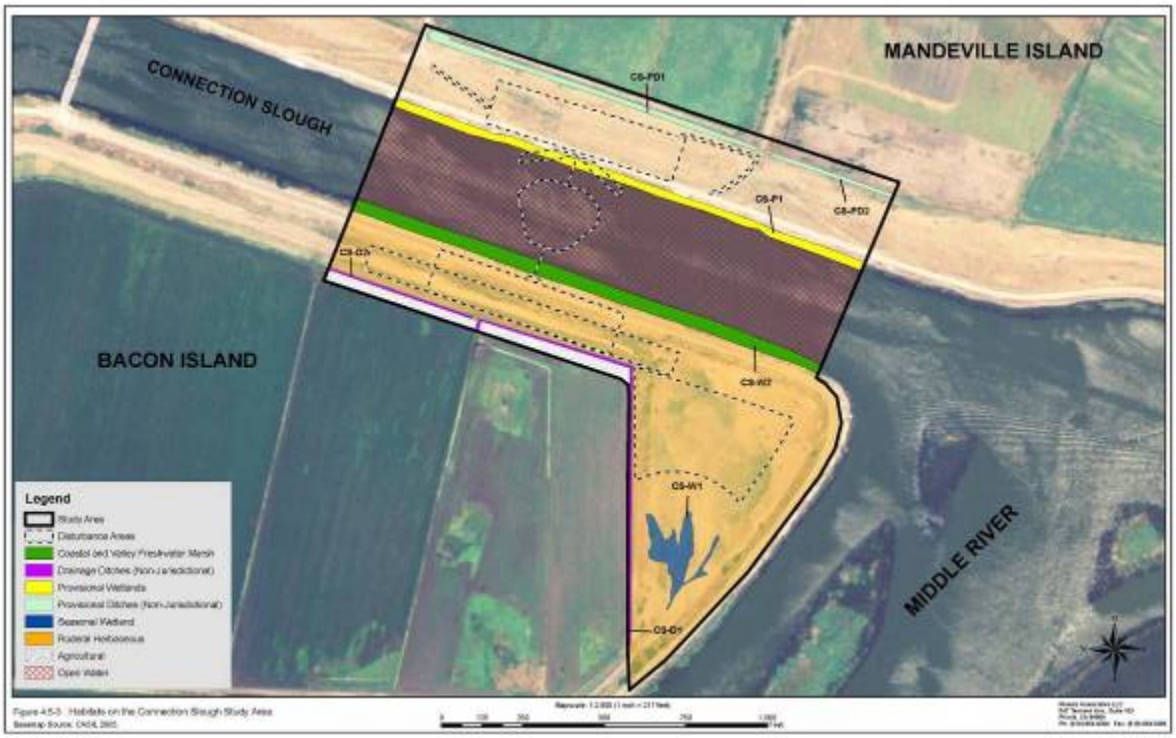


Figure 4.5-3 Habitats on the Connection Slough Study Area

Summer rare plant surveys for late-blooming species at the Old River, Holland Alternate Storage and Connection Slough sites were conducted on September 23 and 29, 2008. Two summer-blooming rare plants were detected, woolly rose mallow (*Hibiscus lasiocarpus*, List 2.*2*) and Suisun Marsh aster (*Symphyotrichum lentum*, List 1B.2). Summer rare plant survey results are reported in the Summer Rare Plant Survey, Two Gates Project Locations (Mosaic Associates, September 30, 2008), enclosed in Appendix C.

A habitat assessment for the federally and state threatened giant garter snake (*Thamnophis gigas*) was conducted by Swaim Biological, Inc. The 2-Gates Project Habitat Assessment for the Giant Garter Snake (*Thamnophis gigas*), (Swaim Biological, September 30, 2008) is enclosed in Appendix D.

Dry- and wet-season sampling for federally listed large branchiopods, including vernal pool fairy shrimp (*Branchinecta lynchi*), vernal pool tadpole shrimp (*Lepidurus packardi*) and Conservancy fairy shrimp (*Branchinecta conservatio*) consistent with USFWS' Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods (1996) were conducted in the 0.5-acre wetland on Bacon Island south of Connection Slough in October 2008 (dry season) and November and December 2008, and January, February and March 2009 (wet season) (Helm Biological February 2009 and April 2009). No listed large branchiopods were detected during the surveys, and since the wetland never ponded water during any of the wet season site visits, the wetland basin was determined to be unsuitable for federally-listed large branchiopods. The wet- and dry-season reports are enclosed in Appendix E.

4.5.1 Environmental Setting

The study areas on Bacon Island and Mandeville Island are actively farmed, and land surrounding the agricultural fields is regularly disked. Portions of Holland Tract are under cultivation, but in the study area, the fields are fallow. Adjacent fields on Holland Tract were utilized as rangeland for cattle at the time of the field visit. Maintenance dredging occurs in the agricultural ditches on all islands. The alternate storage site on Holland Tract was grazed by cattle at the time of the site visit.

Most of the land bordering the study areas is farmland, rangeland, and open space. There are several unused structures (old farmhouses) located on Bacon Island in the Old River location; a large barn is located on Holland Tract. There is a structure visible on aerial photography at Mandeville Island near the access bridge.

Levees have been constructed along both banks of Old River and Connection Slough. The roads on the Old River levees are private. The road on the Bacon Island side of Connection Slough is public, while the road on Mandeville Island is private. Periodic levee maintenance includes the control of vegetation and repairs of the riprap above the waterline.

The portion of the Project located on Holland Tract is located in Contra Costa County. The remainder of the Project (the Bacon Island and Mandeville Island sites) is located in San Joaquin County. The study areas in which the Project effects on terrestrial species and wetland and other waters habitats were evaluated encompass a larger area than the area subject to construction disturbance associated with the construction of the gates. This allowed for a comprehensive analysis of the effects of the Project on potentially occurring special-status species associated with the construction and operation of the gates.

4.5.1.1 Special-Status Natural Communities

One special-status natural community is present within the study area: Coastal and Valley Freshwater Marsh. This vegetation community characteristically forms a dense vegetative cover dominated by perennial, emergent monocots 1 to 15 feet high that reproduce by underground rhizomes. This series is most extensive in the upper portion of the Sacramento-San Joaquin River Delta, and is common in the Sacramento and San Joaquin Valleys in river oxbows and other areas on the flood plain (Holland 1986). Narrow bands of

vegetation, approximately 10 feet wide, along the levee margins fit this description. Nearby islands within the Old River and Connection Slough channels also fit this description, though they are just outside the study area. Narrowleaf cattail (*Typha angustifolia*), tule rush (*Schoenoplectus acutus*), and California bulrush (*Schoenoplectus californica)* are among the dominant hydrophytes of Connection Slough and Old River.

4.5.1.2 Special-Status Species

Special-status plant, fish, and terrestrial species are generally defined as those species that are legally protected or otherwise considered sensitive by federal, state, or local resource conservation agencies and organizations. This includes species protected under federal and California Endangered Species Acts (ESA and CESA) and species identified as sensitive by the California Department of Fish and Game (DFG), and species identified in the CNPS's Inventory of Rare and Endangered Vascular Plants of California (CNPS 2008).

Searches were conducted for sensitive biological resources that have been documented in the U.S. Geological Survey (USGS) Woodward Island, Bouldin Island, Jersey Island, and Brentwood 7.5-minute quadrangles, which cover the Project sites and vicinity. The nine-quadrangle area recommended by CNPS and DFG protocol was not searched because the range of habitats within a nine-quadrangle search of the surrounding area is much more diverse than the habitats encountered within the study area and within the four-quadrangle search. The four-quadrangle search that was conducted encompasses the habitat types, and therefore the suite of species that may reasonably be encountered in the vicinity of the Project site. The California Natural Diversity Database (CNDDB) also was searched as were the USFWS-generated list of Federal Endangered and Threatened Species that Occur in the four USGS quadrangles listed above; and the CNPS' Inventory of Rare and Endangered Plants of California. Based on these database searches and existing site conditions, animal species having the potential to occur on the Project site were identified based on their occurrence in the search area and the presence of habitat suitable for those species. These include Conservancy fairy shrimp (*Branchinecta conservatio*), vernal pool fairy shrimp (*Branchinecta lynchi*), vernal pool tadpole shrimp (*Lepidurus packardi*), giant garter snake (*Thamnophis gigas*), western pond turtle (*Actinemys marmorata*), northwestern pond turtle (*Actinemys marmorata marmorata*), Swainson's hawk (*Buteo swainsoni*), tricolored blackbird (*Ageliaus tricolor*), black rail (*Laterallus jamaicensis coturniculus*), western burrowing owl (*Athene cunicularia*), and loggerhead shrike (*Lanius ludovicianus*).

4.5.1.3 Terrestrial Environment

Habitats present in the study areas include ruderal herbaceous, agricultural cropland, ruderal scrub, coastal and valley freshwater marsh, palustrine submergent wetland, seasonal wetland, and mixed riparian woodland, and planted trees. Figures 4.5-1, 4.5-2, and 4.5-3 depict the habitat types present within the study areas. Habitat types are described below.

Ruderal Herbaceous. This habitat type is the most common one found within the study areas. Ruderal herbaceous communities are those which colonize highly disturbed areas. Portions of the study areas receive regular discing maintenance. This habitat type would correspond most closely to Holland's (1986) Pasture series (11206), or to Sawyer and Keeler-Wolf's California Non-Native Grassland series (1995). Dominant herbaceous species observed in the ruderal herbaceous areas included ripgut brome (*Bromus diandrus*), poison hemlock (*Conium maculatum*), Bermuda grass (*Cynodon dactylon*), Mediterranean mustard (*Hirschfeldia incana*) and field radish (*Raphanus sativus*), and stinging nettle (*Urtica dioicia*).

Agricultural. Small areas within the study area were under active cultivation for crops such as sunflower (*Helianthus annuus*) and corn (*Zea mays*).

Ruderal Scrub. Ruderal scrub is similar to ruderal herbaceous habitat, in that it is a plant community that colonizes disturbed areas, but instead it is composed of bushy, woody, or taller-statured species. A few

patches of dense, monotypic Himalayan blackberry (*Rubus discolor*) located on Holland Tract and Bacon Island within the Old River study area fit this description.

Coastal and Valley Freshwater Marsh. This series is dominated by cattails up to 4 meters tall, and is most extensive in the upper portion of the Sacramento-San Joaquin River Delta. It is common in the Sacramento and San Joaquin Valleys in river oxbows and other areas on the flood plain (Holland 1986). Narrowleaf cattail, tall fescue, and tule rush are among the dominant hydrophytic species along the agricultural ditches and on the levee margins of Connection Slough and Old River.

Palustrine Submergent Wetland. One pond feature, located adjacent to the Holland Tract Alternate Storage site, occurs within the study area. The pond was excavated to provide fill for a nearby road and is inundated with water pumped from the river through the growing season. It functions as a stock pond. At the time of our field visit on September 23, it held approximately 2 to 3 feet of water at its deepest, while at its margins the water depth was closer to 6 inches. This habitat would conform most closely to Cowardin's (1979) palustrine wetland, or Holland's (1986) Permanently Flooded Lacustrine (11520) series. This submerged wetland contains greater than 5 percent vegetation, the majority of which is a submerged aquatic pond weed (*Potamogeton sp*.). The edges of the pond feature host some emergent plants, including tule rush, and an unidentifiable sedge, which may be bull tule (*Scirpus robustus*). Due to the grazing, this emergent vegetation is sparse. Algal matting is also present on the surface of the water.

Seasonal Wetland. Seasonal wetlands occur throughout the study areas in a variety of geomorphic settings including swales, shallow concave basins, and irrigation ditches and canals; primarily in areas with concave topography and fine textured and/or compacted soils which impede surface water infiltration, or allow groundwater infiltration to occur. The seasonal wetland on Bacon Island near Connection Slough was located in a shallow, sparsely vegetated basin south of the proposed gate. Species that did occur in the basin or near the margin included Bermuda grass, umbrella sedge (*Cyperus eragrostis*), knotweed (*Polygonum arenastrum*), and an unidentified plant that may be dogbane (*Apocynum cannabinum*). On the Holland Tract, and on Bacon Island near Old River, the seasonal wetlands were dominated by Bermuda grass and water smartweed (*Polygonum amphibium*).

Mixed Riparian Woodland. Although not specifically described in Holland (1986), mixed riparian woodland consists of annual and perennial native and non-native riparian herbaceous and woody species. This vegetation type is typically found along stream and river banks, on terraces adjacent to floodplains, and along perennial or intermittent streams, gullies, springs or seeps. On site, the mixed riparian woodland would conform most closely to Holland's Great Valley Willow Scrub, described as "An open to dense, broadleafed, winter-deciduous shrubby streamside thicket dominated by any of several Salix species. Dense stands usually have little understory or herbaceous component. More open stands have grassy understories, usually dominated by introduced species" (Holland 1986). Mixed riparian woodland on Bacon Island occurs near Old River and includes mostly shrubby willows (Salix sp.), most of which are not tall in stature, but do form a dense stand. On Mandeville Island, maps indicate that there is a riparian area nearby the Project site that may provide mixed riparian woodland habitat.

Planted Trees. In a small area around the abandoned farmhouse on Bacon Island at Old River, several planted trees are present, including cottonwood (*Populus fremontii*), apple (*Malus x domestica*), and sweet almond (*Prunus dulcis*).

4.5.1.4 Terrestrial Animals

The Project sites are located on the Woodward Island and Bouldin Island USGS 7.5-minute quadrangles. Because of the location of the sites near the edges of the quadrangles, we also included the contiguous Brentwood and Jersey Island quadrangles for our analysis of potentially occurring species. A list of terrestrial animal species for these quadrangles contained 14 federally listed species under the jurisdiction of the

USFWS and three additional state-listed species (Table 4.5-1). Four species are listed by both the federal ESA and CESA.

Wildlife observed on the Project sites during the August and September 2008 site visits in the Old River and Connection Slough sites included Swanson's hawk, northern harrier (*Circus cyaneus*), western gull (*Larus occidentalis*), barn swallow (*Hirundo rustica*), double-crested cormorant (*Phalacrocorax auritus*), red-winged blackbird (*Agelaius phoeniceus*), bull frog (*Rana catesbiana*), cat fish (*Ictalurus* spp.) and ground squirrel (*Spermophilus beecheyi*). Additionally, sign of raccoon (*Procyon lotor*) and coyote (*Canis latrans*) was observed. At the time of the site visit, the pond feature at the Holland Tract Alternate Storage site hosted many shorebirds, including American white pelican (*Pelecanus erythrorhynchos*), killdeer (*Charadrius vociferans*), white-faced ibis (*Plegadis chihi*), red-necked phalarope (*Phalaropus lobatus*), black-necked stilt (*Himantopus mexicanus*), red winged blackbird (*Agelaius phoeniceus*), tree swallow (*Tachycineta bicolor*), barn swallow (*Hirundo rustica*), eared grebe (*Podiceps nigricollis*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), great blue heron (*Ardea herodias*), and a flock of two to three dozen "peeps," likely least sandpipers (*Calidris minutilla*).

No proposed or designated critical habitat for terrestrial species occurs in the Project sites. Table 4.5-2 provides a list of terrestrial animal species of special concern and indicates whether they have been found on the sites or in the four 7.5-minute quadrangle map area noted above. Several special-status birds and other birds that receive protection under the Migratory Bird Treat Act (MBTA) and the California Fish and Game Code have the potential to nest or forage on the Project site and in the vicinity.

Table 4.5-1 Federally Listed and State-Listed Terrestrial Wildlife Species with Potential to Occur on the Project Site

Common Name	Scientific Name	Listing Status[1]		Designated Critical Habitat	Critical Habitat on Project Site	Effects Determination[2]
		Federal	State			
Invertebrates						
Conservancy fairy shrimp	*Branchinecta conservatio*	FE		Yes	No	No effect
Longhorn fairy shrimp	*Branchinecta longiantenna*	FE		Yes	No	No effect
Vernal pool fairy shrimp	*Branchinecta lynchi*	FT	--	Yes	No	No effect
Delta green ground beetle	*Elaphrus viridis*	FT		Yes	No	No effect
Vernal pool tadpole shrimp	*Lepidurus packardi*	FE		Yes	No	May affect
Amphibians						
California tiger salamander	*Ambystoma californiense*	FT	SSC	Yes	No	No effect
California red-legged frog	*Rana aurora draytonii*	FT		Yes	No	No effect
Reptiles						
Alameda whipsnake	*Masticophis lateralis euryxanthus*	FT	ST	Yes	No	No effect
Giant garter snake	*Thamnophis gigas*	FT	ST	No	No	May affect
Birds						
Swainson's hawk	*Buteo swainsoni*	FSC	ST	No	No	May affect. Observed foraging on Bacon Island, 9/8/08. Pair observed in nest tree on east side of Bacon Road, at the SW corner of lower Jones Tract at Middle River.
California black rail	*Laterallus jamaicensis coturniculus*	--	ST	No	No	May affect. Documented in Old River in study area, and Middle River, near study area in 1992 and 1993

Table 4.5-1 Federally Listed and State-Listed Terrestrial Wildlife Species with Potential to Occur on the Project Site

Common Name	Scientific Name	Listing Status[1]		Designated Critical Habitat	Critical Habitat on Project Site	Effects Determination[2]
		Federal	State			
California clapper rail	*Rallus longirostris obsoletus*	FE	SE	No	No	No effect
Bank Swallow	*Riparia riparia*	--	ST	No	No	No effect
Mammals						
San Joaquin kit fox	*Vulpes macrotis mutica*	FE	ST	No	No	No effect

Note: Species list for the Jersey Island, Bouldin Island, Brentwood, and Woodward Island quadrangles, which contain the Project sites.

[1]Listing status definitions: FT = federally listed as threatened; FE = federally listed as endangered; FSC = federal species of concern; ST = state listed as threatened; SE = state listed as endangered; SSC = state species of special concern; SFP = state fully protected species.

[2]A "may affect" determination indicates that suitable habitat was present, there was potential for the species to occur, and that construction, removal or operation of the Project had the potential to affect the species. A "no effect" determination indicates that suitable habitat is not present or that there is no potential to occur due to other factors described below, and that the Project would not affect the species.

Table 4.5-2 Federal and State Terrestrial Wildlife Species of Concern with Potential to Occur in the Project Site

Common name	Scientific name	Listing Status1		Documented to Occur in Project Site	Effects Determination2
		Federal	State		
Reptiles					
western pond turtle	*Actinemys marmorata*	–	SSC	Yes, in three locations 2002	May affect
northwestern pond turtle	*Actinemys marmorata marmorata*	–	SSC	No	May affect
silvery legless lizard	*Anniella pulchra pulchra*	–	SSC	No	No effect
Birds					
tricolored blackbird	*Agelaius tricolor*	–	SSC	No	May affect
burrowing owl	*Athene cunicularia*	–	SSC	No	May affect
loggerhead shrike	*Lanius ludovicianus*	–	SSC	No	May affect
Mammals					
western red bat	*Lasiurus blossevillii*	–	SSC	No	No effect

Note: Species list for the Brentwood, Woodward Island, Bouldin Island, and Jersey Island quadrangles, which contain the Project sites.

1Listing status definitions: FSC = federal species of concern; SSC = state species of special concern.

2 A "may affect" determination indicates that suitable habitat was present, there was potential for the species to occur, and that construction, removal or operation of the Project had the potential to affect the species. A "no effect" determination indicates that suitable habitat is not present or that there is no potential to occur due to other factors described below, and that the Project would not affect the species.

INVERTEBRATES

Focused surveys for the federally threatened vernal pool fairy shrimp, vernal pool tadpole shrimp and Conservancy fairy shrimp were conducted in the 0.5-acre seasonal wetland on Bacon Island at Connection Slough (Helm Biological February and April 2009). Historically, this was not VPFS or VPTS habitat, but the levees have isolated the area from the prolonged periods of flooding that occurred historically. No listed large branchiopods were detected, and the wetland was determined to be unsuitable for these species.

AMPHIBIANS AND REPTILES

A habitat assessment by Swaim Biological concluded that the Project sites are located within the historic and current range of giant garter snake (GGS), and that suitable habitat for the GGS exists within the study areas for the Project (Appendix D).

The GGS has four main habitat requirements as outlined by the draft recovery plan: (1) adequate water during active season to support prey species (i.e., blackfish [*Orthodon microlepidotus*], Pacific tree frog [*Psudacris regilla*], carp [*Cyprinus carpio*], mosquito fish [*Gambusia affinis*] and bullfrogs [*Rana catesbeiana*]); (2) emergent wetland vegetation (i.e., cattails *Typha spp*.) and bulrushes (*Scirpus spp.)* for foraging habitat and cover from predators; (3) upland habitat with grassy banks and openings in vegetation for basking; (4) higher elevation upland habitats for cover and refuge (i.e., burrows and crevices) from flood waters during winter (USFWS 1999).

Habitat quality for the GGS is generally good at all sites within the Project area. The main waterways, including the Old River, are likely not highly preferred habitat, but may provide corridors for movement. These contain the basic features necessary for GGS, including emergent vegetation and cover. The banks of the Old River are lined with rip-rap with interstitial spaces that provide cover from predators and that also may aid in thermoregulation. Much of the Old River is also lined by cattails and bulrush. Both plants provide cover and are positively associated with GGS presence. The results of the habitat features associated with each site are summarized in Table 4.5-3 and discussed in greater detail below.

The west bank of the Old River is adjacent to high-quality GGS habitat. A small canal that runs parallel to the levee road may provide foraging habitat though the deep banks and quantity of emergent vegetation creates a fair amount of shade that may inhibit thermoregulation. The larger, diked canal perpendicular to the levee road provides better foraging habitat for GGS. The banks are moderately sloped with abundant emergent vegetation for cover, and with adequate exposure for thermoregulation. The canal itself appears to have slow-flowing water, and a silt substrate, features positively associated with GGS. Small schools of catfish (*Ictalurus* spp.) are present in the canal. These are generally regarded as predatory game fish, but young catfish may also be a prey source for GGS (USFWS 1999). The levee provides upland habitat and winter refugia above the high water mark. California ground squirrels are absent, but other rodents such as California meadow voles (*Microtus californicus*) are likely present and provide burrows that may be used as retreats.

The west bank of the Old River site has suitable habitat and there are seasonal wetlands that provide potential forage and cover habitat during the GGS active season that are just to the west across the dirt road. The wetlands directly fringing the riverbank comprise the best GGS habitat on the east of the Old River.

On Bacon Island, the study area is adjacent to an irrigation ditch with shallow water flowing over silt. Abundant bullfrogs and mosquitofish, both prey species for GGS, were observed in the ditch. The presence of bullfrogs suggests that the channel provides water year-round since bullfrog tadpoles do not metamorphose until their second season, overwintering in their larval form. Other crucial habitat features such as emergent vegetation and upland habitat were present at the site. California ground squirrels whose burrows provide ideal hibernacula for GGS also were observed. A seasonal wetland south of the proposed gate may provide additional foraging areas in the spring.

Table 4.5-3 Summary of GGS habitat features present at each site

Site Location	Water Availability	Prey Species	Emergent Vegetation	Basking sites	Upland refugia and burrows
Old River Gate Site	Year-round	Fish present	Present	Present	Present
Connection Slough Gate Site, Bacon Island	Year-round	Fish present Bullfrogs present	Present	Present	Present
Holland Tract Storage Site	Seasonal	Fish present	Present but sparse due to grazing	Present	Present

Western pond turtle has been reported on the Project site and in the Project vicinity; suitable habitat exists on site for this species. Additionally, there is a record for the northwestern pond turtle northeast of the Project site. The western pond turtle has recently received some taxonomic study. Formerly this species was called

Clemmys marmorata. The species phylogeny had been split into two subspecies, a northern (*A. m. marmorata*) and a southern (*A. m. pallida*). The characters used to distinguish the species were, however, ill-defined, and it has been argued that the subspecies distinction should be abandoned, and a new phylogeny should be applied, reuniting the species under *A. marmorata* while recognizing the existence of four distinct clades (Bury and Germano 2008, Spinks and Shaffer 2005). Regardless of the name applied to the species or subspecies, records for western pond turtle exist on the site and within the vicinity.

Other special-status amphibian and reptiles, including California red-legged frog (*Rana aurora draytonii*), Alameda whipsnake (*Masticophis lateralis euryxanthus*), California tiger salamander (*Ambystoma californiense*), and silvery legless lizard (*Anniella pulchra pulchra*) are not expected to occur in the Project site or vicinity due to the absence of suitable habitat (Alameda whipsnake), isolation from occupied habitat in the region and historic site conditions that were unsuitable (California tiger salamander, silvery legless lizard), or their extirpation from this portion of the Delta due to the mass colonization of introduced fishes and bullfrogs (California red-legged frog).

BIRDS

Swainson's hawk was observed foraging on Bacon Island on September 8, 2008, and there is a documented nest tree 2.5 miles to the southwest on the Lower Jones Tract along Middle River. Large trees suitable for nesting are present on Holland Tract and Bacon Island near the Project location. Large trees may be present on Mandeville Island, either within the Project area or within 250 feet of the Project area.

California black rails have been documented on the study area within Old River and in Connection Slough, as well as in Middle River. The records indicate that the birds were observed on the in-channel islands near the study areas. Black rails use marsh and mudflat habitat, retreating to areas with dense cover when tides are high. The levee habitats on site provide only marginal cover in high tide situations.

Suitable habitat for the western burrowing owl is present on Bacon Island near Connection Slough. However, no sign of owl use was observed on September 8, 2008, and the habitat area is small and disconnected from other areas known to host burrowing owl.

The tricolored blackbird and the loggerhead shrike have potential to occur on site due to presence of suitable habitat. Habitat suitable for bank swallow (*Riparia riparia*) nesting is absent from the Project site.

Large trees on the Holland Tract, Old River site and possible large trees located on Mandeville Island exist in the study area that could serve as potential nesting sites for other raptors and migratory birds, and the study area does provide foraging habitat for Swainson's hawk and other birds of prey. Suitable nesting habitat is present in the riparian scrub and the planted trees for birds covered under the MBTA.

MAMMALS

San Joaquin kit fox (*Vulpes macrotis mutica*) are not expected to occur in the Project site due to the lack of connectivity between known kit fox occurrences and the Project sites, with the rivers and sloughs creating barriers to movement.

The western red bat (*Lasiurus blossevillii*) has the potential to roost on the site. Abandoned farmhouse structures on Bacon Island, as well as a barn located on the Holland Tract, and large mature trees on Bacon Island, Holland Tract and possibly on Mandeville Island could serve as potential roosting habitat; however, there were no incidental observations of bats or sign of bats during the wetland delineation work (Mosaic Associates 2008). The structures and large trees present within the study area will not be disturbed, so the Project would not affect this species.

4.5.1.5 Plants

A 2008 CNDDB and CNPS search identified locations of special-status plant species within a four-quad radius of the Project site. Eighteen plant species listed either under ESA or CESA or on the CNPS list are shown in Table 4.5-4. Soft bird's beak (endangered under ESA), Delta button-celery (endangered under CESA) and Antioch Dunes evening primrose (endangered under ESA and CESA), were the only endangered plant species documented to occur within the four-quadrangle search surrounding the Project site.

Table 4.5-4 Special-Status Plant Species Identified within the Bouldin Island, Woodward Island, Jersey Island, and Brentwood 7.5 minute Quadrangles Containing the Project Sites and Vicinity

Common Name Scientific Name	Potential To Occur in Study Area	Listing Status[1]		
		Federal	State	CNPS
Heartscale *Atriplex cordulata*	Very low. Some very marginal habitat present, but no alkaline soils observed.	–	–	List 1B
San Joaquin spearscale *Atriplex joaquiniana*	Very low. Some very marginal habitat present, but no alkaline soils observed.	–	–	List 1B
Big tarplant *Blepharizonia plumosa*	Very low. Some very marginal habitat present, but no occurrences reported. Grasslands on site receive regular disking.	–	–	List 1B
Round-leaved filaree *California macrophylla*	Low. Grasslands on site receive regular disking	–	–	List 1B
Bristly sedge *Carex comosa*	Moderate. Suitable habitat present in levee margins.	–	–	List 2
Brown fox sedge *Carex vulpinoidea*	Moderate to High. Documented to occur on study area (Old River). Has potential to occur on levee margins.	–	–	List 2
Soft bird's-beak *Cordylanthus mollis* ssp. *mollis*	Very Low. Other halophytes do not occur in the study areas.	FE	SR	List 1B
Delta button-celery *Eryngium racemosum*	Low. May occur in Riparian Scrub on Mandeville, if present. Marginal habitat present.	--	SE	List 1B
Woolly rose-mallow *Hibiscus lasiocarpus*	High. Documented as occurring in islands of Old River in 1992. Has potential to occur on levee margins. Detected on Bacon Island.	–	–	List 2
Delta tule pea *Lathyrus jepsonii* var. *jepsonii*	Low. Has potential to occur on levee margins.	–	–	List 1B
Mason's lilaeopsis *Lilaeopsis masonii*	Moderate to High. Documented as occurring on study area (Old River); has potential to occur on levee margins.	–	SR	List 1B
Delta mudwort *Limosella subulata*	Low. Documented as occurring near study area, but mudflat habitat does not occur in study area.	–	–	List 2
Antioch Dunes evening-primrose *Oenothera deltoides* ssp. *howellii*	None. Dune habitats not present within the study areas.	FE	SE	List 1B
Eel-grass pondweed *Potamogeton zosteriformis*	Moderate. Suitable habitat present within aquatic habitats.	–	–	List 2
Marsh skullcap *Scutellaria galericulata*	Moderate. Suitable habitat present in levee margins.	–	–	List 2
Side-flowering skullcap *Scutellaria lateriflora*	Moderate. Suitable habitat present in levee margins.	–	–	List 2
Suisun Marsh aster *Symphyotrichum lentum*	Moderate to High. Documented in Old River north of study area; suitable habitat present in levee margins. Detected on Bacon and Holland.	–	–	List 1B
Caper-fruited tropidocarpum *Tropidocarpum capparideum*	Very low. No alkaline soils observed.	–	–	List 1B

1FE = federally listed as endangered; SE = state listed as endangered; SR = state listed as rare; List 1B = rare, threatened, or endangered in California and elsewhere; List 2 = Rare, threatened, or endangered in California, but more common elsewhere.

Source: CNDDB 2008. Data compiled by Mosaic Associates in 2008.

Plants that rate a "Moderate" or higher likelihood of presence, based on an analysis of the habitats present within the study area, and upon documented occurrences of the species within the study area and within the

four-quadrangle search area surrounding the Project sites, merit the conduct of rare plant surveys. The following eight special-status plant species with a moderate or higher potential to occur with in the study area were identified:

- Brown fox sedge (*Carex vulpinoidea*): has been documented on Project site. Flowering Period: May-June.
- Bristly sedge (*Carex comosa*): Has same habitat requirements as Carex vulpinoidea, which has been documented on the Project site. Flowering Period: May to September. Not detected during summer rare plant surveys on Bacon Island and Holland Tract.
- Woolly rose-mallow (*Hibiscus lasiocarpus*): This plant was observed on the levee margin of Bacon Island at Old River during the September 2008 rare plant survey. It has been documented within the islands of Old River nearby the study area, and on the levee margins just south of study area. Flowering Period: June to September. Detected on Bacon Island.
- Mason's lilaeopsis (*Lilaeopsis masonii*): 68 records within the four-quadrangle search; and 4 within the study area. Flowering Period: Apri to November. Not detected during summer rare plant surveys on Bacon Island and Holland Tract.
- Eel-grass pondweed *Potamogeton zosteriformis*: may occur in aquatic habitats on site, though none was observed during the summer rare plant survey. Flowering Period: June to July. Not detected during summer rare plant surveys on Bacon Island and Holland Tract.
- Marsh skullcap (*Scutellaria galericulata*): Occurs in marshes and swamps, suitable habitat is present on levee margins, though none was observed during the summer rare plant survey. Flowering Period: June to September. Not detected during summer rare plant surveys on Bacon Island and Holland Tract.
- Side-flowering skullcap (*Scutellaria lateriflora*): Occurs in marshes and swamps, suitable habitat is present on levee margins, though none was observed during the summer rare plant survey. Flowering Period: July to September. Not detected during summer rare plant surveys on Bacon Island and Holland Tract.
- Suisun Marsh aster (*Symphyotrichum lentum*): This species occurs on the levee margins of Old River, with one individual on the Bacon Island side, and several dispersed on the Holland Tract side. It has been documented near the Project site in Old River islands. Flowering Period: May to November. Detected on Bacon Island and Holland Tract.

Special-status plant species surveys are recommended for the Project site. A fall rare-plant survey was conducted on September 23 at the Old River and Alternate Storage locations and on September 29th on the Bacon Island side of Connection Slough. Two species, wooly rose mallow and Suisun marsh aster, were detected within the study area (Figure 4.5-1).

The following four summer-blooming species with a moderate to high potential for occurrence were not detected during the surveys: bristly sedge, Mason's lilaeopsis, marsh skullcap, and side-flowering skullcap. In relation to Delta mudwort, although there are records in the vicinity, mudflat habitats suitable for this species are absent in the levee areas. Absence of such mudflat habitat greatly reduces the likelihood of this species' presence, and it was not observed during the summer rare plant survey. Additionally, the nativity of this species is under scrutiny; the Jepson Manual (Hickman 1993) lists it as a non-native.

The eight summer-blooming special-status species with a very low or low potential to occur were not detected during the summer rare plant survey. These included: heartscale (*Atriplex cordulata*), San Joaquin spearscale (*Atriplex joaquiniana*), big tarplant (*Blepharizonia plumosa*), soft bird's beak (*Cordylanthus mollis ssp. mollis*), Delta button-celery (*Eryngium racemosum*), Delta tule pea (*Lathyrus jepsonii var. jepsonii*), Delta mudwort and Antioch Dunes evening-primrose (*Oenothera deltoids ssp. howellii*).

The presence of spring blooming species, including brown fox sedge, round-leaved filaree (*California macrophylla*) and caper-fruited tropidocarpum (*Tropidocarpum capparideum*) could not be ruled out by the results of the September focused surveys because they did not coincide with the flowering period for these species. Eel-grass pondweed, although it flowers in the spring, can be distinguished from other pondweeds by its vegetative structures. The pondweed observed was not *P. zosteriformis*.

It is unlikely that any of these species would be found on the landward side of the levees because the hillsides are regularly disked, dredging is used periodically to control vegetation and weed growth within the agricultural ditches and the habitat requirements for the remaining spring-blooming species with potential to occur are present on the river side of the levees. Brown fox sedge is the only spring-blooming plant with a high potential to occur on the Project site.

4.5.1.6 Wetland Resources and Other Waters

A preliminary wetland delineation of the study areas on Holland Tract and Bacon Island was conducted in August and September 2008 (Mosaic Associates 2008). Table 4.5-5 provides the acreage of potentially jurisdictional wetlands and other waters of the U.S. Impacts to wetlands would be limited to the area of fill from the piles installed to support the boat ramps, shading effects from the boat ramps, and the installation of sheet piles perpendicular to the levees. Portions of the river beds (other waters) would be excavated and backfilled with rock to support the barges, and the barges would be secured to the riverbed.

Table 4.5-5 Acreages of Potentially Jurisdictional Waters of the United States†

Habitat	Feature	Hydrological Connectivity [1]	Adjacency [1]	Acreage	Approximate Area of Fill
In-channel Freshwater Marsh (FM)					
	CS-W2	Connection Slough	C	1.36	0.0006
	CS-P1	Connection Slough	C	0.87	0.0003
	OR-W3	Old River	C	3.39	0.0014
	OR-W7	Old River	C	0.06	0
	OR-W8	Old River	C	0.01	0
	FM Total			5.69	0.0023
Other Waters (OW)					
	CS-OW1	Old River, Middle River	C	10.83	0.93
	OR-OW1	Big Break	C	39.78	0.70
	OW Total			50.61	1.63
Seasonal Wetland (SW)					
	CS-W1		A	0.50	0
	OR-W1		A	0.81	0
	OR-W2		A	0.38	0
	OR-W4		A	0.40	0
	OR-W5		A	0.06	0
	OR-W6		A	3.12	0
	SW Total			5.27	0
Submerged Wetland (SM)					
	AS-W1	Connected via culvert to perennial canal, Holland Tract	CV	0.80	0
	SM Total			0.80	*0*
		Total Jurisdictional		62.37	1.6315

Table 4.5-5 Acreages of Potentially Jurisdictional Waters of the United States†

Non-jurisdictional Irrigation/Drainage Ditches (D) *					
	AS-D1			0.22	0
	AS-D2			0.06	0
	CS-D1			0.23	0
	CS-D2			0.07	0
	CS-PD1			0.41	0
	CS-PD2			0.10	0
	OR-D1			0.02	0
	OR-D2			0.01	0
	OR-D3			0.07	0
	OR-D4			0.01	0
	OR-D5			0.03	0
	D Total			1.23	0
		Total Non-Jurisdictional		1.23	0

Notes:

†Note that a site visit to Mandeville Island was not possible and that the wetland areas are provisional, based on aerial map interpretation.
CS = Connection Slough, OR = Old River W = wetland number, D = ditch number PW = potential wetland, PD = potential ditch; for mapped locations, see Appendix B.
Duration of fill discharge would be limited to the period of the demonstration project.
Areas on Mandeville are estimates.
* = A jurisdictional determination by the Corps has not been conducted. The ditches are assumed to be non-jurisdictional because they are inundated through water siphoned from the rivers.

In-Channel Freshwater Marsh
In-channel freshwater marsh, totaling 5.69 acres, is present on the project site along Old River and Connection Slough between the mean watermark (MWM) and ordinary high-water mark (OHWM). A conservative average width of 6 feet of hydrophytic vegetation along all banks of the canal that did not contain riprap was used to calculate the total acreage of these wetland features on the project site. The hydrophytic vegetation along the canal is strongly associated with the small bench of substrate located between the MWM and OHWM. Dominant hydrophytic vegetation in the in-channel freshwater marsh includes Tule rush (*Shoenoplectus californicus*, OBL), bulrush (*Shoenoplectus acutus*, OBL), and common cattail (*Typha latifolia*, OBL).

Seasonal Wetland
Seasonal wetland, totaling 5.27 acres, was delineated on Bacon Island and Holland Tract. Indicators of wetland hydrology included inundation, sediment deposits, and drainage patterns in wetlands. Dominant vegetation in the seasonal wetland included Bermuda grass (*Cynodon dactylon*, FAC), umbrella sedge (*Cyperus eragrosits*, OBL), knotweed (*Polygonum arenastrum*, NL), and water smartweed (*Polygonum amphibium*, OBL).

Submergent Wetland
Submergent wetland, totaling 0.80 acres, was delineated on Holland Tract in the Alternate Storage Area. Indicators of wetland hydrology included inundation, and saturation. Dominant vegetation in the submerged wetland included pond weed (*Potamogeton* sp, OBL), Tule rush (Shoenoplectus californicus, OBL), and filamentous algae (OBL).ON the fringes of this feature, we observed Bermuda grass (*Cynodon dactylon*, FAC), and cocklebur (*Xanthium strumarium*, FAC+).

Agricultural Ditches
Agricultural ditches, totaling 1.23 acres, were delineated on Bacon Island, Holland Tract, and provisionally estimated on Mandeville Island. We are assuming that the hydrology in these areas is artificial. Indicators of wetland hydrology included inundation, sediment deposits, and drainage patterns in wetlands.

1 Adjacency / Hydrological Connection to Corps Jurisdictional Waters of the United States

A = "adjacent" due to definition in 33 CFR part 328.

C = Contiguous with, or located within, the listed feature.

D = Connected by ditch or other drainage feature.

CV = Connected, directly or indirectly, by culvert or storm drain.

F = Connects by surface flow during flood events.

4.5.2 Regulatory Setting

4.5.2.1 Federal

The following federal laws and regulations related to terrestrial biological resources are applicable to the Project; they are described in Section 4.4:

- Federal ESA
- Clean Water Act Sections 401 and 404
- Rivers and Harbors Act, Section 10
- MBTA

4.5.2.2 State

The following state laws and regulations related to terrestrial biological resources are applicable to the Project; CESA is described in Section 4.4:

- CESA
- California Fish and Game Code/Native Plant Protection Act
- California Fish and Game Code Section 1600 (Streambed Alteration Agreement)
- California Fish and Game Code Section 3503.5 (Protection of Birds of Prey)

Native Plant Protection Act

The California Native Plant Protection Act (NPPA) of 1977 (Fish and Game Code Section 1900-1913) directed the DFG) to carry out the Legislature's intent to "preserve, protect and enhance rare and endangered plants in this State."

Fish and Game Code Section 1600

The DFG exercises jurisdiction over wetland and riparian resources associated with rivers, streams, and lakes under California Fish and Game Code Sections 1600 to 1607. DFG has the authority to regulate work that will substantially divert, obstruct, or change the natural flow of a river, stream, or lake; substantially change the bed, channel, or bank of a river, stream, or lake; or use material from a streambed. Areas subject to DFG's jurisdiction over rivers, streams, creeks or lakes are usually bounded by the top-of-bank or the outermost edges of riparian vegetation.

Birds of Prey

Birds of prey are protected in California under provisions of the Fish and Game Code Section 3503.5 (1992), which states that it is "unlawful to take, possess, or destroy any birds in the order Falconiformes or Strigiformes (birds of prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto." Construction disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings, or otherwise lead to nest abandonment. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered "taking" by the DFG.

4.5.2.3 Regional and Local Plans, Policies, Regulations, and Ordinances

The East Contra Costa County Habitat Conservation Plan does not cover any portion of the 2-Gates Project area. The SJMSCP covers all of San Joaquin County, so portions of the Project fall within the SJMSCP area. The proposed Project activities however, would not be "covered activities" under the SJMSCP:

> "Activities involving tidally influenced wetlands, jurisdictional wetlands or Other Waters of the United States are not covered by the SJMSCP until and unless a programmatic general permit or its equivalent is secured from the Corps (see SJMSCP Section 5.6 for additional details). However, pursuant to Section 8.2.4, a Project Proponent may, with authorization from the Corps and acquisition of a Section 404 permit, use the SJMSCP to mitigate impacts to SJMSCP Covered Species." (SJMSCP, Section 8.2.2.1G)

A programmatic general permit from the Corps has not been issued. Therefore, while the Project falls within the SJMSCP area, the Project is not covered by the Plan.

The following plans related to biological resources are applicable to the Project:

Contra Costa County General Plan

As discussed in Section 4.4, Contra Costa County considers Connection Slough and Old River to be SERAs, which are defined by one or more of the following characteristics: (1) areas containing rare, threatened and endangered species; (2) unique natural areas; and (3) wetlands and marshes.

Relevant Conservation Element Policies include:

> 8-3. Watersheds, natural waterways, and areas important for the maintenance of natural vegetation and wildlife populations shall be preserved and enhanced.
>
> 8-6. Significant trees, natural vegetation, and wildlife populations generally shall be preserved.
>
> 8-9. Areas determined to contain significant ecological resources, particularly those containing endangered species, shall be maintained in their natural state and carefully regulated to the maximum legal extent. Acquisition of the most ecologically sensitive properties within the County by appropriate public agencies shall be encouraged.
>
> 8-10. Any development located or proposed within significant ecological resource areas shall ensure that the resource is protected.
>
> 8-15. Existing vegetation, both native and non-native, and wildlife habitat areas shall be retained in the major open space areas sufficient for the maintenance of a healthy balance of wildlife populations.
>
> 8-17. The ecological value of wetland areas, especially the salt marshes and tidelands of the bay and delta, shall be recognized. Existing wetlands in the County shall be identified and regulated. Restoration of degraded wetland areas shall be encouraged and supported whenever possible.
>
> 8-24. The County shall strive to identify and conserve remaining upland habitat areas which are adjacent to wetlands and are critical to the survival and nesting of wetland species.
>
> 8-84. Riparian resources in the Delta and along the shoreline shall be protected and enhanced.
>
> 8-86. Existing native riparian habitat shall be preserved and enhanced by new development unless public safety concerns require removal of habitat for flood control or other public purposes.

8-92. Revegetation of a watercourse shall employ native vegetation, providing the type of vegetation is compatible with the watercourse's maintenance program and does not adversely alter channel capacity.

8-93. Particular care shall be exercised by development proposals to preserve and enhance riparian corridors along creeks which connect to the freshwater marsh segments of coastal areas in the North Central and East County areas.

San Joaquin County General Plan

Relevant vegetation and wildlife habitat policies included in the Resources Element are as follows:

1. Resources of significant biological and ecological importance in San Joaquin County shall be protected. These include wetlands; riparian areas; rare, threatened and endangered species and their habitats as well as potentially rare or commercially important species; vernal pools; significant oak groves and heritage trees.

2. No public action shall significantly diminish the wildlife and vegetative resources of the County; cumulatively significant impacts shall be avoided.

3. The County shall encourage the protection of those habitat areas that are of a size or quality so that they are no more than minimally affected by adjacent development. Connection of habitat areas shall be encouraged.

5. No net loss of riparian or wetland habitat or values shall be caused by development.

6. Development projects which have the potential to destroy wetlands shall not be permitted, unless:

    (a) no suitable alternative site exists for the land use, and the use is considered necessary to the public;

    (b) there is no degradation of the habitat or numbers of any rare, threatened, or endangered plant, or animal species as a result of the project; and

    (c) habitat of superior quantity and superior or comparable quality will be created or restored to compensate for the loss.

7. The County shall support feeding areas and winter habitat for migratory waterfowl.

8. Strips of land along waterways shall be protected for nesting and foraging habitat and for protection of waterway quality.

10. Use of the Delta channel islands for levee materials or deposition of dredge spoils shall be strongly discouraged.

11. Fisheries shall be protected by:

    (a) designing and timing waterway projects to protect fish populations; and

    (b) operating water projects to provide adequate flows for spawning of anadromous fish.

15. Replacement vegetation generally shall be native vegetation. Landscaping with native trees and shrubs shall be encouraged in urban areas to provide suitable habitat for native wildlife, particularly in proposed open space uses of future development.

16. Habitat that is required to be protected, restored, or created as mitigation for a project's impacts shall be monitored and maintained in accord with a County approved program.

4.5.3 Impacts and Mitigation Measures

4.5.3.1 No Project Alternative

The No Project alternative would not affect terrestrial species because no development would occur.

4.5.4 2-Gates Project

mm. 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 the U.S. Fish and Wildlife Service

Impacts of the Project on special-status animal and plant species are described below. Mitigation measures BIO 1 through BIO-6 are proposed to reduce the potential impacts of the Project to special-status animal and plant species to a less-than-significant level. No impacts on other federally listed, proposed, or candidate terrestrial species or destruction or adverse modification of proposed or designated critical habitat would occur as a result of Project implementation.

4.5.4.1 Giant Garter Snake

Less than Significant with Mitigation Incorporated. Habitat suitable for giant garter snake is present at both gate locations and the Holland Tract Alternate Storage site. The Project site is within habitat designated for the recovery of the species, and giant garter snake is assumed to be present. Construction of the Project has the potential to take individual snakes if they are present in the area subject to disturbance. GGS are active during the summer (season defined May 1 to September 30) and hibernate in upland burrows and refugia during the winter (season defined October 1 to April 30). Construction activities and site disturbance between May 1 and September 30 could result in the take of snakes during their active period, if present within the area subject to disturbance.

Project construction may result in a temporary loss of habitat for giant garter snake as upland refugia and burrows suitable for hibernation may be crushed by earthmoving equipment, and debris piles that function as upland refugia are removed from within the laydown areas to accommodate construction activities. This would be a short-term impact to habitat as burrowing mammals would likely recolonize areas disturbed during construction. The most significant land-based disturbance would occur during construction starting in September (during the active season) and lasting five weeks into October.

Installation of the barge and gates during November would involve access along the roads, but would not impact GGS because there would be no earthmoving work that could disturb, expose or entomb GGS hibernating in upland refugia, and GGS would not be present above ground on roadways.

Project operations would not affect giant garter snakes or impede their movement. The snakes are highly mobile and would be able to move around the sheet piles on the levees.

By implementing Mitigation Measure BIO-**1**, the Project Proponent would reduce the potential for impacts on giant garter snake to a less-than-significant level.

Mitigation Measure BIO-1: Avoidance, minimization, and mitigation measures for giant garter snake will include the following:

Conduct preconstruction surveys for GGS, and if present, implement protection measures. The Project Proponent will implement the following measures to minimize potential impacts on giant garter snake:

(a) All land-based site disturbance, including construction in 2009 and removal in 2014 shall be conducted during the active season for GGS, between May 1 and September 30 when the snakes are active and the risk of direct mortality is lessened. Before any ground-disturbing construction activities begin, the Project proponent will retain a qualified biologist in possession of a recovery permit for GGS to conduct focused surveys to determine the presence or absence of this species on the Project site. At a minimum a visual preconstruction survey will be conducted not more than 24 hours before the start of construction in any portion of the Project site slated for ground-disturbing activities. There is a potential that trapping surveys would be effective in some areas of the Project site and may be implemented upon approval of this method by CDFG and USFWS. Surveys must be conducted every year in which Project construction activities or land-based disturbance occurs.

Construction related activities in the channel/water shall also be monitored by a qualified biologist due to the highly aquatic nature of the GGS during its active season.

(b) Not less than 48 hours prior to the start of any construction activities, including the removal of the structures in 2014, the permitted biologist will monitor installation of exclusionary fencing with one-way exits suitable for GGS around the terrestrial portion of the area subject to site disturbance. Habitat features suitable for GGS within the perimeter of the fence would be removed under the direct supervision of the permitted biologist, and any snakes detected would be relocated to a USFWS and DFG-approved location. The USFWS and DFG will be notified within 24 hours of any GGS (living or dead) observed during Project construction. The exclusionary fencing will be maintained throughout the duration of the Project, or will be reinstalled annually or when deemed necessary by the Project sponsor, the USFWS and DFG. If the fence is reinstalled annually, it should be installed during the active period for GGS, between May 1 and September 30, and will contain one-way exits so snakes within the fenced area would be able to escape but not reenter. All aquatic construction activities shall also be monitored by a qualified biologist.

(c) Before construction and prior to removal, a worker environmental training awareness program will be conducted by a qualified biologist. The training will include instruction regarding species identification, natural history, habitat, and protection needs. If the species is observed at the construction site at any time during construction or operations, work will cease immediately within 150 feet of the area until the animal can be moved to a safe location consistent with DFG and USFWS regulations, and USFWS and DFG, will be contacted immediately.

(d) A monitoring report of all activities associated with surveys and mitigation for this species will be submitted to DFG and USFWS no later than one month after land-based construction is completed.

(e) At the end of the 2-Gates Project, terrestrial and wetland habitat disturbed during construction and operation of the gates shall be restored to pre-Project conditions. Restoration work may include replanting with plant species removed the Project site.

4.5.4.2 Western and Northwestern Pond Turtle

Less than Significant with Mitigation Incorporated. Western pond turtle (or the subspecies, northwestern pond turtle) has been documented to occur in the canal west of the Old River site on Holland Tract, on the channel islands north of the Old River study area, and to the south, on Old River. Construction and removal of the Project facilities may impact western or northwestern pond turtles if present within the Project area. Project operations would not affect these organisms since operations would not alter their habitat or involve actions that could pose a direct or indirect threat to these mobile animals. By implementing Mitigation Measure BIO-2, the Project Proponent would reduce the potential for impacts on western pond turtle to a less-than-significant level.

Mitigation Measure BIO-2: Conduct preconstruction surveys for western pond turtle, and if present, implement protection measures. The Project Proponent will implement the following measures to minimize potential impacts on western pond turtles:

(a) Not more than 48 hours prior to the start of site disturbance, a qualified biologist will conduct focused ocular surveys for western pond turtles to determine the presence or absence of this species on the Project site. After the preconstruction surveys, silt fencing, buried not less than 6 inches at the base, will be installed around the perimeter of the laydown area, and the removal of vegetation within the laydown areas that is required for Project construction will be conducted under the direct supervision of the qualified biologist. If juvenile or adult turtles are found aestivating or hibernating on the Project site, the individuals will be moved out of the construction area and relocated as near as possible in suitable habitat outside the area of construction. If a nest is found in the construction area, DFG will be notified immediately to determine appropriate measures to protect or relocate the nest. Surveys must be conducted every year in which land-based construction activities occur.

(b) A letter report documenting survey methods and findings will be submitted to DFG following the completion of the preconstruction survey.

(c) Before land-based construction, a worker environmental training awareness program will be conducted by a qualified biologist. The training will include instruction regarding species identification, natural history, habitat, and protection needs. If the species is observed at the construction site at any time during construction, construction work will cease within 50 feet of the area until the animal can be moved to a safe location.

4.5.4.3 Western Burrowing Owl

Less than Significant with Mitigation Incorporated. There are no CNDDB records of burrowing owls, a federal and state species of concern, in the Bouldin Island or Woodward Island topographic quadrangles surrounding the Project area. However, suitable habitat for burrowing owls is present on Bacon Island at Connection Slough, as an abundance of ground squirrel burrows are present in the laydown and spoil disposal areas. Land-based construction activities, including the installation and removal of sheet piles, pile-supported boat ramps, clearing, grading, the storage or movement of rock or other construction materials, or disposal of dredge spoils could result in a direct take of individuals or result in the failure of an active nest, if burrowing owls are present in the disturbance area.

Project operations would not have any impacts on burrowing owls since the operations would not require land-based earthwork.

By implementing Mitigation Measure BIO-3, The Project Proponent would reduce the potential for construction-related impacts on western burrowing owl to a less-than-significant level.

Mitigation Measure BIO-3: Conduct surveys for western burrowing owl and, avoidance or mitigation for owls, if present. The Project proponent will implement the following measures to minimize potential impacts on burrowing owls:

The California Burrowing Owl Consortium's Burrowing Owl Survey Protocol and Mitigation Guidelines (1997) and the DFG Staff Report on Burrowing Owl Mitigation (1995) state that mitigation actions should be carried out from September 1 to January 31. These documents explain that reproductive timing may vary with latitude and climatic conditions, therefore the Staff Report states that the time frame to carry out mitigation activities should be adjusted accordingly.

(a) Surveys consistent with the California Burrowing Owl Survey Protocol (California Burrowing Owl Consortium 1997) will be conducted in all areas where construction-related site disturbance may occur and within a 500-foot buffer of land-based disturbance. A survey to determine if suitable burrows (larger than 3.5 inches diameter) are present in all areas of ground disturbance will be conducted. If no burrows suitable for burrowing owls are present in areas of ground disturbance then no other activities are necessary to avoid effects to individuals.

(b) If suitable burrows are present in the Project area then all areas of ground disturbance (including access roads) should be surveyed for occupancy by burrowing owls within 30 days of initial ground disturbance. The California Burrowing Owl Survey Protocol (CBOC 1997) calls for up to four surveys on four separate days to determine burrowing owl presence or absence.

No disturbance should occur within 250 feet of occupied burrows during the breeding season (February 1 through August 31). If burrowing owls are present within 160 feet of construction during the non-breeding season (September 1 through January 31), a site-specific impact avoidance plan will be prepared by a qualified biologist and submitted to DFG and Project sponsor for approval. The Plan will describe passive relocation procedures and maintenance of one-way doors during site disturbance, and habitat restoration after the Project is completed. Passive relocation procedures will include the installation of one-way doors in burrow entrances by a qualified biologist. One-way doors should be left in place not less than 48 hours to ensure that owls have left the burrow prior to excavation of the burrow by the qualified biologist.

(d) If construction activities result in the loss of occupied habitat, mitigation consistent with DFG Staff Report on Burrowing Owl Mitigation Guidelines (1995) will be provided by permanently protecting not less than 6.5 acres of suitable habitat per pair or unpaired resident owl at a location acceptable to DFG. Long-term management and monitoring of protected habitat acceptable to DFG will be provided.

(e) Before land-based site disturbance, a worker environmental training awareness program will be conducted by a qualified biologist. The training will include instruction regarding species identification, natural history, habitat, and protection needs. If the species is observed at the construction site at any time during construction, construction work will cease within 160 feet of the area until the animal can be moved to a safe location consistent with DFG regulations.

A monitoring report of all activities associated with surveys and mitigation for this species will be submitted to DFG and Project sponsor within one month after construction is completed. If owls are observed in the study area, monitoring reports will be submitted to DFG and the Project sponsor before any action is taken. CNDDB reports will be submitted within one month of each observation with a copy to the local DFG biologist and the Project sponsor.

4.5.4.4 Swainson's Hawk, Black Rail, and Other Raptors and Migratory Nesting Birds

Less than Significant with Mitigation Incorporated. Swainson's hawk has been observed foraging on site and could nest in trees on Holland Tract and Bacon Island at Old River that are located within 250 feet of the Project activities. Black rail is documented to occur in the dense emergent wetland habitat on the islands in Old River and Connection Slough. Nesting and foraging habitat for this species is present in the Project area,

particularly in the emergent wetland vegetation on the east bank of Old River, although the potential for it to be present in the construction area is low.

Raptors and migratory birds have been documented in the Project vicinity. Suitable nesting habitat for various raptors and other migratory birds is present in the large trees on the Project site. Numerous species have the potential to nest on site, either in the marsh areas fringing the levees, or within trees, shrubs and grassland on the landward sides of the levees. These could include the tricolored blackbird, loggerhead shrike, and other birds protected by the MBTA.

Installation of the Project facilities would not affect nesting activities of Swainson's hawk because construction would occur outside of the nesting season (mid-March to late July). Removal of the gates and boat ramps during the in-water work window (July 1 through November 30) in 2014 would take place toward the end of the nesting season when young birds are active and nest abandonment due to construction disturbance is extremely unlikely, or after the nesting season. Therefore, the project would not adversely affect the nesting behavior of Swainson's hawk.

Construction activities would not affect the nesting activities of black rail, tricolored blackbird, or loggerhead shrike because land-based construction activities would occur September through November, outside the nesting season. Removal of the gates and boat ramps between July and November 2014 would occur towards the end of or after the nesting season. Removal activities in 2014 could adversely affect the nesting behavior of these species, if occupied nests are present.

Project operations would not result in impacts to protected bird species. Nesting and foraging habitat would not be impacted by gate operations, since operations are not expected to disturb habitat, and birds nesting in proximity to the gates would presumably be habituated to ongoing operations since operations would begin prior to the nesting season for all species of concern. Gates would be open during flood events, producing less than a 0.1-foot change in flood stage elevations in a 100-year event, so the disturbance of low-lying nesting habitat is unlikely. By implementing Mitigation Measure BIO-4, the Project Proponent would reduce the potential for construction-related impacts on nesting birds to a less-than-significant level.

Mitigation Measure BIO-4: Conduct Preconstruction Surveys for Nesting Birds Prior to Construction Activities and Avoidance or Mitigation Activities for Nesting Birds, if present:

If site disturbance commences between February 15 and August 15, a pre-construction survey for nesting birds will be conducted by a qualified wildlife biologist. If nests of either migratory birds or birds of prey are detected on or adjacent to the site, a no-disturbance buffer in which no new site disturbance is permitted will be fenced with orange construction fencing or equivalent, and the buffer will be observed until August 15, or the qualified biologist determines that the young are foraging independently or the nest has failed. The size of the no-disturbance buffer will be determined by a qualified wildlife biologist, and will take in to account local site features and pre-existing sources of potential disturbance. If more than 15 days elapses between the survey and site disturbance, the survey will be repeated.

4.5.4.5 Plants

Less than Significant with Mitigation Incorporated. Of the nine rare plants determined to have a potential to occur on the study area, seven are summer blooming plants, and one species, eel-grass pondweed (*Potamogeton zosteriformis*) is distinguishable from other pondweed by its vegetative parts. A summer rare plant survey was conducted at the Old River site on September 23, 2008 and on the Bacon Island side of the Connection Slough site on September 29, 2008. Two rare plants were observed within the study area: woolly rose-mallow, and Suisun Marsh aster. The remaining plant that has a moderate or higher potential to occur, brown fox sedge, is spring-blooming, and may be present.

Individual special-status plants present within the development envelope of the Project could be negatively impacted by work conducted within the Project area. By implementing Mitigation Measure BIO-5, The Project Proponent would reduce the potential for construction-related impacts on special-status plants to a less-than-significant level.

Mitigation Measure BIO-5: Conduct preconstruction surveys for rare plants, and, avoidance or mitigation for rare plants, if present:

(a) Rare plant surveys, timed to coincide with the flowering period of target species (spring and summer) will be conducted to determine if any special-status plant species are present within the study area. A summer survey has already been conducted on the Project area on Holland Tract and Bacon Island.

(b) If rare plants are present within the development area of the Project, the feasibility of avoidance will be evaluated. Avoidance would include the installation of orange construction fencing around the plants prior to site disturbance. The summer-blooming rare plants observed within the study area would be afforded protection by this measure.

(c) If a survey timed to coincide with the flowering period for brown fox sedge cannot be performed due to a lack of access to the site, it will be assumed to be present. Prior to construction, a thorough search for plants sharing the vegetative characteristics of brown fox sedge will be made and if present, assumed to be the sensitive species. Individual plants found will be subject to the measures described in (d), below.

(d) If avoidance is not feasible, a mitigation plan, approved by DFG, will be developed and implemented, using the steps in the following order: (1) number and area of rare plants affected by the Project will be measured and documented; (2) a conservation easement of occupied habitat for the affected plant species in an area nearby the Project site will be established; and/or (3) a mitigation population near the Project site will be established (one possible site is the Wildlands Inc. marsh restoration area located on Holland Tract or the in-channel islands protected as sanctuaries by the Delta Wetlands Project); and/or (4) affected plant(s) will be transplanted to a suitable nearby area.

nn. 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 the U.S. Fish and Wildlife Service.

Less than Significant with Mitigation Incorporated. Project construction would occur within ruderal herbaceous and wetland habitats only. Project designs specifically avoid mixed riparian woodland and seasonal wetland habitats present on Holland Tract and Bacon Island in the Old River site. Impacts to ruderal herbaceous and freshwater marsh wetland habitats on the Connection Slough Site have been minimized through the location and design of the project. There is no mixed riparian habitat located in the Connection Slough construction area. Project plans avoid disturbance of riparian vegetation, and construction-level measures will be employed to ensure that riparian habitat and sensitive wetland communities near the project site will be protected during construction through the installation of protective fencing. The project will not have a substantial adverse impact on any riparian habitat or other sensitive natural community.

oo. 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.

Less than Significant with Mitigation Incorporated. Implementation of the Project would result in the discharge of approximately 1.63 acres of fill into potentially jurisdictional waters of the United States, including wetlands and other waters subject to Corps jurisdiction under the federal Clean Water Act, and Section 10 of the Rivers and Harbors Act. Construction of the pier-supported boat

ramps would require the discharge of fill to Coastal and Valley Freshwater Marsh wetlands as well as unvegetated waters of the U.S. The boat ramps would also result in the temporary conversion of approximately 0.18 acre of freshwater marsh wetland habitat to unvegetated waters of the U.S. due to shading and the loss of vegetated cover during the demonstration Project. Construction of the gates would require the excavation of unvegetated waters of the U.S. and the discharge of fill in other waters of the U.S. associated with the rock fill surrounding the barge and the installation of the barge. Seasonal wetlands in the laydown areas and in the spoil disposal area would be avoided. Impacts to wetlands and other waters have been minimized by the use of sheet piles rather than rock dikes to span the channels to the barges.

By implementing Mitigation Measure BIO-6, the Project Proponent would reduce impacts on jurisdictional waters of the United States to a less-than-significant level. Table 4.5-5 (above) provides estimates of the maximum impacts on potentially jurisdictional waters of the U.S.

Mitigation Measure BIO-6: Secure CWA Section 404 Permit, Sec. 401 Water Quality Certification and Streambed Alteration Agreement and Implement All Permit Conditions. The Project Proponent will secure authorization for the discharge of fill to waters of the U.S. from the Corps, and will adhere to the required conditions of the permit and associated mitigation requirements. The Project Proponent will obtain a Section 401 Water Quality Certification from the Central Valley RWQCB and a Streambed Alteration Agreement from DFG and comply with all specified permit conditions.

The Project Proponent will secure the following permits and regulatory approvals before implementation of any construction activities:

(a) Authorization for the discharge of fill to waters of the U.S. will be secured from Corps through the CWA Section 404 permitting process before any fill is placed in jurisdictional waters of the United States, including wetlands. Mitigation for the discharge of fill to wetland habitats, if required by the Corps, RWQCB, or DFG, will be secured through the purchase of wetland mitigation credit at an approved wetland mitigation bank or through the approval and implementation of a wetland mitigation and monitoring plan. Any mitigation required by the Corps, as well as USFWS and DFG, will take into consideration the following benefits provided by the Project:

    (i) Reduced take of the delta smelt and other listed species at the State Water Project and Central Valley Project pumps by restricting entrainment of fish from the western Delta toward the export pumps.

    (ii) Continuation of water supply to agricultural and urban users throughout the state of California.

(b) Water Quality Certification pursuant to Section 401 of the CWA will be required as a condition of issuance of the Section 404 permit. Before construction in any areas containing wetland features, the Project Proponent will obtain water quality certification for the Project. Any measures required as part of the issuance of the water quality certification will be implemented.

(c) Report of waste discharge pursuant to California Water Code Section 13050 will be required for those waters of the state determined to be nonjurisdictional under Sections 404 and 401 of the Clean Water Act. Any measures required as part of the issuance of the report of waste discharge will be implemented.

(d) Orange construction fencing will be installed around the perimeter of wetlands and other waters in proximity to construction activities to prevent accidental disturbance during construction.

(e) The Project Proponent will implement all mitigation requirements determined through the process of obtaining the above permits.

pp. 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. The Project would not interfere with the movement of terrestrial wildlife species or movement corridors. All terrestrial special-status species with potential to occur in the Project area are highly mobile and would be able to move around the gates.

qq. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

No Impact. The Project would not conflict with any of the policies or goals described in the Contra Costa County or San Joaquin County General Plans because mitigation measures would be implemented that would reduce or avoid significant impacts.

rr. 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. The East Contra Costa County Habitat Conservation Plan boundaries exclude the 2-Gates Project area. The SJMSCP covers the entire San Joaquin County, so portions of the Project fall within the SJMSCP area. The activities proposed under the, however, would not be "covered activities" under the SJMSCP, and the Project would not conflict with the goals of the plan.

4.5.4.6 Cumulative Impacts

The Project is not likely to result in cumulative impacts to terrestrial special-status species or wetlands. The effects of the Project are individually and cumulatively limited in scope, scale and duration, and the proposed mitigation measures would fully offset the effects of the Project on terrestrial species and wetlands.

4.6 CULTURAL RESOURCES

Issues & Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
ss. Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?	☐	☒	☐	☐
tt. Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	☐	☒	☐	☐
uu. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☒	☐
vv. Disturb any human remains, including those interred outside of formal cemeteries?	☐	☒	☐	☐

4.6.1 Environmental Setting

4.6.1.1 Cultural Overview

Archaeology and Regional Prehistory

Archaeological investigations in the Delta region began in the early 1890s with the excavations conducted by J. A. Barr and W. H. Holmes; the two amassed considerable collections of artifacts from mounds in the Stockton area, which were eventually donated to the U.S. National Museum (Moratto 1984:177). Found throughout the Delta, mound sites typically contain several strata of cultural deposits covering multiple millennia of occupation. Not surprisingly, early attempts to construct a chronology of the northern San Joaquin Valley were based on the excavations in the Delta region, most notably by Elmer J. Dawson. Dawson recognized cultural change in the strata at his mound site near Lodi and proposed a succession of periods (early, middle, and late) to categorize such change (Moratto 1984:177). Although the importance of his chronology was initially minimized by preeminent archaeologist W. E. Schenck, Dawson's sequence eventually was supported by studies in the Delta and lower Sacramento Valley during the 1930s.

The tripartite chronology has been reworked several times since Lillard, Heizer, and Fenenga (1939) offered their sequence (Early, Transitional, and Late periods) for the Central Valley in the late 1930s. While subsequent chronologies have labeled the three eras differently, each time period does display a common suite of characteristics (Moratto 1984:180–214).

- Early Period/Early Horizon/Windmiller Pattern. Extended burials with westerly orientation are typically accompanied by funerary goods, including shell ornaments and beads. The high frequency of large projectile points indicates that subsistence centered on game. Grinding implements are present but infrequent.
- Transitional Period/Middle Horizon/Berkeley Pattern. Flexed burials with variable orientation are often accompanied by red ochre and sometimes by funerary items. There is a greater reliance on acorns, as suggested by the higher frequency of mortars and pestles compared to the previous period. Projectile points remain large, and bone tools are frequent and well developed.
- Late Period/Late Horizon/Augustine Pattern. Burials are typically flexed with a scarcity of grave artifacts. Subsistence continues to focus on acorns and other plant materials. Projectile points are smaller and marked with serrations. Shell beads and other ornaments are well developed, owing to an intensification of trade.

The above chronology helps consolidate a vast amount of data into a manageable number of time periods, but like any taxonomic division, it implicitly minimizes the importance of differences that exist within each time period and does not account for geographical variability. Such variation confounds attempts to devise an orderly chronology with absolute dates for each time interval. For instance, the earliest component of CA SJO 68 contains mortars, pestles, and a bone awl (typically associated with the Berkeley Pattern), yet the site has been dated to around 4500 B.P., one of the earliest known sites in the Central Valley (Moratto 1984:207). In addition, radiocarbon dates from 31 central California sites indicate that the time ranges of the Windmiller, Berkeley, and Augustine patterns show considerable overlap, especially after 1750 B.P. (see Moratto 1984:200, Figure 5.11). The analysis suggests that the Windmiller and Berkeley Pattern sites in San Joaquin County (CA SJO 145 and 91) were coeval with Augustine sites in Sacramento County between 1750 and 750 B.P. Moreover, consideration of geographical similarities and differences in the archaeological record of California indicates that the east-west flow of goods among the Bay, Delta, and Central Sierra regions was more pronounced than the economic ties between northern and southern valley peoples (Moratto 1984:215).

Habitation in the Central Valley predating the Early Period/Windmiller Pattern is evidenced by assemblages found near the Tulare and Buena Vista lakebeds as well as in the surrounding foothills and mountains. It is likely that most archaeological material in the Delta region dating to this early time is deeply buried under alluvium. Moratto (1984:214) observed that as much as 10 meters of sediments may have accumulated during the past 5,000 years.

Ethnography

The likely inhabitants of the Project vicinity were the Northern Valley Yokuts, whose territory extended south from Bear Creek near Stockton to the south side of the San Joaquin River past Mendota, east to the Sierra Foothills, and west to the Coast Range (Wallace 1978a:462). Specifically, the *Chulamni* tribe occupied the area west of present-day Stockton. Given the fluidity of tribal borders, however, it is possible that the Plains Miwok, located north of the Yokuts, also used the area. Wallace (1978a:462) subsumes the *Chulamni* into the Northern Valley Yokuts but acknowledges that others have considered the tribe as Plains Miwok.

Pettigrew et al. (1994:3 34–3 35) note that the Northern Valley Yokuts occupied year round villages along the San Joaquin River and other major tributaries to exploit riverine resources. The Delta wetlands stocked an array of waterfowl and aquatic resources as well as herds of browsing mammals that frequented the fringes of the marshes. Wallace (1978a:464) states that fish were one of the most important resources procured, with salmon topping the list of preferred varieties. Like all California peoples, prehistoric inhabitants of the Delta also depended on acorns and other plant foods.

The Northern Valley Yokuts were organized into individual autonomous villages composed of single-family structures (Moratto 1988:174). The structures were small and usually built from woven tule mats. Other structures included sweathouses and ceremonial chambers. Villages were established on high ground near drainages and other valley water sources (Moratto 1988:174).

Most stone artifacts were fashioned of chert from nearby coastal sources, and obsidian was imported from other locations (Wallace 1978a:465). Mortars and pestles were the dominant ground stone tools; bone was used to manufacture awls for making coiled baskets. Tule was important in the manufacture of mats and boats, and other materials were acquired by trading with neighboring Miwok and Coastanoans.

As with other Indian groups in the valley, the lifeways of the Northern Valley Yokuts were dramatically altered as a result of contact with Spanish explorers and missionaries, miners, ranchers, and other European immigrants who entered the valley after 1800. Population estimates for the eighteenth century put the number of Yokuts living in the San Joaquin Valley at around 41,000. However, the introduction of European culture and Old World diseases proved devastating to the native population. Traditional lifestyles were diminished and numerous people died from epidemics (Moratto 1988:174).

4.6.1.2 History

Early Exploration and Settlement

The first recorded European encounter with the Yokuts occurred in 1772 when Spanish explorer Pedro Fages led a group of soldiers through Tejon Pass into the San Joaquin Valley (Wallace 1978b:459). During the late 1700s, the Spanish established a string of missions along the California coast. Although initially insulated from the direct impact of the missions, the Northern Valley Yokuts no doubt had some contact with the Spanish. Mission San Jose was founded in 1797, effectively establishing a Spanish presence along the Northern Valley Yokuts' western border. Gabriel Moraga and his band entered the valley in 1806 to locate new lands for missions, find and return runaway Indians, and relocate stolen livestock (Clough and Secrest 1984:25–27). Moraga is credited with naming several valley geographical features, including the San Joaquin and Stanislaus rivers. Although Mexico's independence from Spain ended expansion of the missions in California by the early 1820s, European encroachment on the areas occupied by the indigenous peoples continued. In the late 1820s, fur trappers began their forays into the California interior. Jedediah S. Smith passed through the area during a fur trapping expedition in 1827, and French Canadian trappers of the Hudson's Bay Company established a seasonal base at French Camp just south of present-day Stockton (Shideler 1988:1).

Although relatively short lived, California's Mexican administration (1821–1848) facilitated the economic transition between Spanish mercantilism and Euro-American capitalism. The Colonization Act of 1824 and the Supplemental Regulations of 1828 afforded private individuals—both Mexican nationals and immigrants—the right to obtain title to land (Hackel 1998:132). In 1834, the missions were secularized, effectively freeing up their enormous landholdings to private interest. From this point until California's accession into the Union, the Mexican authorities made over 800 land grants, often designated as "ranchos," to individuals with the intent to settle and improve these parcels (Monroy 1998:180).

In 1844, the government granted William Gulnac, a native of New York, the Campo de los Franceses, a nearly 49,000 acre tract that included French Camp (Smith 2004:148–152). One year later, Gulnac, who was unable to permanently settle on the land, sold the property to Captain Charles H. Weber in exchange for his $60 grocery bill owed at Weber's store in San Jose. Weber, a German immigrant, went on to establish the town of Stockton in 1849. Smith's (2004:158) map of Mexican land grants indicates that the current Project areas were not part of any rancho; prior to the mid 1800s, the marshlands west of Stockton were unsuitable for ranching or agriculture.

The gold rush triggered a mass immigration to California. Stockton, which could be reached via steamboat from San Francisco, served as the port of entry to the gold fields east of the town. As the gold fervor subsided, former miners looked to other pursuits, and Stockton became an important shipping center for wheat, cattle, dairy products, and other goods.

Farming and Development of the Delta

Early attempts by farmers in the 1850s to reclaim the swamplands west of town confirmed the fertility of the soil, but their makeshift levees were largely ineffectual during times of flood (Lortie 1996:4; Maniery 1993:7). Large-scale, long-term reclamation required a capital investment beyond the means of individual landowners. Taking advantage of a series of federal and state reclamation acts, wealthy investors from San Francisco purchased large tracts of swampland at cheap prices with the intent to reclaim them for agricultural purposes. These landowners included George T. Roberts (Roberts Island), Henry Bacon (Bacon Island), James Haggin (Staten Island), T. H. Williams (Victoria Island), and the Sargent brothers (Bouldin and King islands) (Maniery 1993:7). Horse-drawn scrapers were used to build levees and dredge waterways, and much of the labor was provided by former rail workers. Many of these Chinese laborers were then retained to till the newly reclaimed soil. Construction proceeded on a trial-and-error basis, and the first levees often could not

protect the reclaimed "islands" (which lay below sea level) during times of flood. By the late 1870s, engineering methods had improved, and reclamation efforts apparently reached at least a moderate level of success. In 1879, Thompson and West acknowledged past difficulties while foreseeing a promising outlook for the reclamation of the Delta: "The results already achieved from the unportentous beginning have been great. What the future may have in store is not hidden behind a shadow, yet its extent is incalculable" (Gilbert 1968:42).

Beginning in the 1890s, however, cracks began to develop not only in the original land monopoly of San Francisco investors but also in the levees themselves. The initial levees made from peat soil were subject to sinking and fracture, and the high waters of winter and spring caused breaches around many of the islands (Maniery 1993:9). Continual repair and maintenance costs led many original landowners to sell their properties. Some of these transactions involved the transfer of title from one San Francisco investor to another, although by the 1910s and 1920s the property in the Delta was being sold or leased in smaller parcels to a larger number of individual farming operations (Lortie 1996:7; Maniery 1993). The introduction of such heavy machinery as the clamshell dredge spurred the construction of new levees and facilitated the maintenance of existing ones; peat was replaced with more stable sediment dredged from river bottoms (PAR Environmental Services 1996:9). Most notably, the California Delta Farms Company, established by Lee Philips in 1907, reclaimed vast acreage for lease to farmers, including George Shima, who raised predominantly potato crops on Bacon, McDonald, and other Delta islands (Maniery 1993:11).

Before the turn of the century, the only means to transport harvested crops off the Delta islands was via boat. Farming operations included landings to assist the loading of cargo onto ships headed for markets in Stockton, Sacramento, and San Francisco (PAR Environmental Services 1996:10–11). The arrival of the railroad in 1900 and the construction of roads and bridges in the 1910s made the region more accessible, which not only reduced freight costs but increased the value of the Delta land.

Within the Project vicinity, small communities arose at or near the convergence of these transportation routes. Located along the waterway known as the Middle River with access to the Atchison, Topeka and Santa Fe Railway, the town of Middle River served as an important shipping point and the site of an asparagus cannery as early as 1915 (Hillman and Covello 1985:217–218). Similarly, the town of Holt lay at the intersection of the southern end of Whiskey Slough, the Santa Fe tracks, and the Delta Borden Highway (the precursor of State Route 4). Completed in 1915, the highway was the first paved roadway through the Delta and included a series of swing bridges spanning the numerous waterways of the marshlands. Located a few miles upstream from the town of Middle River, the Middle River Bridge (P 39 000474) was built in 1915 as part of this early transportation network; it remains today as a historically and architecturally significant structure (California Department of Transportation 1990:116).

In addition to its importance as a transportation center for agricultural and dairying interests, Holt became the focus of social activity in the Delta (Hillman and Covello 1985:211–214). The town's saloons, a blacksmith, general stores, and other commercial businesses attracted farmworkers from the surrounding areas. A 1910 map shows a spur of the Santa Fe tracks leading to a cannery located along Whiskey Slough, and a 1917 photo depicts multistory restaurants and hotels (Hillman and Covello 1985:212, 214). Continual improvement in transportation networks ironically led to Holt's demise, as local residents found it easier to drive to nearby Stockton. The highway has since been rerouted 0.5 mile south of its original path, and presently little remains of Holt except for a marina on Whiskey Slough and a nearby post office that still bears the town's name.

While engineering methods and technology have come a long way since the mid and late 1800s, rising river levels still pose a very real threat to the levee system. In 1983, waters broke through around nearby Mildred Island; the area has remained submerged. In spring 2004, a breach occurred at the southwest corner of the Upper Jones Tract. The levee has since been repaired, and currently most of the water has been drained from the area.

George Shima—the "Potato King"

Typical of most Central Valley areas, the infusion of immigrant manpower and vision has been integral to the development and modernization of the agriculture industry in the California Delta region. Holt housed an ethnic collage of farmworkers, including Chinese, Portuguese, Italian, and Mexican immigrants (Hillman and Covello 1985:214). In particular, Japanese were the primary work force in the Delta from the early twentieth century until their internment in detention camps during World War II (Maniery and Costello 1986:38–45). For most first generation Japanese immigrants, however, farm labor was not an end in itself but the first step in securing a better life for the worker and his family.

Like Kyutaro Abiko, who established the Yamato Colony in Merced County, George Shima (Kinji Ushijima) came to California from Japan with more aspirations than capital. After laboring in the potato fields, he had saved enough money to lease his own plot in 1893 (Maniery 1993:11). For about a decade, Shima endured economic and natural hardships, often relying upon loans from friends to stave off bankruptcy. In 1902, he teamed with Lee Philips.

Usually, Philips acquired ownership to land, built levees and ditches, and secured an island. He then leased it to Shima, usually under an oral agreement and a hand shake. Shima then provided labor and equipment to burn off vegetation, prepare the land for planting, and farm (Maniery 1993:12).

By 1906, luck and market conditions had finally swung Shima's way. He produced more than 3 million bags of potatoes on 8,000 acres of leased land, which gave one newspaper reason to dub him the "Potato King" (Maniery 1993:12–13). In 1907, Shima recorded a substantial profit when the price of potatoes soared due to shortages in the market.

Up until 1910, Shima cultivated leased land exclusively. While ownership of an agricultural parcel is perhaps more profitable over the long haul, the lessee of land does enjoy certain benefits: he is not saddled with property costs such as levee maintenance and can devote more of his finances to farming operations since less money is tied up in property investments. In this way, Shima was able to leverage his resources to control thousands of acres of farmland. The lease arrangement with Philips and his California Delta Farms Company worked especially well for Shima, who was able to maintain a constant turnover of land by leasing newly reclaimed areas and terminating the leases on older parcels. Long before the introduction of modern fertilizers, Shima considered that a plot was no longer suitable for potato crops after 3 years of cultivation (Maniery 1993:12). As his empire grew, the Potato King sought to invest his profits in property; he bought an 800 acre farm in 1910 and added another 800 acre lot the following year. In 1913, however, passage of the California Alien Act prohibited the purchase of land by a noncitizen, although Shima and other Japanese could indirectly acquire land through their U.S. born children (Maniery 1993:14). In addition to the lands he leased from the California Delta Farms Company, Shima maintained his own property and leased other plots to individual farmers.

In 1916, Shima leased 5,600 acres on Bacon Island, which had been reclaimed by the California Delta Farms Company the year before (Maniery 1993:15). In general, the management of such vast acreage was structured into camps, each headed by a foreman who oversaw the cultivation of 100 to 500 acres (Maniery 1993:20–22). Located near the waterways, these camps typically contained a foreman's house, cookhouse, and one or more boarding houses; larger camps included other ancillary structures such as a blacksmith or machine shop. Camps housed from 20 to 50 men in small units to as many as 350 to 400 in larger complexes. Based on the size and number of structures, Camp No. 3 (CA SJO 213H)—south of the Old River Project area on Bacon Island—typifies one of the larger complexes, whereas Camp No. 4 (CA SJO 214H), adjacent to the Old River, appears to be one of the smaller settlements.

4.6.1.3 Historic and Prehistoric Resources at the Project Sites

Methods

RECORDS SEARCHES AND BACKGROUND RESEARCH

Because the Project area lies within two different counties, it was necessary to complete records searches of the California Historical Resources Information System at two locations. On September 10, 2008, a records search covering the Project areas in San Joaquin County was performed at the Central California Information Center on the campus of California State University, Stanislaus. On October 3 and 13, 2008, records searches for the Project areas lying in Contra Costa County were conducted at the Northwest Information Center at Sonoma State University. Site record files, maps, and other materials were examined to identify previously recorded resources and prior surveys occurring within the Project areas. The sources included the Historic Property Data File, the National Register of Historic Places, the California Register of Historical Resources, the listings of California Historical Landmarks, the California Inventory of Historic Resources, and the California Points of Historical Interest.

NATIVE AMERICAN CONSULTATION

Native American consultation is an integral and essential part of the Section 106 process (36 CFR 800). In addition, pursuant to State Public Resources Code Section 5097.9 (CEQA regulation), state and local agencies are to cooperate with and assist the Native American Heritage Commission (NAHC) in its efforts to preserve and protect locations of sacred or special cultural and spiritual significance to Native Americans.

For the current investigation, Native American consultation involved three steps. First, Æ contacted the NAHC to request a search of its sacred lands file to identify Native American resources in the study vicinity and to obtain the names and contact information for individuals knowledgeable of such resources. Next, Æ mailed letters summarizing the current Project and investigation to individuals identified by the NAHC, soliciting information about the study vicinity in general and the whereabouts of Native American sites in particular. Lastly, approximately 3 to 4 weeks after the letters were sent, a follow-up telephone call was placed to confirm that the correspondence was received and to provide an opportunity for comment.

SURVEY

Æ archaeologist Randy Baloian performed an archaeological field survey of the Project areas on October 2, 2008. The survey entailed walking systematic transects spaced at 15 to 20 meter intervals over the three Project locations.

When an artifact, feature, or isolate was discovered, the surveyor marked its position and closely examined the area to determine if other materials occurred in association. Newly discovered sites and isolates were assigned a temporary field number or name and documented on a California Department of Parks and Recreation forms (DPR 523). Photographs of the resources were taken in the field, and their locations were plotted on the appropriate U.S. Geological Survey 7.5-minute topographic quadrangle(s). Universal Transverse Mercator (UTM) coordinates were obtained using an Etrek Garmin Global Positioning System (GPS) unit. Complete documentation of newly discovered archaeological sites, including confidential location maps, are provided in a separate confidential report. The survey area was photographed using a digital camera to document cultural resources as well as environmental setting and ground visibility at the time of survey. Digital files are archived at Æ's office in Fresno, California.

Records Searches

The records searches conducted by the Central California Information Center (San Joaquin County) and the Northwest Information Center (Contra Costa County) revealed the following information about the Project areas.

CONNECTION SLOUGH PROJECT AREA

In the late 1980s, Maniery et al. (1989) surveyed selected portions of Bacon Island for the Delta Wetlands Project. Subsequent documentation relating to that project included Maniery's (1993) NRHP evaluation of the Bacon Island Rural Historic District and Jones & Stokes' (1995) executive summary of the draft Environmental Impact Report. The investigations recorded and evaluated numerous sites on Bacon Island related to George Shima's agricultural operations during the 1910s and 1920s. The south bank of the Connection Slough site was examined by these studies. Although this area contains no cultural resources, it is within the boundaries of the Bacon Island Rural Historic District (Maniery 1993:Figure 26).

No surveys have been performed on the north bank of the Connection Slough site on Mandeville Island, and no recorded resources occur in or near this area. However, the Central California Information Center indicated that the Mandeville Island School or Venice Mandeville School lies approximately 200 meters northwest of the Project area. The first school in the vicinity was built in 1912 at a location known as Light 11 (San Joaquin County Superintendent of Schools [SJCSS] 1991:142). Twenty years later, a new schoolhouse was constructed on King Island (5 to 10 miles northeast of Mandeville Island). In 1938, the Mandeville Island School opened its doors when the original school building was moved via barge to Mandeville Island to accommodate the area's growing enrollment. A new structure was completed in 1954, and the older quarters were moved to the end of the yard and converted into a home for the principal. In 1972, the Mandeville Island School was abandoned due to low enrollment (SJCSS 1991:143).

OLD RIVER PROJECT AREA

Like the south bank of the Connection Slough Project area, the east (Bacon Island) portion of the Old River Project area was included in the investigations for the Delta Wetlands Project and lies within the boundaries of the Bacon Island Rural Historic District (Jones & Stokes 1995, Maniery 1993, Maniery et al. 1989). In her evaluation report, Maniery summarized the reasons why the district is eligible for the NRHP:

> *Bacon Island Rural Historic District appears eligible for inclusion on the National Register of Historic Places under Criteria A, B, C, and D for the following reasons: 1) it is a representative example of reclamation and agricultural endeavors relating to Japanese Americans between 1913 and 1942; 2) it was used by and associated with George Shima, a pivotal figure in Japanese American history; 3) it is an example of a type of landscape (seen in spatial organization of features and camps) and architectural style not seen in the delta today; and 4) it contains archaeological materials, particularly Japanese manufactured items, with comparative value. While some alterations have occurred since 1942, the district as a whole retains a remarkable degree of integrity of location, design, setting, materials, workmanship, feeling, and association. It represents one of the last examples of early farming ventures in the delta and is important at a state level [Maniery 1993:iii].*

Located within the east portion of the Old River Project area, Shima Camp No. 4 (CA SJO 214H) is one of 13 sites that make up the Bacon Island Rural Historic District. The site consists of a 2.5-story boarding house, a single-story boarding house, three outbuildings, and associated artifacts (Maniery et al. 1989). The two worker barracks were probably built around 1915. Situated about 700 meters north of the Old River Project area are the bulldozed remnants of Camp No. 5 (CA SJO 215H). Historical maps also identify the site as Days Landing in 1883 and as the Bee Ranch in 1905, prior to its use as a labor complex beginning in the 1910s (Maniery et al. 1989).

Along with the Maniery et al. (1989) inventory study for the Delta Wetlands Project, which also covered parts of Holland Island, Greenway and Soule (1977) conducted a cultural resources reconnaissance that included the west (Holland Island) portion of the Old River Project area. Although the Northwest Information Center's site maps contain no plotted resources in or near this area, the Historic Property Data File lists the Holland Tract levee as a resource. The data file classifies the levee, which was built in 1910, as ineligible for the NRHP. In addition, the 1916 Byron quadrangle depicts three structures within the Project area that are no longer extant. The Holland Island portion of the Old River Project area does not lie on or near archaeologically sensitive soils.

HOLLAND TRACT AUXILIARY STORAGE AREA

Both Greenway and Soule (1977) and Maniery et al. (1989) covered this 10-acre parcel in their surveys of Holland Island. No recorded resources occur within the auxiliary storage area. The parcel does, however, lie within the vicinity of previously recorded resources and archaeologically sensitive soils. Located less than 1 mile away, CA CCO 147, 593, and 678 are prehistoric occupation sites containing formed tools, including projectile points, as well as shell beads, ground stone, and human burials. As with many prehistoric resources in the region, the sites are associated with Piper series soils. Commonly surrounded by organic soils, Piper series soils form the basis of mounds, ridges, and other stable land forms. Werner (2005:12–15) noted that consistent with his and other studies, there is a strong correlation between prehistoric archaeological sites and Piper series sand mounds and that such soils typically occur on the edges of the Delta such as in Contra Costa County and in the north San Joaquin Valley. Werner (2005) and Maniery et al. (1989) collectively observed Piper series soils on the Holland, Webb, and Palm tracts west of the Old River but not on the tracts and islands east of the Old River (e.g., Bacon Island). Werner (2005:12) added that over decades, agricultural activity has leveled sand mounds and dispersed and mixed their physical and cultural constituents with surrounding soils, making identification of former mound sites much more complex. Despite this difficulty, the U.S. Department of Agriculture (1977) plotted soil types on the Holland Tract as part of its survey of Contra Costa County. Those maps show that while "Shima Muck"—an organic soil type formed from the remains of reeds and tules—completely underlies the auxiliary storage area, Piper series soils immediately flank the Project area to the east, west, and north.

Native American Consultation

On September 10, 2008, Æ faxed the NAHC a request for a sacred lands file search and asked for the contact information of local Native American representatives. Along with the contact list, the NAHC stated in its October 7, 2008 response that the search failed to indicate the presence of resources in or around the Project areas. The commission added, however, that the absence of information about sites does not necessarily suggest the absence of sites in the Project area.

On October 13, 2008, a letter summarizing Æ investigations was sent to Silvia Burley of the California Valley Miwok Tribe, Matthew Franklin of the Ione Band of Miwok Indians, Andrew Galvan of the Ohlone Indian Tribe, Ramona Garibay of the Trina Marine Ruano Family, Mary Daniels-Tarango and Leland Daniels of the Wilton Rancheria, Katherine Erolinda Perez, and Randy Yonemura. No comments have been received to date.

Figure 4.6-1 Truss Bridge across Connection Slough, looking northwest

Survey

Ground conditions, survey coverage, and results for each location are provided below.

CONNECTION SLOUGH PROJECT AREA

Because Mandeville Island could not be accessed, the survey examined only the south or Bacon Island portion of this Project area. Surface visibility was generally good (75 to 100 percent) along the levee road but decreased to 10 to 50 percent on the slope and level terrain below the crest of the levee. Survey coverage was confined to the areas immediately adjacent to the road by a corn field with dense vegetation that completely obscured ground visibility. No prehistoric resources were observed in this Project area.

A historical bridge stands at the western boundary of this Project area. The iron truss bridge spans about 350 feet across the Connection Slough and links Bacon and Mandeville islands. It is currently in use. A commemorative plaque bolted to the southeast outer diagonal indicates that the structure was commissioned by San Joaquin County and built by Clark and Henery in 1905. The bridge is not listed on the Caltrans Historic Bridge Inventory. Clark and Henery Bridge and Wharf Builders and General Construction was based in Stockton from the 1890s through 1911 (Online Archive of California 2006). Due to its age, the bridge was recorded as a historical resource.

A standing structure was observed from a distance at the location of the Mandeville Island School, but because the complex could not be approached, no details can be reported about this site.

OLD RIVER PROJECT AREA

Much of the east (Bacon Island) portion of the Old River Project area had been recently graded, allowing good to excellent ground visibility (90 to 100 percent). As with the south bank of the Connection Slough Project area, survey coverage was limited to the areas immediately adjacent to the road by a dense corn that completely obscured ground visibility. No prehistoric resources were observed in the Old River project area.

The current survey confirmed that CA SJO 214H, Shima Camp No. 4, lies within the Project area. Compared to Maniery et al.'s (1989) description of the site, the two boarding houses appear to have experienced only minor changes in the past 20 years (Figure 4.6-2). The short stairway leading to the first floor of the 2.5-story residence has been removed. On this same structure, the shingled roof described in the 1989 site record has apparently been replaced with corrugated metal. No observable differences were noted in the single-story residence. Both boarding houses rest on concrete or wooden footing, which elevates them about 2 feet above the ground; as a consequence, the sections of these structures—particularly the 2.5-story building—sag inward or lean in one direction or another. Nevertheless, they are in relatively good condition given their age. Of the three outbuildings identified by Maniery et al. (1989), only the corrugated metal shed remains intact. The wooden structure north of the shed is dilapidated, while the building to the south has been demolished or simply collapsed due to disrepair. Other than crushed brick, no historical artifacts were noted at CA SJO 214H, although the tall grasses that surrounded the structures reduced ground visibility within the site boundaries.

Figure 4.6-2 Shima Camp No. 4 (CA SJO 214H); view to the east

In the west (Holland Tract) portion of the Old River Project area, a short but dense blanket of grass covers the shoulders along the levee road. The vegetation becomes increasingly taller and thicker with greater distance from the road. Ground visibility ranged from 10 to 75 percent, accordingly.

The surveyor encountered a large metal utility building just west of the levee road (Figure 4.6-3). Measuring approximately 110 feet (north-south) by 35 feet (east-west), the iron-framed structure is clad with corrugated metal and is supported at least in part by a cinder block foundation. The concrete flooring covers most, but not all, of the interior. The structure was built after World War II and appears to date to be historical (i.e., 50 years or older), but its exact age is unknown. A small metal placard on the south end of the structure reads "Soulé Building," suggesting that it may have been constructed by the precursor of Soule Building Systems, a Sonoma County-based firm that specializes in metal structures. Additional research, which is beyond the scope of this investigation, would be needed to determine the date of construction and builder of this structure. For the purposes of this study, however, the Soulé Building is considered a historical resource and has been recorded as such.

HOLLAND TRACT AUXILIARY STORAGE AREA

The 10-acre space proposed for auxiliary storage is currently used as a pasture and lies just east of a pond frequented by migratory birds (Figure 4.6-4). Grasses and other vegetation are tall but sparse, which allowed fairly good ground visibility (75 percent). No cultural resources were identified in this Project area.

Figure 4.6-3 Soulé Building, looking north

Figure 4.6-4 Proposed Auxiliary Storage Area, Located Just East (Left) of Pond; View to the Southeast

4.6.1.4 Paleontological Resources

Both the Old River and Connection Slough Project sites are located within Quaternary (Holocene-age, 10,000 years before present [BP] to present day) alluvial fan and fluvial surface deposits, and Holocene dune sands. These extend to 30 feet below the ground surface. Older Pleistocene-age (1.8 million to 10,000 years BP) alluvial fan and stream terrace deposits underlie the Holocene sediments (Helley et al. 1997). The results of a paleontological literature search indicate no recorded sites within 2 miles of the vicinity of the Project sites (University of California Museum of Paleontology [UCMP] 2008), nor were any paleontological resources identified in Quaternary (Holocene-age) deposits. Given the relatively young age of these deposits, the potential for fossils to be present is low. A variety of common mammal fossils have been found in both Contra Costa and San Joaquin counties in Pleistocene deposits (e.g., bison, deer, mastodon, and equine species).

4.6.2 Regulatory Setting

4.6.2.1 State Regulations

Section 15064.5 of the CEQA Guidelines provides that a project may have a significant environmental effect if it causes "substantial adverse change" in the significance of an historical resource or a unique archaeological resource. Historical resources are defined in the CEQA Guidelines section 15064.5 as any of the following:

1) A resource listed in, or determined to be eligible by the State Historical Resources Commission for listing in the California Register of Historical Resources (PRC Section 5024.1, Title 14 CCR, Section 4850 et seq.).
2) A resource included in a local register of historical resources, as defined in section 5020.1(k) of the PRC or identified as significant in an historical resource survey meeting the requirements of Section 5024.1(g) of the PRC, shall be presumed to be historically or culturally significant. Public agencies must treat any such resource as significant unless the preponderance of evidence demonstrates that it is not historically or culturally significant.
3) Any object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California may be considered to be an historical resource, provided the lead agency's determination is supported by substantial evidence in light of the whole record. Generally, a resource shall be considered by the lead agency to be "historically significant" if the resource meets the criteria for listing on the California Register of Historical Resources (PRC Section 5024.1, Title 14 CCR, Section 4852), including the following:
    a) is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
    b) is associated with the lives of persons important in our past;
    c) embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or
    d) has yielded, or may be likely to yield, information important in prehistory or history.

The guidelines specify that a lead agency shall identify potentially feasible measures to mitigate significant adverse changes in the significance of an historical resource. The lead agency shall ensure that any adopted measures to mitigate or avoid significant adverse changes are fully enforceable through permit conditions, agreements, or other measures.

The guidelines specify that if an archaeological site does not meet the criteria for being designated a historical resource, but does meet the definition of a unique archeological resource in section 21083.2 of the PRC, impacts to the site shall also shall be treated or mitigated.

If an archaeological resource is neither a unique archaeological nor an historical resource, the guidelines indicate that effects of the project on those resources shall not be considered a significant effect on the environment. It shall be sufficient that both the resource and the effect on it are noted in the Initial Study or EIR, if one is prepared to address impacts on other resources, but they need not be considered further in the CEQA process.

The CEQA Guidelines refer to whether or not implementation of a project would "directly or indirectly destroy a unique paleontological resource." Additionally, PRC Section 31244 states that "where development would adversely impact archaeological or paleontological resources as identified by the State Historic Preservation Officer, reasonable mitigation measures shall be required."

4.6.2.2 Federal Regulations

Passage of the National Historic Preservation Act (NHPA) in 1966 established the Federal historic preservation program and made it the policy of the Federal government, in partnership with the states, local governments, Indian tribes, and private organizations and individuals, to preserve, protect, and manage cultural resources for "the inspiration and benefit of present and future generations" (16 USC 470-1, Section 2[3]).

Section 106 of the NHPA directs federal agencies to take into account the effects of their actions on historic properties and to afford the Advisory Council on Historic Preservation an opportunity to comment with respect to the effects of the undertaking. Implementing regulations for section 106 are found at 36 CFR 800, and establish the procedures Federal agencies must follow when assessing the effects of a proposed action on historic properties. The term "historic properties" is defined at 36 CFR 800.16(l)(1) as "….any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in the National Register of Historic Places [NRHP]…[and] includes properties of traditional religious importance to an Indian tribe or Native Hawaiian organization that meet the National Register criteria."

To be eligible for listing on the NRHP, a cultural resource must be at least 50 years old (although there are exceptions) and must meet one or more of the eligibility criteria set forth at 36 CFR 60.4 which state:

> *The quality of significance in American history, architecture, archaeology, engineering and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or (b) that are associated with the lives of persons that are significant in our past; or (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant and distinguishable entity whose components may lack individual distinction; or (d) that have yielded, or may likely yield, information important in prehistory or history.*

Cultural resources are evaluated for potential listing on the NRHP with reference to an historic context and associated research questions, in consultation with the SHPO and/or Tribal Historic Preservation Officer, tribes, and other interested organizations and individuals.

Pursuant to Executive Order (EO) 13007 agencies must also consider the effects of their actions on the physical integrity of sacred sites, and access to and ceremonial use of such sites by Indian religious practitioners. EO 13007 defines a "sacred site" as:

> *…any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site.*

EO 13007 directs federal agencies "…to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions," to accommodate access to and use of such sites by Native American traditional religious practitioners, and to avoid affecting their physical integrity.

There are no federal regulations specifically relating to paleontological resources.

4.6.3 Impacts and Mitigation Measures

4.6.3.1 No Project

No impacts to cultural resources would occur because no development would occur.

4.6.3.2 2-Gates Project

ww. Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5

Less than Significant. Constructed in 1905, the truss bridge across the Connection Slough was among the first bridges built in the Delta region. It remains intact and in service. In instances where a project has the potential to affect a historical resource, additional investigations are required to evaluate its NRHP/CRHR eligibility and (if eligible) to determine whether the Project would affect the significant qualities of the resource. In the case of the Project, however, such investigations are not warranted since Project effects to the bridge would be negligible if not altogether absent. Construction of the Connection Slough gate would occur more than 0.25 mile to the east and would not cause any direct physical disturbance to the bridge. Moreover, it is unlikely that the Project would have any significant incidental effects. Although the gate would be visible, it is not reasonable to presume that this new element on the landscape would significantly change the surroundings and other intangible elements of the bridge. Thus, no further studies regarding the Connection Slough Bridge are recommended. The Project would not cause a substantial adverse change in the significance of this resource.

The Soulé Building appears 50 years old or older and is thus considered a historical resource. The shed lies within the Project boundaries, but there is little potential that the Project will affect this structure. The proposed lay down area for the Holland Tract side of the Old River Project area lies about 375 feet to the south. Project plans do not involve the removal of the building, and the likelihood of incidental damage is remote given the distance to the lay down area. Additionally, the shed would not be used for storage or any other Project purposes. As with the Connection Slough Bridge, it is not reasonable to presume that the Project would significantly change the surroundings of the shed. Thus, no further studies regarding the Soulé Building are recommended. The Project would not cause a substantial adverse change in the significance of this resource.

Less than Significant with Mitigation Incorporated. As a contributing element of the Bacon Island Rural Historic District, Shima Camp No. 4 (CA SJO 214H) is an NRHP/CRHR eligible resource. The site lies within the Project boundaries and about 100 feet south of the proposed lay down space on the east (Bacon Island) side of the Project area. Project plans do not involve any direct effect or impact to the camp. Moreover, there is little evidence to suggest that archaeological artifacts and features associated with CA SJO 214H extend into the lay down area; it is more likely that such remains would be found within or immediately adjacent to the camp. There is, however, a moderate to high potential for incidental Project effects given the presence of heavy equipment and ground disturbance so close to the site. The proximity of construction may result in the increased accumulation of debris and/or inadvertent damage to the buildings.

Mitigation Measure CR-1: CA SJO 214H will be shown on contractor specifications with the direction that Project activities are to be kept as far away from the site as possible. Additionally, protective fencing will be installed as follows: (1) at the south end of the lay down area; (2) along the east shoulder of the levee road; (3) approximately 100 feet south of the site; and (4) along the western edge of the corn field east of the site. The site also will be monitored periodically (e.g., every week) during construction by the general contractor and its supervisory staff to ensure that the protective measures are effective and that no damage has been sustained to the camp structures.

Less than Significant with Mitigation Incorporated. The north (Mandeville Island) portion of the Connection Slough Project area was inaccessible and therefore was not surveyed. Although it appears unlikely that the Project would result in impacts that would change the significance of the Mandeville Island School site, it is conservatively determined that impacts would potentially be significant.

Mitigation Measure CR-2: The Mandeville Island Portion of the Connection Slough site will be surveyed by a qualified archaeologist prior to the onset of construction. The purpose of this study will be to (1) determine

if cultural resources are present in or near the Project area and (2) better define the relationship between the Project boundaries and the Mandeville School complex.

If there is a potential for the Mandeville Island School site to be affected by Project construction activities, the following measure will be implemented.

Mitigation Measure CR-3: The Mandeville Island School site will be shown on contractor specifications with the direction that Project activities are to be kept as far away from the site as possible. Additionally, protective fencing will be installed at locations identified by the archaeologist. The site also will be monitored periodically (e.g., every week) during construction by the general contractor and its supervisory staff to ensure that the protective measures are effective and that no damage has been sustained to the camp structures.

xx. Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5

Less than Significant with Mitigation Incorporated. No archaeological resources were identified at the Project sites. Nevertheless, the possibility still exists that cultural deposits may be unearthed during construction given the archaeological sensitivity of the Project area and impacts are conservatively considered potentially significant. Surveys were not conducted at the Mandeville Island portion of the Project area; therefore, the potential for archaeological resources to be present has not been fully assessed. Mitigation CR-2, which requires that this area be surveyed by a qualified archaeologist, is applicable to this impact.

Mitigation Measure CR-4: Due to the presence of archaeologically sensitive Piper series soils immediately adjacent to the Holland Tract storage site, all ground-moving activities and the operation of heavy equipment will be restricted to the 12-acre site to prevent incidental damage to possible archaeological resources.

Mitigation Measure CR-5: Before initiating construction or ground-disturbing activities associated with the Project, all construction personnel will be alerted to the possibility of uncovering buried cultural resources. The general contractor and its supervisory staff will be responsible for monitoring the construction for disturbance of cultural resources. If any cultural resources, such as structural features, unusual amounts of bone or shell, artifacts, human remains, or architectural remains, are encountered during any development activities, work will be suspended and DWR and Reclamation will be immediately notified. DWR and Reclamation will retain a qualified archaeologist who will conduct a field investigation of the specific site and recommend reasonable mitigation deemed necessary to protect or recover any cultural resource concluded by the archaeologist to represent historical resources or unique archaeological resources. DWR and Reclamation will be responsible for approval of the recommended mitigation if it is determined to be feasible. DWR and Reclamation will implement the approved mitigation before the resumption of construction activities at the construction site.

After DWR and Reclamation are notified, work may proceed on other portions of the Project sites while mitigation of impacts on archaeological resources is implemented.

Mitigation Measure CR-6: In the event that the archaeological survey of the Mandeville Island site identifies archaeological resources, the area shall be fenced and the site will be avoided.

yy. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature

Less than Significant. No unique geologic features are present at the Project sites. The potential for paleontological resources to be present in the areas where ground disturbance would occur is low given the relatively modern age of the soils. Dredging would not extend below -30 feet, and thus would not affect the

Pleistocene-age deposits that have the potential to contain fossils. Thus, the potential for unique paleontological resources to be destroyed is low.

zz. Disturb any human remains, including those interred outside of formal cemeteries

Less than Significant with Mitigation Incorporated. There is a potential for human remains to occur in the Project area, and this impact is conservatively considered to be significant even though no direct evidence of the presence of human remains was identified.

Mitigation Measure CR-7: In accordance with the California Health and Safety Code, if human remains are uncovered during construction at the Project site, the construction contractors will immediately suspend work within 50 feet of the remains, and the Contra Costa County Coroner will be immediately notified. If the remains are determined by the County Coroner to be Native American, the Native American Heritage Commission (NAHC) will be notified within 24 hours of making that determination (Health and Safety Code Section 7050[c]), and the guidelines of the NAHC shall be adhered to in the treatment and disposition of the remains. The NAHC will then assign a Most Likely Descendent (MLD) to serve as the main point of Native American contact and consultation. Following the coroner's findings, the MLD and the archaeologist will determine the ultimate treatment and disposition of the remains and take appropriate steps to ensure that additional human interments are not disturbed. DWR and Reclamation will be required to implement any feasible, timely formulated mitigation deemed necessary for the protection of the burial remains. Construction work in the vicinity of the burials will not resume until the mitigation is completed.

4.6.3.3 Cumulative Impacts

The Project would not affect known archaeological resources or human remains, but there is a potential for undiscovered resources to be disturbed by construction. Other projects in the study area also could affect archaeological sites or human remains, and cumulative impacts could be significant. Mitigation measures identified in this MND/EA would ensure that the Project's contribution to this cumulative impact would be reduced to less than significant. The Project could affect historic resources during construction, as could other projects in the study area, potentially resulting in a significant cumulative impact. Mitigation measures identified in this MND/EA would ensure that the 2-Gates Project would prevent adverse effects to such resources; therefore reducing its contribution to this cumulative impact to less than significant. The Project has a low potential to affect unique paleontological resources, and cumulative impacts would be less than significant.

4.7 GEOLOGY AND SOILS

Issues & Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
aaa. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
bbb. 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 Division of Mines and Geology Special Publication 42.	☐	☐	☒	☐
ccc. ii) Strong seismic ground shaking?	☐	☐	☒	☐
ddd. iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
eee. iv) Landslides?	☐	☐	☐	☒
fff. Would the project result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
ggg. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☒	☐
hhh. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994) creating substantial risks to life or property?	☐	☐	☒	☐
iii. 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?	☐	☐	☐	☒

4.7.1 Environmental Setting

4.7.1.1 Overview

Both the Old River and Connection Slough sites are located in Holocene-age (10,000 years B.P. to present day) alluvial fan deposits and dune sands. These deposits extend up to 30 feet below ground surface where they are underlain by older, late-Pleistocene (10,000 to 70,000 years B.P.) alluvial fan deposits and stream terrace deposits (Helley 1997, Wagner et al. 1991). These sedimentary deposits are characterized by soft, water-saturated muds, peat, and loose sands. Local areas may slump and slide. Muds contain expansive clays, and the area is considered to have a high liquefaction potential. The surrounding areas are reclaimed wetlands, which experience amplified lateral and vertical movements that can be damaging to structures. The Project area also is subject to subsidence, the gradual setting or sinking of the earth's surface with little or not horizontal motion. In the Project area, subsidence results from the oxidation of peat on the Delta islands, as well as such factors as anaerobic decomposition, shrinkage, wind erosion, and compaction by farm equipment (Contra Costa County 2005, San Joaquin County 1992).

Seismic hazards are those hazards associated with earthquakes. Neither of the Project sites is in a mapped Alquist-Priolo Special Studies Zone (Contra Costa County 2005, San Joaquin County 1992, CGS 2002). The active seismic source closest to the Project sites is the Midland fault, a thrust fault located approximately 3 miles west of the Old River site. The many active faults in the region include the Tracy-Stockton, Patterson, Calaveras, Hayward, and San Andreas faults (Contra Costa County 2005 and San Joaquin County 1992).

4.7.1.2 Old River Site – Subsurface Conditions

Subsurface exploration completed to date for the Old River site includes two borings in fields on Holland Tract west of the levee, three borings on the crest of the Bacon Island levee, one near the toe of the Bacon Island levee and two in fields beyond the levee. At the Holland Tract side of the Old River channel, the native peat and organic soil extend to about elevation -18 feet in the two borings drilled in the fields west of the levee. Earlier exploration data further north and south of the planned Holland Tract abutment suggests that the base of the peat and organic soil may be near elevation -22 feet. The peat and organic soil is underlain by sand that extends to about elevation -60 feet. For preliminary design, the tule berm is assumed to be composed of peat and organic soil with sand lying below elevation -18 feet. The original channel of Old River is assumed to be a layer of silt or silty sand overlying sand. As the channel becomes shallower approaching the Bacon Island levee, the soils above elevation -15 feet are assumed to be peat and organic soil, with sand below that elevation. At the Bacon Island side of the Old River channel, the peat extends down to about elevation -12 feet and is underlain by sand.

4.7.1.3 Connection Slough Site – Subsurface Conditions

Subsurface exploration completed to date for the Connection Slough site includes four borings on the Bacon Island levee crest, one boring near the levee toe, two borings in the Bacon Island fields south of the levee, and three borings within the southern portion of Connection Slough. Peat and organic soil, together with an underlying 5-foot-thick layer of normally consolidated elastic silt, extend to about elevation -30 to -35 feet in the borings drilled on the Bacon Island levee and in Connection Slough. These soils are underlain by 5 to 10 feet of medium dense sand over 5 to 8 feet of stiff clay. Below the stiff clay are thicker deposits of sands interbedded with silt and clay to the depths explored.

4.7.2 Regulatory Setting

No federal regulations related to geology and soils are applicable to the Project.

4.7.2.1 Alquist-Priolo Earthquake Fault Zoning Act

Under the Alquist-Priolo Earthquake Fault Zoning Act, the State of California defines an active fault as one that exhibits evidence that surface rupture has occurred within the last 11,000 years (i.e., Holocene activity). Under the Act, the state has identified active faults within California and has delineated "earthquake fault zones" along active faults. This act restricts development of structures for human habitation within the earthquake fault zones to reduce the potential for injuries and damage caused by fault rupture.

4.7.2.2 Seismic Hazard Mapping Act

The State of California passed the Seismic Hazard Mapping Act in 1990, following the 1989 Loma-Prieta earthquake. The act was passed to reduce the potential impacts on public health and safety and to minimize property damage caused by earthquakes. The act established a requirement for the identification and mapping of areas prone to the earthquake hazards of liquefaction, earthquake-induced landslides, and amplified ground-shaking. The act requires site-specific geotechnical investigations to identify potential seismic hazards and formulate mitigation measures prior to permitting most developments designed for human occupancy within the Zones of Required Investigation.

4.7.2.3 California Building Code

The 2001 California Building Code (CBC) is based on the 1997 Uniform Building Code, with the addition of more extensive structural seismic provisions. The California Building Code is contained in the CCR Title 24,

or the California Building Standards Code, and is a compilation of three types of building standards from three different origins:

- Building standards that have been adopted by state agencies without change from building standards contained in national model codes
- Building standards that have been adopted and adapted from the national model code standards to meet California conditions
- Building standards authorized by the California legislature that constitute extensive additions not covered by the model codes that have been adopted to address particular California concerns

Seismic sources and the procedures used to calculate seismic forces on structures are defined in 24 CCR, Part 2, Volume 2, Chapter 16. The code covers grading and other geotechnical issues, building specifications, and non-building structures.

4.7.2.4 Contra Costa General Plan

The Safety Element of the General Plan includes the following policies:

> 10-20. Any structures permitted in areas of high liquefaction danger shall be sited, designed, and constructed to minimize the dangers from damage due to earthquake-induced liquefaction.
>
> 10-21. Approvals to allow the construction of public and private development projects in areas of high liquefaction potential shall be contingent on geologic and engineering studies which define and delineate potentially hazardous geologic and/or soils conditions, recommend means of mitigating these adverse conditions, and on proper implementation of the mitigation measures.

4.7.2.5 San Joaquin County General Plan

The San Joaquin County General Plan contains a number of policies associated with identifying geologic hazards and preventing risks from urban development.

4.7.3 Impacts and Mitigation Measures

4.7.3.1 No Project

The No Project alternative would not affect geology and soils because no development would occur.

4.7.3.2 2-Gates Project

Further geotechnical investigation will be performed at both Project sites consisting of explorative land-based borings and monitoring wells at each levee abutment and explorative borings beneath the waterway gate structure from a barge. The borings will explore the thickness and strength of the underlying fill and peat layer, and the thickness, permeability and relative density of the sand formation underlying the peat soil. Monitoring wells along the existing levees will verify the existing groundwater elevations in the sand formations and track groundwater elevation changes that may occur during Project implementation. The field data will be used to refine the design criteria and recommendations for final design and construction, including site-specific levee improvements.

jjj. Expose people or structures to 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.)

Less than Significant. Surface ground rupture along faults is generally limited to a linear zone a few yards wide. No active faults are mapped across the Project sites by the California Geological Survey or the USGS, and because the Project sites are not located in an Alquist-Priolo Earthquake Special Study Zone, fault ground rupture is unlikely (San Joaquin 1992, Contra Costa County 2005, CGS 2008).

ii) Strong seismic ground shaking?

Less than Significant. The Project sites are located in modern sediments of the Delta lowlands, are located near seismically active areas, and are highly susceptible to damage from ground shaking and liquefaction (Contra Costa County 2005). Most likely sources of strong ground shaking include the San Andreas, Hayward-Rodgers Creek, Calaveras, Green Valley-Concord, Greenville, Great Valley, and Tracy-Stockton faults.

The current State of California earthquake forecast strategy is based on the concept that earthquake probabilities change over time. The 2007 Working Group on California Earthquake Probabilities produced the Uniform California Earthquake Rupture Forecast, Version 2, or "UCERF" (USGS Open-File Report 2007-1437, http://pubs.usgs.gov/of/2007/1437/). Based on most recent calculations, three of these faults have been determined to have a relatively high probability for one or more earthquakes with a magnitude greater than or equal to 6.7 to occur within the next 30 years. These are the Hayward-Rodgers Creek fault (31 percent probability), Northern San Andreas (21 percent probability) and the Calaveras (7 percent probability) (Working Group on California Earthquake Probabilities 2007). Thus, the gate foundations would be subject to seismic ground shaking associated with a Modified Mercalli Intensity level VII (defined as Very Strong).

Thus, the gate foundations would be subject to seismic ground shaking associated with a Modified Mercalli Intensity level VII (defined as Very Strong).

Ground motions from seismic activity can be estimated by probabilistic method at specified hazard levels. The intensity of ground shaking depends on the distance from the earthquake epicenter to the site, the magnitude of the earthquake, site soil conditions, and the characteristic of the source. Data contained in the Probabilistic Seismic Hazard Assessment for the State of California Model, 2002 (USGS/CGS 2003), suggest there is a 10 percent probability that the peak horizontal acceleration experienced at the site would range from 0.275g for firm rock to 0.332g for alluvium (where "g" is the acceleration of gravity) in 50 years. According to the California Building Code (CBC) (2001 edition), the site is located in Seismic Zone 4, which implies a minimum horizontal acceleration of 0.4g for use in earthquake-resistant design.

The CBC specifies more stringent design guidelines where a project would be located adjacent to a Class A or B fault as designated by the California Probabilistic Seismic Hazard Maps (USGS/CGS 2003). Hayward-Rodgers fault is a Class A fault (Cao et al. 2003).

Although the facilities could be subject to strong seismic ground shaking, the Project would be required to adhere to the building safety standards specified in the CBC for Seismic Zone 4, which include measures designed to prevent significant structural damage from seismic ground acceleration.

iii) Seismic-related ground failure, including liquefaction?

Less than Significant. Project site soil types include interlayered deposits of loose to dense silty to clayey sands mixed with stiff clays. These factors, combined with a high probability for strong seismic ground shaking, indicate that Project structures could be subject to liquefaction. The Project would be designed in accordance with the recommendations presented in both the predesign and design-level geotechnical engineering investigation reports and would comply with the CBC requirements. Additionally, all earthwork would be monitored by a geotechnical engineer tasked with the responsibility of providing oversight during all excavation, placement of fill, and disposal of materials removed from and deposited on the Project site. Because these features would be incorporated into the Project design, this impact is considered less than significant.

iv) Landslides?

No Impact. The Project sites are not located in or near a landslide hazard area. Therefore, no impact would occur.

kkk. Result in substantial soil erosion or the loss of topsoil?

Less than Significant. Although the sites are located in an area of relatively flat topography, they are located in a tidal area, thus exposing site soils to the potential for wind erosion. Construction activities would involve some excavating, moving, filling, and temporary stockpiling of soil on the Project site. Grading activities would remove any vegetative cover and expose site soils to erosion via wind and surface water runoff. The Project would be required to implement best management practices (BMPs) as part of its storm water pollution prevention plan (SWPPP), which would prevent substantial soil erosion or the loss of topsoil.

The following standard erosion and sediment control measures and practices would be used during and after construction to ensure that impacts from soil erosion and sedimentation are less than significant:

- Minimize site disturbance
- Perform initial cleanup
- Compact subsurface backfill material
- Leave topsoil in roughened condition
- Construct water bars
- Perform seeding and mulching
- Install erosion control blankets
- Install silt fencing and straw bale dikes
- Conduct daily inspections and periodic maintenance of erosion and sediment control measures

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

Less than Significant. The Project sites are located in an area that is subject to lateral spreading, subsidence, and liquefaction. The Project would comply with the recommendations included in the pre-design and design-level geotechnical engineering investigation reports intended to avoid impacts associated with unstable geologic units and soils.

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

Less than Significant. The Project sites are located in an area that contains expansive soils. The Project would comply with the recommendations included in the pre-design and design-level geotechnical engineering investigation reports intended to avoid impacts associated with unstable geologic units and soils.

nnn. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?

No Impact. The Project does not involve the use of septic tanks or alternative wastewater disposal systems. Therefore, no impact would occur.

4.7.3.3 Cumulative Impacts

Impacts to geology and soils are highly localized; no other projects are located in the immediate vicinity, and no cumulative impacts would occur.

4.8 HAZARDS AND HAZARDOUS MATERIALS

Issues & Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
ooo. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
ppp. Create a significant hazard to the public or the environment through the reasonably foreseeable upset and accident conditions involving the likely release of hazardous materials into the environment?	☐	☐	☒	☐
qqq. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
rrr. Is the project located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
sss. For a project located within 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 result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
ttt. For a project within the vicinity of a private air strip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
uuu. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
vvv. Expose people or structures to the risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☒	☐

4.8.1 Environmental Setting

The Project sites are located in rural area where the primary source of contaminants is pesticides and fertilizers used for agricultural operations. Neither the Old River nor the Connection Slough site is listed on the California Department of Toxic Substances Control's (DTSC) Hazardous Waste and Substances Sites List (also known as the Cortese List) (DTSC 2008). There are no Superfund National Priorities List (NPL) sites within 5 miles of the Project sites (EPA 2008).

The Project area contains peat soils. Once ignited, peat fires pose a special hazard because they are very difficult to extinguish. In some cases, islands have been flooded into extinguish peat fires, although even flooding may not always put out the fires (San Joaquin County 1992). The Old River site is classified as having over 9.5 days per year of Critical Fire Weather (Contra Costa County 2005), the highest classification in the county.

4.8.2 Regulatory Setting

4.8.2.1 Clean Water Act (CWA)

The Spill Prevention Control and Countermeasures (SPCC) requirements (Title 40 CFR Part 112) were developed pursuant to the Clean Water Act. SPCCs are intended to reduce the threat of spills of hydrocarbons to navigable waters of the United States.

4.8.2.2 Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (42 USC Section 6922) (RCRA) establishes requirements for the management of hazardous wastes from the time of generation to the point of ultimate treatment or disposal. 42 USC Section 6922 requires generators of hazardous waste to comply with record keeping requirements relating to the identification of quantities of hazardous wastes generated and their disposition, labeling practices and use of appropriate containers, use of a manifest system for transportation, and submission of periodic reports to the U.S. Environmental Protection Agency (EPA) or authorized state.

4.8.2.3 Title 40, Code of Federal Regulations, Part 260

These regulations were promulgated by the EPA to implement the requirements of RCRA as described above. The regulations define the characteristics of hazardous waste in terms of ignitability, corrosivity, reactivity, and toxicity and list specific types of wastes deemed hazardous.

4.8.2.4 Hazardous Materials

Title 22 of the California Code of Regulations, Division 4.5, Chapter 11 contains regulations for the classification of hazardous wastes. A waste is considered a hazardous waste if it is toxic (causes human health effects), ignitable (has the ability to burn), corrosive (causes severe burns or damage to materials), or reactive (causes explosions or generates toxic gases) in accordance with the criteria established in Article 3 Characteristics of Hazardous Waste. Article 4 lists specific hazardous wastes, and Article 5 identifies specific waste categories, including RCRA hazardous wastes, non-RCRA hazardous wastes, extremely hazardous wastes, and special wastes.

4.8.2.5 Worker Safety

Occupational safety standards exist in federal and state laws to minimize worker safety risks from both physical and chemical hazards in the workplace. The California Occupational Health and Safety Administration (Cal/OSHA) is responsible for developing and enforcing workplace safety standards and assuring worker safety in the handling and use of hazardous materials.

Among other requirements, Cal/OSHA obligates many businesses to prepare Injury and Illness Prevention Plans and Chemical Hygiene Plans. The Hazard Communication Standard requires that workers be informed of the hazards associated with the materials they handle. For example, manufacturers are to appropriately label containers, Material Safety Data Sheets are to be available in the workplace, and employers are to properly train workers.

4.8.2.6 Wildland Fire

The California PRC includes fire safety regulations that: restrict the use of equipment that may produce a spark, flame, or fire; require the use of spark arrestors on construction equipment that has an internal combustion engine; specify requirements for the safe use of gasoline-powered tools in fire hazard areas; and specify fire suppression equipment that must be provided onsite for various types of work in fire-prone areas.

4.8.2.7 Local General Plans

Both the Contra Costa County and San Joaquin County General Plans contain general goals and policies intended to protect public safety.

4.8.3 Impacts and Mitigation Measures

4.8.3.1 No Project

The Project would not affect hazards or hazardous materials because no development would occur.

4.8.3.2 2-Gates Project

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

Less than Significant. The Project would not require the routine transport, use, or disposal of hazardous materials. Commonly used hazardous materials would be used during construction (e.g., fuels, lubricants), and diesel would be required to power the generators during operations until power was obtained from the PG&E grid. All materials would be handled in accordance with regulatory requirements intended to prevent significant hazards to the public and the environment.

xxx. Create a significant hazard to the public or the environment through the reasonably foreseeable upset and accident conditions involving the likely release of hazardous materials into the environment

Less than Significant. During construction, heavy equipment and vehicles would be present in the Project area. All contractors would be required to adhere to mandatory federal Occupational Safety and Health Administration regulations. Most of this equipment requires a number of petroleum products such as fuel, hydraulic fluids, and lubricants for effective operation. Lubricant and hydraulic fluid changes and replenishment would be required less frequently. Typically, service trucks deliver these types of fluids to the site and then perform the necessary fuel and oil transfers. The risk of small fuel or oil spills is considered possible, but this would have a negligible impact on public health. Any spills would be cleaned up in accordance with permit conditions, as outlined in Section 2.5.2. During non-working hours, heavy equipment and vehicles in areas that could be accessed by the public would be secured in a general contractor's staging area that would not pose a safety hazard.

yyy. 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. Neither the Old River site nor the Connection Slough site is within one-quarter mile of an existing school, nor are any schools proposed in this agricultural area.

zzz. Is the project located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment

No Impact. Neither the Old River site nor the Connection Slough site is located on a hazardous materials site compiled pursuant to Government Code Section 65962.5.

aaaa. For a project located within 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 result in a safety hazard for people residing or working in the project area

No Impact. Neither the Old River site nor the Connection Slough site is located within an airport land use plan or within 2 miles of a public airport or public use airport.

bbbb. For a project within the vicinity of a private air strip, would the project result in a safety hazard for people residing or working in the project area

No Impact. Neither the Old River site nor the Connection Slough site is located within the vicinity of a private air strip.

cccc. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan

No Impact. The Project is located in remote rural area, and neither construction nor operations would impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.

dddd. Expose people or structures to the risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands

Less than Significant. Most Project construction would occur in the water, and thus would not pose a fire hazard. Some construction activities would occur in the laydown areas. The fuel tanks on board some construction equipment can contain fuel volumes ranging from 100 to 500 gallons. Accidental ignition could result in a fire, which, depending on the location, could spread. All such equipment is required to have fire suppression equipment on board or at the work site and to ensure the availability of an adequate on-site supply of water with all-weather access for fire-fighting equipment and emergency vehicles. Therefore, adherence to Contra Costa and San Joaquin County codes and requirements during construction would reduce the potential for significant fire hazard impacts.

4.8.3.3 Cumulative Impacts

The Project would result in a minor, localized potential for impacts associated with hazards or hazardous materials and would not contribute to a cumulative impact in combination with other reasonably foreseeable projects.

4.9 HYDROLOGY AND WATER QUALITY

Issues & Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
eeee. Violate any water quality standards or waste discharge requirements?	☐	☐	☒	☐
ffff. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (i.e., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
gggg. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☒	☐
hhhh. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☒	☐
iiii. Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☒	☐
jjjj. Otherwise substantially degrade water quality?	☐	☐	☒	☐
kkkk. Place housing within a 100-year floodplain, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
llll. Place within a 100-year floodplain structures which would impede or redirect flood flows?	☐	☐	☒	☐
mmmm. Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☒	☐
nnnn. Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

4.9.1 Environmental Setting

4.9.1.1 Surface Water Hydrology

The San Joaquin River originates in the Sierra Nevada Mountains and flows west to the Central Valley. It meets the Sacramento River near the city of Antioch, and together they form the Sacramento-San Joaquin Delta, one of the largest estuaries in the United States. Two distributary rivers, the Old River and the Middle River, flow from the San Joaquin River before it joins the Sacramento River; both of these once were the main channels of the river. Because of the bend in the San Joaquin River channel at the head of the Old River, a substantial portion of the San Joaquin River flow continues down the Old River instead of heading northward along the San Joaquin. Flows along the Old River are eventually divided between the Old River, Middle River, and Grant Line Canal. In response to concerns about impacts to outmigrating salmon resulting from lower flows in these areas, DWR and DFG have installed temporary rock barriers at the head of the Old River in order to keep fish in the main channel of the San Joaquin River.

Surface water in the Delta is dominated by tidal flows from San Francisco and Suisun bays. Additional hydrologic contribution to Delta surface water is runoff from upstream in the Sacramento and San Joaquin River watersheds. Average daily inflow (and outflow) of water from tidal action is approximately 170,000 cubic feet per second (cfs). The average estimated freshwater outflow from the combined watershed is approximately 30,000 cfs (DWR 1993). Approximately 77 percent of the freshwater inflow is derived from

the Sacramento River portion of the watershed. The mainstem and tributaries of the San Joaquin River contribute about 15 percent of the total freshwater inflow and streams that flow directly into the Delta (e.g., the Mokelumne River) contribute the remainder of the freshwater.

Surface water flow in the Old River and Connection Slough is dominated by natural tidal variations and is also affected by diversion pumping at the various export pumping facilities.

4.9.1.2 Surface Water Quality

The State Water Resources Control Board (SWRCB) has adopted water quality control plans and policies to protect the water quality and to control the water resources in the Delta. The Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan) was adopted in 1995 and amended in 2006. Water quality and water rights for the Delta were established via Water Right Decision 1485 (D-1485) (1978), and D-1641(2000). When combined, the Bay-Delta Plan and applicable Water Right Decisions establish water quality objectives that consider the need for the protection of beneficial uses, including agricultural, domestic, and industrial uses by humans and the needs of the ecosystem. These establish the water quality objectives and set the conditions for water management in the Delta.

Except during period of large regional flood or runoff events, surface water quality in the Old River and Connection Slough also is dominated by natural tidal variations and is affected by diversion pumping at the various export pumping facilities. Figure 4.9-1 illustrates the existing variation in salinity (expressed in micromhos per centimeter (µmho/cm). Additional historic flow and salinity information is available in Appendix E.

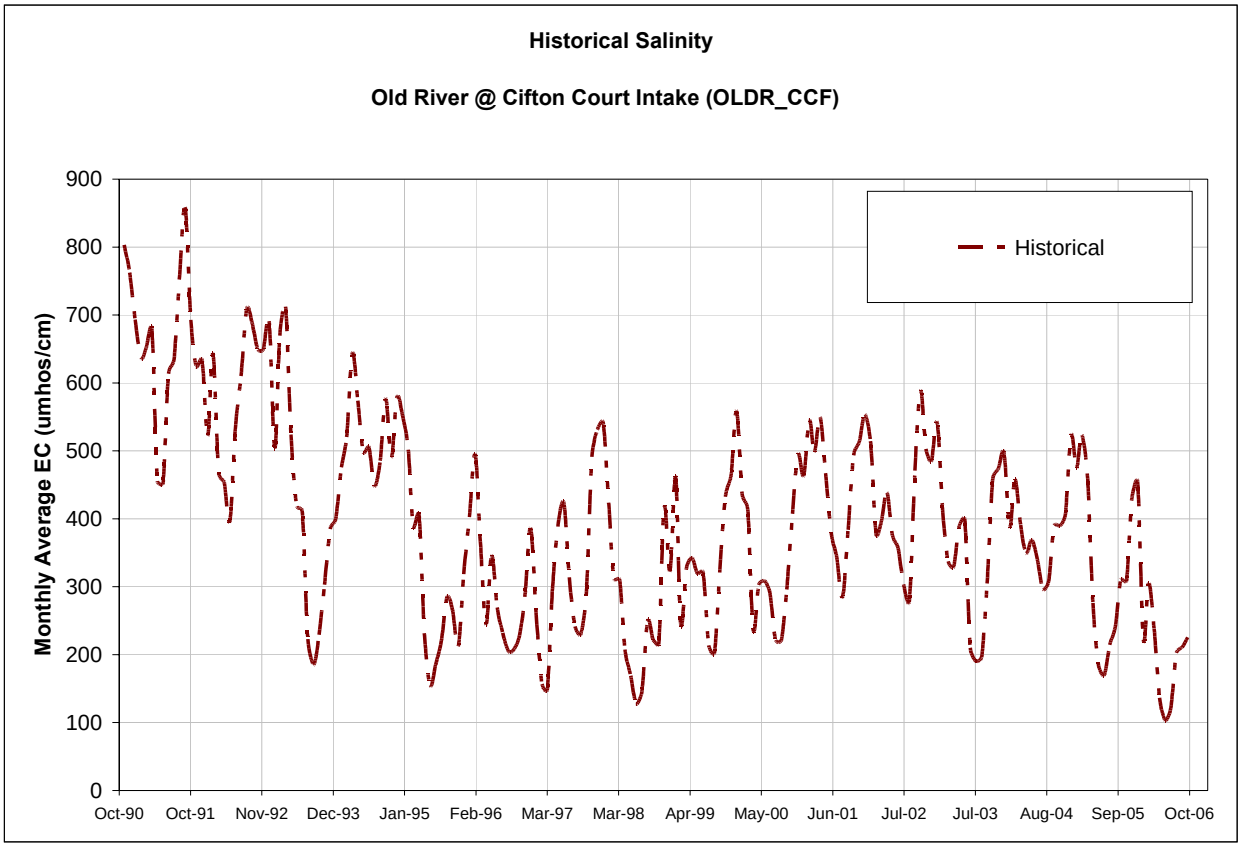


Figure 4.9-1 Historic Salinity (µmho/cm) at the 2-Gates Locations

4.9.1.3 Flooding

The Project would construct facilities in channels that convey a portion of the total runoff from areas within the San Joaquin River watershed. The lands surrounding the Old River and Connection Slough sites are within 100-year floodplains (Contra Costa County 2005, San Joaquin County 1992). A system of levees protects the lands on the neighboring islands (Holland Tract, Bacon Island, and Mandeville Island), which are below sea level.

4.9.1.4 Groundwater

The Project sites are located in the Tracy Subbasin of the Great Valley Geomorphic Province (DWR 2006). The Tracy Subbasin is composed of four defined strata: the Tulare Formation, Older Alluvium, Flood Basin Deposits, and Younger Alluvium. The Flood Basin Deposits consist primarily of silts and clays between the Younger Alluvium and older and deeper sediments, and include occasional gravel interbeds in areas adjacent to existing waterways. Because of their fine-grained nature, the flood basin deposits have low permeability and correspondingly low yields to water wells. Occasional zones of fresh water are found in these basin deposits, but they generally contain poor quality groundwater. The Younger Alluvium aquifer unit includes sediments deposited in the channels of active streams as well as overbank deposits and terraces of those streams. This unit is locally highly permeable and is less than 100 feet thick.

4.9.2 Regulatory Setting

4.9.2.1 Federal

Clean Water Act

The U.S. Environmental Protection Agency (EPA) is the federal agency responsible for water quality management and administers the federal Water Pollution Control Act Amendments of 1972 and 1987, collectively known as the Clean Water Act (CWA). The CWA establishes the principal federal statutes for water quality protection. It was established with the intent "to restore and maintain the chemical, physical, and biological integrity of the nation's water, to achieve a level of water quality which provides for recreation in and on the water, and for the propagation of fish and wildlife." Several key sections of CWA guide the regulation of water pollution in the United States:

Section 208, Water Quality Control Plans. This section requires the preparation of local water quality control plans throughout the nation. Each water quality control plan covers a defined drainage area. The primary goal of each water quality control plan is to attain water quality standards established by the CWA and the state governments within the defined area of coverage. Minimum content requirements, preparation procedures, time constraints, and federal grant funding criteria pertaining to the water quality control plans are established in Section 208. Preparation of the water quality control plans has been delegated to the individual states by the EPA.

Section 401, Water Quality Certifications. This section of CWA requires that, prior to the issuance of a federal license or permit for an activity or activities that may result in a discharge of pollutants into navigable waters (see Section 404 discussion, below), the permit applicant must first obtain a certification from the state in which the discharge would originate. A state certification indicates that the proposed activity or activities would not result in a violation of applicable water quality standards established by federal or state law, or that there are no water quality standards that apply to the proposed activity.

Section 402, NPDES. The National Pollutant Discharge Elimination System (NPDES) requires permits for pollution discharges into water bodies such that the permitted discharge does not cause a violation of federal and state water quality standards. NPDES permits define quantitative and/or qualitative pollution limitations

for the permitted source, and control measures that must be implemented to achieve the pollution limitations. Pollution control measures are often referred to as BMPs.

Section 404, Discharge of Dredge and Fill Material. Section 404 assigns the Corps with permitting authority for proposed discharges of dredged and fill material into waters of the U.S., defined as "…waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; territorial seas and tributaries to such waters."

The Corps typically considers all natural drainages with defined beds and banks to be waters of the U.S. Section 404 establishes procedures by which the permitting agency is to review, condition, approve, and deny permit requests. Per the regulations, permitting agencies are responsible to conduct public noticing and provide the opportunity for public hearings during the review of each permit request. This includes informing United States Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS) of each permit request. Consultation with USFWS and/or NMFS is required for proposed discharges that could affect species protected by the federal Endangered Species Act (ESA). Measures that are required by USFWS and/or NMFS to minimize impacts to federally protected species must be included as conditions of the permit.

Rivers and Harbors Act

The Rivers and Harbors Act (RHA) of 1899 prohibits the unauthorized alteration or obstruction of any navigable waters of the United States. As defined by the RHA, navigable waters include all waters that are:

- Historically, presently, or potentially used for interstate or foreign commerce and
- Subject to the ebb and flow of tides

Regulations implementing Section 10 of the RHA are coordinated with regulations implementing CWA Section 404. The RHA specifically regulates:

- Construction of structures in, under, or over navigable waters
- Deposition or excavation of material in navigable waters
- All work affecting the location, condition, course, or capacity of navigable waters

The RHA is administered by the Corps. If a proposed activity falls under the authority of RHA Section 10 and CWA Section 404, the Corps processes and issues a single permit. For activities regulated only under RHA Section 10, such as installation of a structure not requiring fill, permit conditions may be added to protect water quality during construction. The San Joaquin River is considered a navigable water between the mouth of the river and Sycamore Road (a point about 7 miles downstream of U.S. Highway 99 near Fresno).

National Flood Insurance Program

FEMA administers the National Flood Insurance Program (NFIP). FEMA has completed Flood Insurance Rate Maps that identify Special Flood Hazard Areas in the Project area. To comply with the NFIP, communities must adopt a floodplain management ordinance addressing construction and habitation in flood zones. In California, the DWR provides and encourages communities to adopt the California Model Floodplain Management Ordinance.

Executive Order 11988-Floodplain Management

Executive Order 11988 requires federal agencies to recognize the values of floodplains and to consider the public benefits from restoring and preserving floodplains. Under this order the Corps is required to take action and provide leadership to:

- Avoid development in the base floodplain
- Reduce the risk and hazard associated with floods
- Minimize the impact of floods on human health, welfare, and safety and
- Restore and preserve the beneficial and natural values of the base floodplain.

4.9.2.2 State

Porter-Cologne Act

The Porter-Cologne Act (California Water Code Section 13000) is the principal law governing water quality regulation in California. It establishes a comprehensive program to protect water quality and the beneficial uses of water. The Porter-Cologne Act applies to surface waters, wetlands, and groundwater, and to both point and non-point sources of pollution. Pursuant to the Porter-Cologne Act, it is the policy of the state of California that:

- The quality of all the waters of the State shall be protected
- All activities and factors affecting the quality of water shall be regulated to attain the highest water quality within reason and
- The State must be prepared to exercise its full power and jurisdiction to protect the quality of water in the State from degradation

Pursuant to the Porter-Cologne Act, the responsibility for protection of water quality in California rests with the State Water Resources Control Board (SWRCB). The SWRCB administers federal and state water quality regulations for California's ocean waters and also oversees and funds the state's nine Regional Water Quality Control Boards (RWQCBs). The RWQCBs prepare water quality control plans, establish water quality objectives, and carry out federal and state water quality regulations and permitting duties for inland water bodies, enclosed bays, and estuaries within their respective regions. The Porter-Cologne Act gives the SWRCB and RWQCBs broad powers to protect water quality by regulating waste discharge to water and land and by requiring clean up of hazardous wastes.

Section 401 Water Quality Certification

The Central Valley RWQCB has jurisdiction over issues concerning CWA Section 401 Water Quality Certifications for the Project site.

Water Quality Control Plan – for the San Francisco Bay/Sacramento-San Joaquin Estuary (2006)

Generally, the Water Quality Control Plans from all nine of the RWQCBs and the California Ocean Plan (prepared and implemented by the SWRCB) collectively constitute the State Water Quality Control Plan. However, the SWRCB prepared the Bay-Delta Plan to the requirements of the CWA and the California Porter-Cologne Act. The Bay-Delta Plan supplemented other water quality control plans adopted by the SWRCB and RWQCBs, and State policies for water quality control as they relate to the Bay-Delta Estuary watershed. The other plans and policies established by the RWQCBs to adopt water quality standards and

requirements for specific contaminants and other factors which have the potential to impair beneficial uses or cause nuisance. The Bay-Delta Plan has been designed to support the intentions of the CWA and the Porter-Cologne Act by: (1) characterizing watersheds within the Delta; (2) identifying beneficial uses that exist or have the potential to exist in each water body; (3) establishing water quality objectives for each water body to protect beneficial uses or allow their restoration, and; (4) providing an implementation program that achieves water quality objectives. Implementation program measures include monitoring, permitting, and enforcement activities.

Stormwater Permit

Construction activities that involve 0.5 or more acres of land disturbance must comply with the General Permit for Discharges of Storm Water Associated with Construction Activity (Construction General Permit, 99-08-DWQ), which regulates stormwater originating from construction activities. Construction activity subject to this permit includes clearing, grading and disturbances to the ground such as stockpiling, or excavation, but does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility.

The Construction General Permit requires the development and implementation of a SWPPP. Section A of the Construction General Permit describes the elements that must be contained in a SWPPP. These elements include a site map(s) that shows the construction site perimeter, existing and proposed buildings, lots, roadways, storm water collection and discharge points, general topography both before and after construction, and drainage patterns across the project. The SWPPP must list the BMPs the discharger will use to protect storm water runoff and the placement of those BMPs. Additionally, the SWPPP must contain a visual monitoring program; a chemical monitoring program for "non-visible" pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment.

The SWRCB is in the process of reissuing the Construction General Permit and released a preliminary draft of the new permit on March 2, 2007 (SWRCB 2007). A revision to the draft was released in March 2008. When adopted, this permit will replace the 1999 Construction General Permit and, as proposed, would require the permittee to implement additional minimum BMPs. The revised draft permit also requires specific analytical procedures to determine whether the BMPs are preventing further impairment due to sediment and preventing non-visible pollutants from violating water quality objectives. The new requirements would require monitoring (i.e., sampling and testing) of the quality of stormwater discharges at most sites. In addition, all sites would be required to meet new development and redevelopment performance standards to minimize or mitigate hydrologic impacts.

Fish and Game Code, Sections 1601 to 1603

Under Sections 1601 to 1603 of the Fish and Game Code, the California Department of Fish and Game must be notified prior to any project that would divert, obstruct, or change the natural flow, bed, channel, or bank of any river, stream, or lake. The term "stream" can include intermittent and ephemeral streams, rivers, creeks, dry washes, sloughs, blueline streams, and watercourses with subsurface flows. The Project Proponent will apply for a Streambed Alteration Agreement from DFG.

4.9.2.3 Local

Contra Costa County General Plan

The following policies are included in the Conservation Element:

8-75. Preserve and enhance the quality of surface and groundwater resources.

8-87. On-site water control shall be required of major new developments so that no increase in peak flows occurs relative to the site's pre-development condition, unless the Planning Agency determines that off-site measures can be employed which are equally effective in preventing adverse downstream impacts.

8-91. Grading, filling and construction activity near watercourses shall be conducted in such a manner as to minimize impacts from increased runoff, erosion, sedimentation, biochemical degradation, or thermal pollution.

8-92. Revegetation of a watercourse shall employ native vegetation, providing the type of vegetation is compatible with the watercourse's maintenance program and does not adversely alter channel capacity.

San Joaquin County General Plan

The following policies are included in the Resources Element:

1. Water quality shall meet the standards necessary for the uses to which the water resources are put.

2. Surface water and groundwater quality shall be protected and improved where necessary.

10. The County shall support properly timed, sufficient flows in the rivers to maintain spawning grounds, fish migration, and resident fish populations.

11. Water projects shall:

(a) incorporate safeguards for fish and wildlife; and

(b) mitigate erosion and seepage to adjacent lands.

13. Water diversion projects shall protect the fishery, wildlife habitat, and recreation; shall ensure adequate water for County agricultural, municipal and industrial uses; and shall guarantee adequate Delta outflows for salinity repulsion.

4.9.3 Impacts and Mitigation Measures

4.9.3.1 No Project

The No Project alternative would not affect surface or groundwater hydrology or water quality because no gates or other facilities would be constructed across the Old River or Connection Slough channels or on adjacent lands. Hydrologic and water quality conditions would remain as they have in the past.

4.9.3.2 2-Gates Project

The Project is intended to alter the flow path for tidal and watershed discharge flows through Old River and Connection Slough and thereby reduce or prevent the movement of delta smelt and other aquatic species into the south Delta. These changes are anticipated to reduce the entrainment of fish by the major water diversion facilities located near Tracy and to provide a substantial benefit to aquatic species.

Changes to the movement of water and the timing of water movements were evaluated using the "Delta Model Simulation II" (DSM2) computer model. DSM2[4] calculates stages, flows, velocities; many water quality parameters and the movement of individual particles.

When the Project gates are closed, the Project has the potential to alter the regional flow-path of water in some portions of the Delta region. The greatest change to flow rates would be found in channels immediately adjacent to the Project facilities. Under the right hydrologic conditions, and with information on the location of fish species of concern, the Project facilities and operations are very effective at reducing the entrainment of delta smelt and other poor-swimming pelagic fish from the western and central portions of the delta to the pumps. On a more regional basis, water that would currently flow in the Old River or Connection Slough channels would be re-directed to other nearby north-south channels (e.g., Middle River). When the Project gates are open, the Project would have an undetectable effect on Delta hydrology and water quality. These changes were compared using historic flow and salinity data for the period 1991-2006. Detailed results are available in Appendix E.

Depending upon the duration of the closure, weather and initial water quality conditions could result in changes in water quality similar to those found in other dead-end sloughs of the Delta. Portions of channels adjacent to the Old River and Connection Sloughs barriers would likely receive reduced mixing, which may result in slightly degraded water quality in the form of somewhat reduced oxygen, minor changes in salinity, and may have a tendency to temporarily trap floating debris. This effect would be temporary and would not be as pronounced as conditions in real dead-end sloughs because Project operations anticipated relatively short closure periods (frequently less than one day), the gates would not be completely sealed, and some small flow volumes would move past the gates. These conditions would dissipate soon after the gates were opened. These changes would be most pronounced when ambient air temperature is high, winds speeds are low, and tidal action is small. Therefore, changes to water quality would be small and less than significant.

oooo. Violate any water quality standards or waste discharge requirements.

Less than Significant. Due to its proximity to the Project, changes in salinity could occur at the compliance location at Rock Slough specified under D-1641(SWRCB 2000). Simulations of the Project operations conducted using DSM2 indicate that operation of the Project would not to lead to violations of the Rock Slough standard, although there were instances (winter) when salinity was increased by a small amount compared to existing conditions at Rock Slough (Figure 4.9-2). Installation of barriers and closure of the gates would generally improve water quality at Rock Slough by reducing salinity intrusion. During winter months, gate closure would reduce local flushing, which could lead to degradation of water quality at Rock Slough. This would only be a significant concern if CCWD operations required significant flow from Rock Slough. In general, CCWD minimizes the use of Rock Slough during the winter and spring, and the gates would be operated to flush any build up of agricultural drainage water in the channel if necessary.

The Project is projected to result in small increases in average monthly salinity at other regional locations. The greatest anticipated increase in average monthly salinity at a location not adjacent to the Project site would be approximately 8 percent at the San Joaquin River near Jersey Point. However, this would not result in a violation of a water quality standard.

The greatest anticipated change in salinity changes indicated by the model results is a reduction (improvement in water quality) of approximately 20 percent at "Middle River upstream of Mildred" and "Woodward Cut" based on the average monthly salinity (in April) This magnitude of a salinity reduction at these locations, south of the proposed Project facilities, would be a beneficial impact on existing water quality and water uses.

[4] Detailed descriptions of this model are available at http://baydeltaoffice.water.ca.gov/modeling/deltamodeling/models/dsm2/dsm2.cfm.

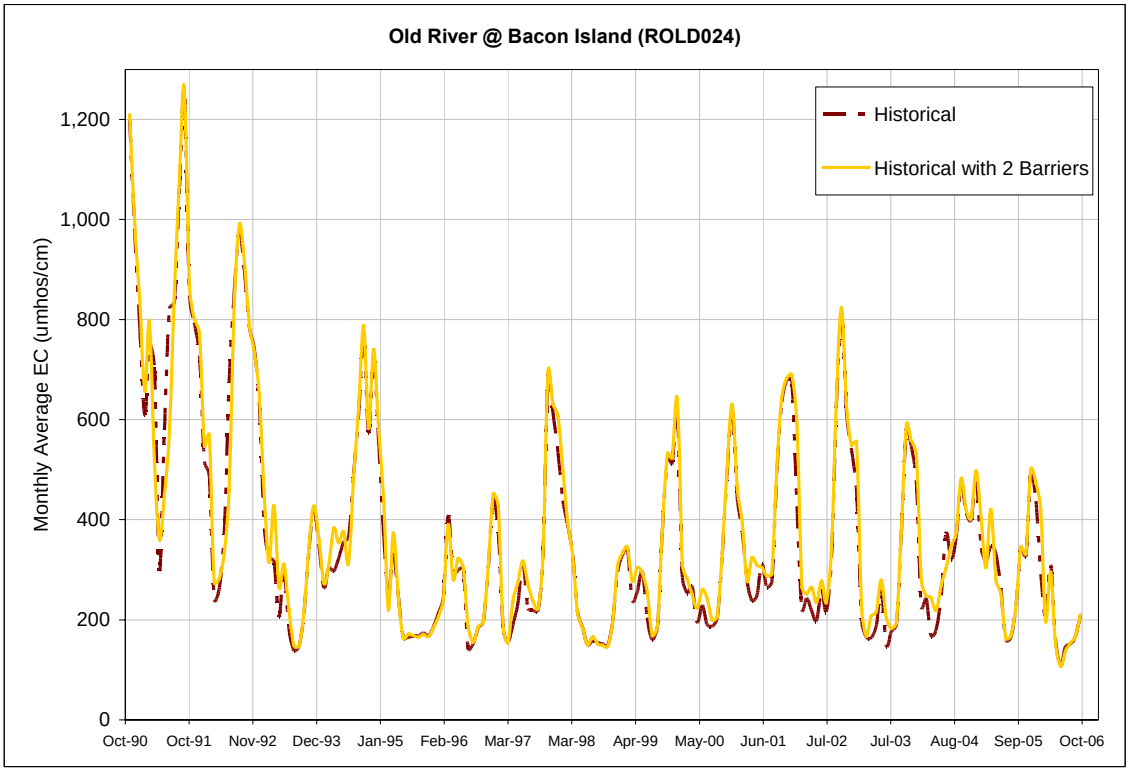


Figure 4.9-2 Projected Salinity near the CCWD Rock Slough Water Diversion Location

pppp. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted).

No Impact. The Project would only contact the uppermost portion of groundwater-bearing formations as a result of dredging to approximately 30 feet below sea level and would have no effect on local or regional groundwater hydrology or groundwater water quality. The Project would not increase the use of groundwater, nor would it interfere with natural groundwater recharge because no impermeable surfaces would be created on land.

qqqq. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial on- or off-site erosion or siltation.

Construction

Less than Significant. Construction would occur primarily within the Old River and Connection Slough channels and generally would not require grading or other topographic modifications. Channel bottom material would be dredged and disposed of on the northeast corner of Bacon Island. The dredged material would be confined within a bermed area and would not result in erosion or siltation. Dredging for the foundation for the barge-mounted gates would result in a short-term increase in sediment load in a channel. This increase in turbidity would dissipate quickly as suspended particles settled to the bottom after dredging was complete. Moreover, as described in Section 2.5.4, turbidity would be monitored during in-water construction, and work would cease as needed to prevent exceedance of the standards approved by the regulatory agencies.

Operations

Less than Significant. During operations, the Project temporarily and periodically would alter the height of the water (stage) at various locations immediately adjacent to the Project facilities. A substantial change in stage could result in the exposure of soils to erosion. As shown in Figure 4.9-3, very little difference is predicted to occur as a result of Project operations. The small change in stage would not result in substantial erosion or siltation.

rrrr. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in on- or off-site flooding.

Less than Significant. Although the Project facilities would occasionally alter the existing hydrology of two specific stream channels in the Delta, the facilities have been designed to avoid the substantial modification of hydrology under high flow (flood) conditions from the Sacramento and San Joaquin River watersheds. As a fundamental operational criterion, the gates would be kept open during the high-flow conditions to permit the passage of the flood flows. This would restore much of the pre-Project channel capacity of the Old River and Connection Slough.

DSM2 was used to model the peak flood event from February 1998 event, which was roughly a 100-year event. The stage hydrographs of the existing and "gates open" conditions for this flood event at the Project barrier on Old River are compared in Figure 4.9-4. As the figure illustrates, the barrier would not increase the flood stage profile at the peak stages immediately upstream or downstream of the barrier.

The stage hydrographs of the existing and gates open conditions for the February 1998 flood event at gage location ROLD014 downstream of the barrier are compared in Figure 4.9-5. The stage hydrographs of the existing and gates open conditions for the February 1998 flood event at Gage location ROLD024 upstream of the barrier are compared in Figure 4.9-6. Figures 4.9-5 and 4.9-6 confirm that the barrier would not increase the flood stage profile at the peak stages within a mile upstream or downstream of the barrier.

The exceedance probability expressed as a percent for river stage at the sites immediately upstream and downstream of the barrier is presented in Figure 4.9-7 for the Old River barrier. Lines are shown for the baseline condition, as well as gates open on the upstream side of the structure and gates open on the downstream side of the structure. The exceedance probability plots support the finding of no impact on flood stage greater than 8.4 feet North American Vertical Datum of 1988 (NAVD88) due to the Project barrier. These results include an inherent conservatism in the analysis due to lack of overtopping of the barrier that would normally occur for flood stages greater than 6.6 feet NAVD88. The 100-year flood stage within Old River is 9.71 feet NAVD88.

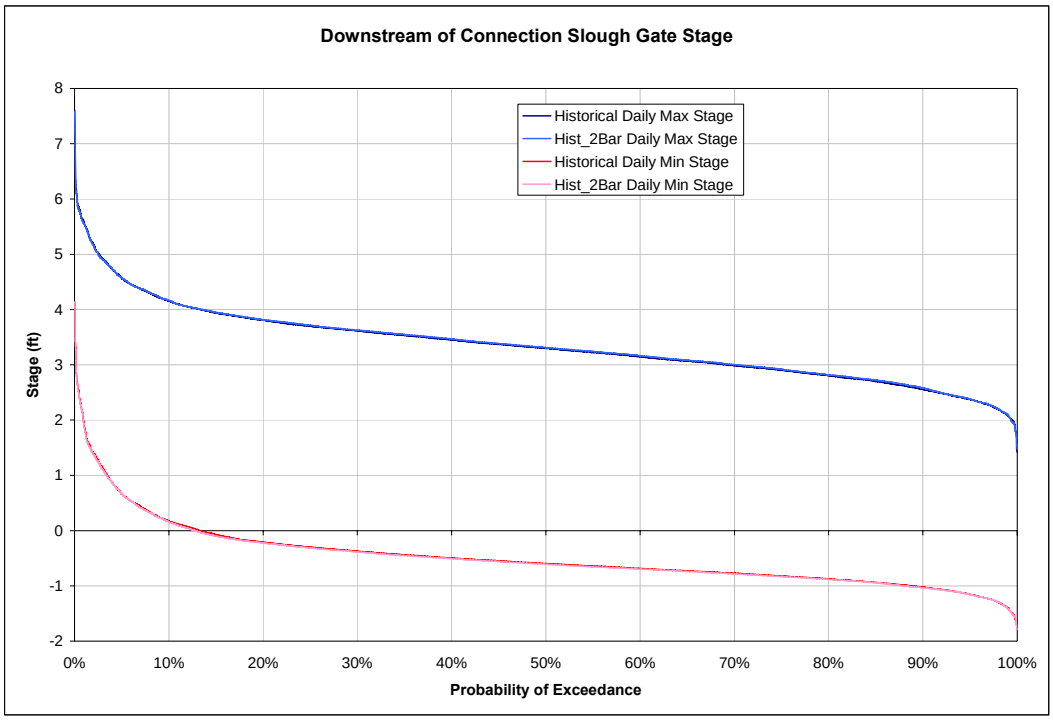


Figure 4.9-3 Change in Low and High Tide Water Surface Elevation near 2-Gates Facilities

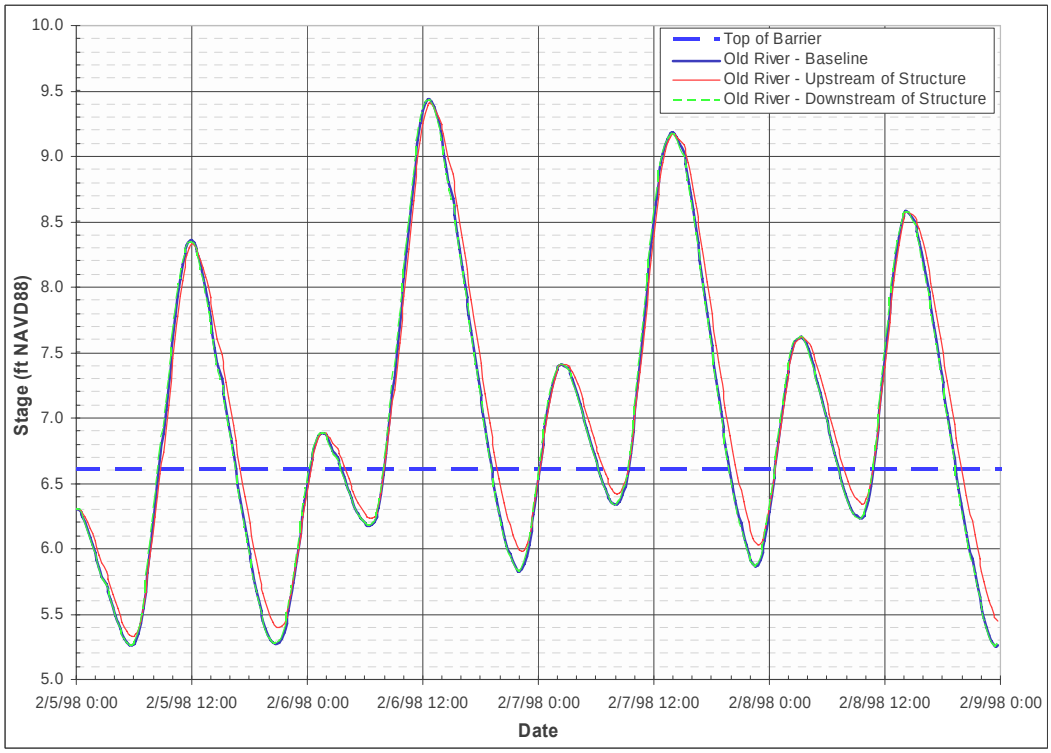


Figure 4.9-4 Stage Profiles for February 1998 Flood Event at Old River—2-Gates Barrier

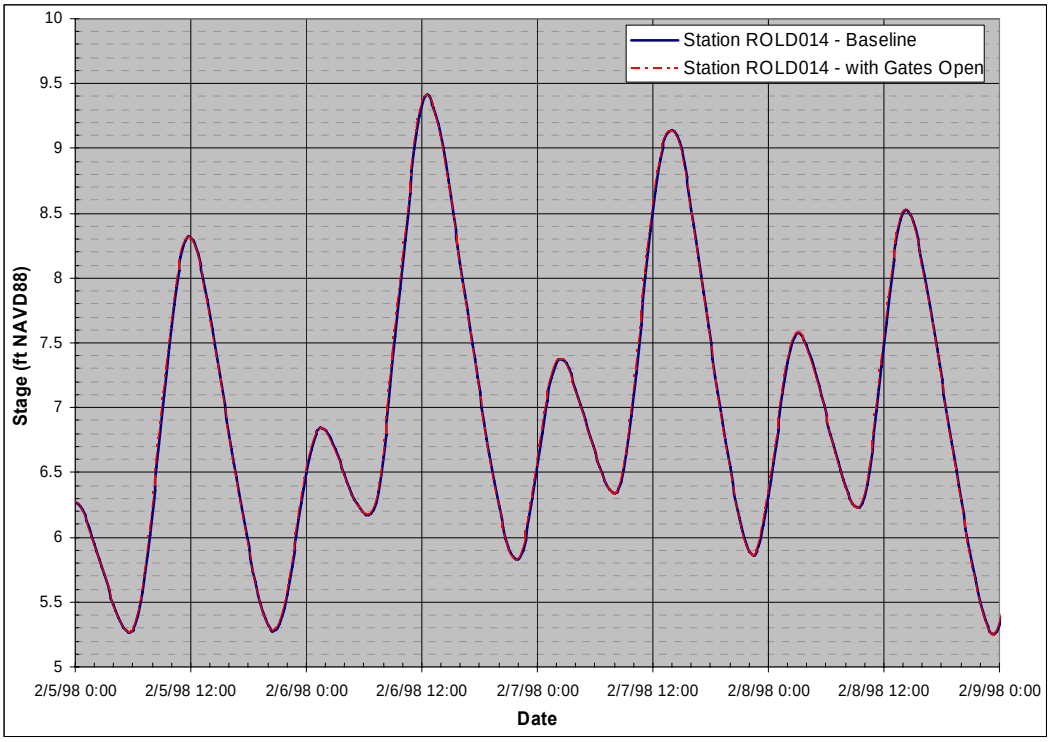


Figure 4.9-5 Stage Profiles for February 1998 Flood Event at Old River Gage Station ROLD014

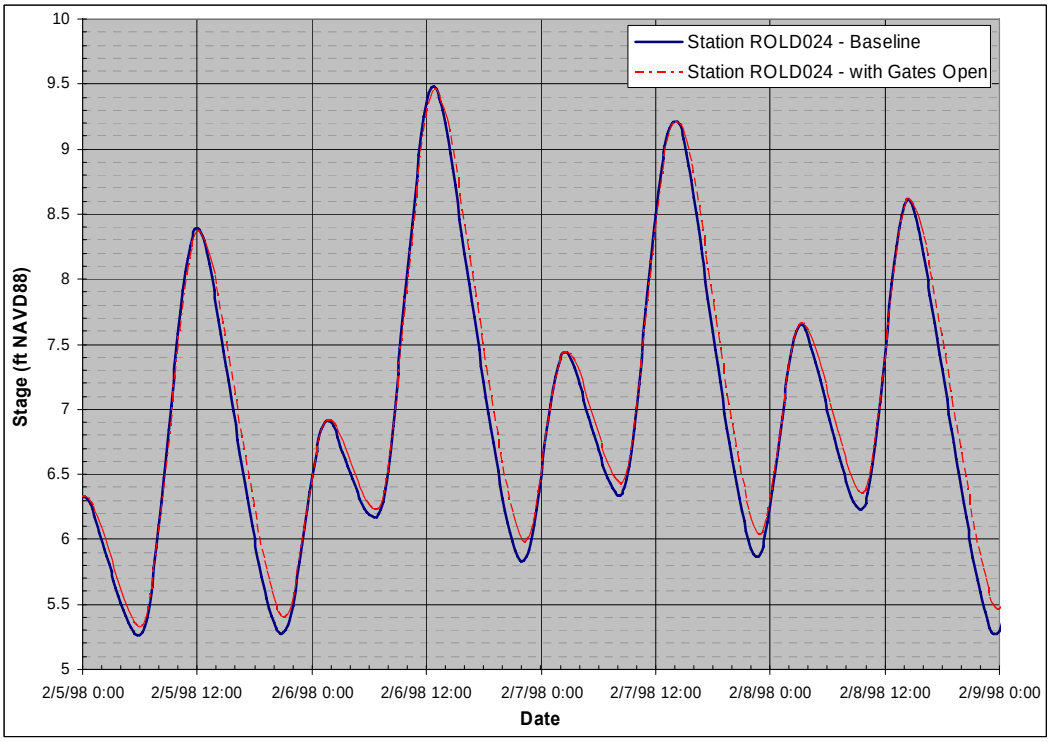


Figure 4.9-6 Stage Profiles for February 1998 Flood Event at Old River Gage Station ROLD024

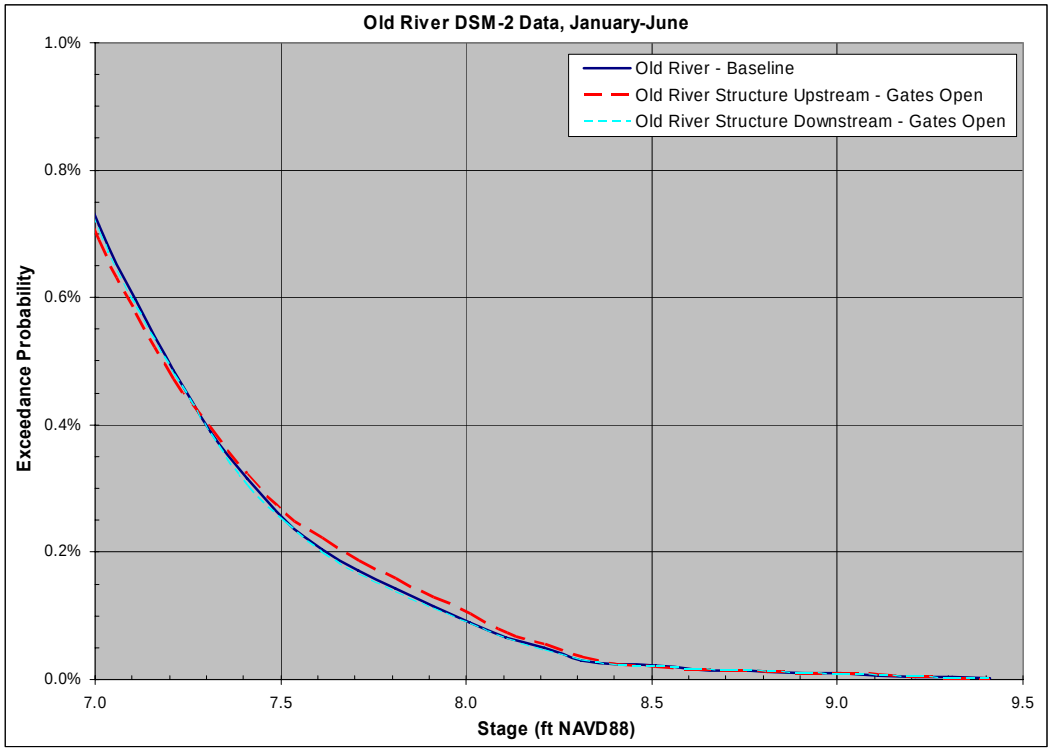


Figure 4.9-7 Exceedance Probabilities for High Stages at Old River—2-Gates Barrier

Additionally, Project facilities, especially the sheet pile materials connecting the Project barriers to the existing levee system, are designed to preclude adversely affecting the existing levee system. This design consideration further minimizes the potential to adversely affect off-site flooding.

ssss. Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.

Less than Significant. No stormwater drainage systems are in place at the Project sites; runoff enters the waterways. The only potential source of runoff water would be associated with dredged material disposal. The channel bottoms would be dredged with a clamshell, and the dredged material would be placed in a bermed disposal site on Bacon Island. Material would be largely dewatered by the time it was placed in the storage area, and the berm would confine any potential runoff. The dredged material is not expected to contain contaminants, such as heavy metals, because it is in a rural area, well-removed from industrial uses. The runoff from the dredge material disposal site would be controlled using standard BMP for such sites.

tttt. Otherwise substantially degrade water quality.

No Impact. No other water quality impacts have been identified. However, the Project would include local and regional water quality monitoring to support all testing and adaptive management of the facilities. Water quality monitoring would be conducted at a series of compliance points and at municipal and agricultural water diversion intakes to identify if changes in water quality occur that are associated with Project operations. If these data identify water quality effects associated with the Project, adjustments to operation criteria would be implemented to minimize salinity or other water quality effects at sensitive locations. Operational adjustments would primarily involve changes to timing and duration of gate opening.

uuuu. Place housing within a 100-year floodplain, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map

No Impact. The Project would not increase the flood stage profile upstream or downstream of the Project facilities and therefore would not alter the relationship of housing within the 100-year floodplain.

vvvv. Place within a 100-year flood hazard area structures that would impede or redirect flood flows.

Less than Significant. Refer to impact discussion (d) above.

wwww. Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam.

Less than Significant. Geotechnical studies are currently underway to evaluate two options: (1) peat removal along the landward side of the levee near the barrier sites and (2) installation of a seepage barrier mat as well as buttress levees. The peat along the landward side of the levees near the barrier sites would be left in place, except in areas of foundation preparation and post-demonstration removal of the Project facilities. The potential for seepage to occur where peat is removed would be prevented by installation of a layer of impermeable material topped with a 5-foot layer of crushed rock to act as a seepage barrier.

xxxx. Result in inundation by seiche, tsunami, or mudflow.

No Impact. A seiche is a long wave-length, large-scale wave action set in a closed body of water such as a lake or reservoir. Seiches can occur during earthquakes and primarily appear to affect elongated and deep (relative to width) bodies of water (Contra Costa County 2005). The waterways affected by the Project are not closed bodies of water; thus, seiches would not occur. Tsunamis are sea waves created by undersea fault movement. In Contra Costa County, the damage potential from tsunamis is greatest near the Golden Gate and decreases to near toward the head of the Carquinez Strait. Therefore, the Project sites would not be affected by tsunamis. Mudflow would not be an issue because construction would occur on levees or on level ground, and no grading would be required.

4.9.3.3 Cumulative Impacts

The proposed Project would result in some beneficial impacts on water quality and would not violate any water quality standards. Any cumulative impacts would be less than significant because the Project includes monitoring procedures to verify that the operable gates would improve water quality. The Project provides the ability to make real-time adjustments to operations based on changing conditions in the Delta, including changes associated with SWP and CVP operations. The Project would not affect groundwater supplies or affect groundwater recharge; therefore, no cumulative impacts would occur. Any erosion and siltation or runoff caused by the Project would be localized and would not contribute to a cumulative impact. The Project is designed in a manner that would not increase the risk of flooding; therefore, no cumulative impacts associated with flooding would occur.

4.10 LAND USE AND PLANNING

Issues & Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
yyyy. Physically divide an established community?	☐	☐	☐	☒
zzzz. Be incompatible with existing land use in the vicinity?	☐	☐	☒	☐
aaaaa. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
bbbbb. Conflict with any applicable habitat conservation plan or natural communities conservation plan?	☐	☐	☐	☒

4.10.1 Environmental Setting

4.10.1.1 Land Uses

The Old River and Connection Slough sites are located in the central Delta, approximately 13 and 16 miles northwest of Stockton, and 4.8 and 6.8 miles north and northwest of Discovery Bay, respectively. Project construction would occur in both Contra Costa and San Joaquin counties. Both the Old River and Connection Slough sites are located in a rural area characterized by agricultural land uses. The study areas on Bacon Island and Mandeville Island are actively farmed, with land surrounding the agricultural fields regularly disked. Portions of Holland Tract are under cultivation; but in the study area, the fields are fallow. Adjacent fields on Holland are utilized as rangeland for cattle. There are several unused structures (old farmhouses) located on Bacon Island in the Old River location; a large barn is located on Holland Tract. There is a structure visible on aerial photography at Mandeville Island near the access bridge. Levees have been constructed along both banks of Old River and Connection Slough. The roads on the Old River levees are private. The road on the Bacon Island side of Connection Slough is public, while the road on Mandeville Island is private.

4.10.1.2 General Plan Designations

In Contra Costa County, the Old River is designated as Water (WA). Uses allowed in the WA designation include transport facilities associated with heavy industrial plants, such as ports and wharves; and water-oriented uses such as boating and fishing. The construction area in Contra Costa County just west of Old River is designated as Delta Recreation (DR).The primary land uses allowed in the DR designation are related to agricultural production and processing activities.

San Joaquin County designates all waterways as Resource Conservation (RC), areas with significant resources that generally are to remain in open space. The Resources Element of the San Joaquin County General Plan (1992) specifies that waterways designated as RC should be developed with waterway dependent uses only.

The construction area in San Joaquin County to the east is designated General Agriculture (A/G). The areas on either side of Connection Slough are designated as A/G. A/G areas are generally committed to agriculture with viable commercial agricultural enterprises that require large land areas to efficiently produce their crops.

4.10.1.3 Zoning

Old River and Connection Slough are waterways and as such do not have zoning designations. The construction area in Contra Costa County just west of Old River is zoned General Agriculture, 5-acre minimum parcel size (A-2). The construction area in San Joaquin County to the east is zoned General Agriculture, 80-acre minimum parcel size (AG-80). The areas on either side of Connection Slough are designated as AG-80. These agricultural zoning designations are established to preserve agricultural lands for the continuation of commercial agriculture enterprises.

4.10.2 Regulatory Setting

Contra Costa and San Joaquin counties regulate land use through zoning and general plan designations, which specify allowable uses, as well as through general plan policies. Key policies related to individual resources are addressed in their respective sections.

4.10.3 Impacts and Mitigation Measures

4.10.3.1 No Project

The No Project alternative would not affect local land uses or planning because no development would occur.

4.10.3.2 2-Gates Project

ccccc. Physically divide an established community

No Impact. The Project would be located in a remote area and would place structures in waterways. It would not physically divide an established community.

ddddd. Be incompatible with existing land use in the vicinity

Less than Significant. The Project is located in an agricultural area and would not be incompatible with existing agricultural uses. Short-term noise and dust emissions would occur during the installation of Project components, but impacts would be less than significant and would not prevent agricultural activities from taking place.

eeeee. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect

The Project would not result in any significant, unavoidable environmental impacts, and with mitigation that would be implemented as part of the Project, it would be consistent with the policies included in the Contra Costa and San Joaquin County General Plans; moreover, it is intended to be a conservation project that would improve conditions for delta smelt and other sensitive species and thus is consistent with policies and regulations requiring the protection of such species. The Project is a water-dependent use and is consistent with the WA and RC designations established by Contra Costa and San Joaquin counties.

fffff. Conflict with any applicable habitat conservation plan or natural communities conservation plan

No Impact. The East Contra Costa County Habitat Conservation Plan boundaries exclude the 2-Gates Project area. The SJMSCP covers all of San Joaquin County, so portions of the 2-Gates Project fall within the SJMSCP area. The proposed Project activities, however, would not be "covered activities" under the SJMSCP, and the Project would not conflict with the goals of the plan. It, too, is a conservation plan intended to benefit sensitive species.

4.10.3.3 Cumulative Impacts

The 2-Gates Project is a water-based project and would not result in land use changes. No cumulative impacts would occur.

4.11 MINERAL AND ENERGY RESOURCES

Issues & Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
ggggg. 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?	☐	☐	☐	☒
hhhhh. 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?	☐	☐	☐	☒
iiiii. Conflict with adopted energy conservation plans?	☐	☐	☐	☒

4.11.1 Environmental Setting

No mineral resources are present at the areas affected by construction at either the Old River or Connection Slough sites (Contra Costa County 2005, San Joaquin County 1992). Peat removal occurs in some areas, but has not been identified as a use at the Project sites.

4.11.2 Regulatory Setting

The California Surface Mining and Reclamation Act of 1975 (SMARA) includes a process called "classification-designation." The purpose of this process is to provide local agencies with information about the location, need for, and importance of mineral resources within their jurisdictions. Pursuant to SMARA, the California State Mining and Geology Board uses the Mineral Resource Zone system to classify California's mineral resources. These zones are based on the presence of significant aggregate deposits. Aggregates are used in the production of building materials, such as concrete, asphalt, and cement.

The Contra Costa and San Joaquin County General Plans contain policies intended to protect mineral resources.

4.11.3 Impacts and Mitigation Measures

4.11.3.1 No Project

The No Project alternative would not result in impacts on mineral resources because no development would occur.

4.11.3.2 2-Gates Project

jjjjj. 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. No impacts would occur because no mineral deposits are present at either of the Project sites.

kkkkk. 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. No impacts would occur because no mineral deposits are present at either of the Project sites.

IIIII. Conflict with adopted energy conservation plans

No Impact. The Project would require energy during construction and operations (e.g., to power the lights in the operator house, flood lights, and operate the gates), but it would not use energy in a wasteful manner and would not conflict with any adopted energy conservation plans.

4.11.3.3 Cumulative Impacts

No cumulative impacts would occur because no mineral deposits are present at either of the Project sites.

4.12 NOISE

Issues & Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project result in:				
mmmmm. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☒	☐	☐
nnnnn. Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
ooooo. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
ppppp. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
qqqqq. For a project located within 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?	☐	☐	☐	☒
rrrrr. For a project within the vicinity of a private air strip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

4.12.1 Environmental Setting

4.12.1.1 Fundamental Noise Principles

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. Several noise measurement scales are used to describe noise in a particular location. A decibel (dB) is a unit of measurement that indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 dB represents a 10-fold increase in acoustic energy, while 20 dB is 100 times more intense, 30 dB is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10-dB increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities.

There are several methods of characterizing sound. The most common is the A-weighted sound level, or dBA. This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This energy-equivalent sound/noise descriptor is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

Because the sensitivity to noise increases during the evening and at night—excessive noise interferes with the ability to sleep—24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The Community Noise Equivalent Level (CNEL) is a measure of the cumulative noise exposure in a community, with a 5-dB penalty added to evening (7:00 p.m. to 10:00 p.m.) and a 10-dB addition to nocturnal (10:00 p.m. to 7:00 a.m.) noise levels. The Day/Night Average Sound Level (L_{dn}) is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this 3-hour period are grouped into the daytime period.

4.12.1.2 Existing Conditions

The Project site is located in a remote rural area. Primary sources of noise are agricultural activities on adjacent farmlands, although the use of power boats also would cause periodic noise increases. The EPA has indicated that background noise levels are generally near 44 to 45 dBA L_{dn} in agricultural cropland (EPA 1978). Some land uses are generally regarded as being more sensitive to noise than others due to the types of population groups or activities involved. Single- or multiple-family residences, schools, hospitals, churches, and public libraries are typically considered to be noise-sensitive receptors. The nearest known sensitive receptors are liveaboards at the marina located approximately 4,120 feet south of the Old River site. There are no noise-sensitive land uses near the Connection Slough site.

4.12.2 Regulatory Setting

Noise is regulated at the local level through policies and standards included in the Noise Elements of the Contra Costa and San Joaquin County General Plans. The Contra Costa General Plan specifies that noise levels in agricultural areas are normally acceptable up to 75 dBA (L_{dn} or CNEL) and conditionally acceptable up to 80 dBA. Noise levels in residential areas are normally acceptable up to 60 dBA and conditionally acceptable up to 70 dBA. Policy 11-9 states that: "Construction activities shall be concentrated during the hours of the day that are not noise-sensitive for adjacent land uses and should be commissioned to occur during normal work hours of the day to provide relative quiet during the more sensitive evening and early morning periods." (Contra Costa County 2005)

The San Joaquin County General Plan Public Health and Safety Element, Section D, Noise, does not address construction noise, but indicates that the hourly equivalent sound level from stationary noise sources shall be 50 dB during the daytime and 45 dB during the nighttime for outdoor activity areas for residential development and that the maximum sound level from stationary sources shall be 70 dB during the nighttime at such areas (San Joaquin County 1992). The San Joaquin County Code, Part 9-1025.9 also contains noise standards. It exempts construction noise from the provisions of the noise chapter, as long as construction activities do not take place before 6 a.m. or after 9 p.m. on any day. Maximum allowable noise exposure at residential outdoor activity areas from stationary noise sources is 50 dB L_{eq} from 7 a.m. to 10 p.m. and 45 dB L_{eq} from 10 p.m. to 7 a.m. The maximum sound level (L_{max}) during these periods is 70 dB and 65 dB, respectively.

4.12.3 Impacts and Mitigation Measures

4.12.3.1 No Project

The No Project alternative would not affect noise because no development would occur.

4.12.3.2 2-Gates Project

The Project would generate noise primarily through the installation of Project components. The construction equipment and activities are those identified in Section 4.3, Air Quality.

sssss. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies

Less than Significant with Mitigation Incorporated. Noise from a point source, such as a construction site, attenuates, or is reduced, by about 6 dBA for every doubling of the distance. Noise at the marina south of the Old River site would attenuate to 59 L_{dn} or CNEL, which is within the limits of what Contra Costa County considers acceptable in residential locations. Given the short-term nature of this impact, it is considered less than significant.

There are no residential outdoor activity areas near the Connection Slough site, and the Project would not create stationary noise sources at this site; therefore, Project construction would not expose persons to or generate noise levels in excess of established San Joaquin County noise standards.

ttttt. Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels

No Impact. The principle Project construction activities that would generate vibration are those associated with vibration pile driving. However, this vibration would be transmitted through the water to the shore. The transmission of these vibrations to groundborne vibrations would be reflected back into the water and refracted into the earth, thereby substantially reducing the vibration sensations. General construction activities that generate groundborne vibrations include impact pile driving, vibratory rollers, and bulldozers, and would not be used for this Project. The vibration pile driver typically results in an approximate vibration velocity level (velocity in decibels or VdB) of approximately 93 VdB at 25 feet (FTA 2006). The nearest receptors are residents of live-aboards (at approximately 4,120 feet from the Old River site). These water-based live-aboards would not be subject to levels of vibration that would be considered to exceed the human annoyance threshold of 75 VdB (FTA 2006).

uuuuu. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project

Less than Significant The Project would not create permanent noise sources. Two small generators would be operated intermittently at the Old River and Connection Slough sites until PG&E power is available to provide electric power to the sites. Noise emitted by the generators would attenuate to inaudible levels at the marina to the south of the Old River site. There are no noise-sensitive land uses near the Connection Slough site; therefore, noise emitted by Project generators would not adversely affect noise-sensitive receptors.

vvvvv. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project

Less than Significant with Mitigation Incorporated. Refer to (a) above.

wwwww. For a project located within 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. The Project sites are not located within an airport land use plan or within 2 miles of a public airport.

xxxxx. For a project within the vicinity of a private air strip, would the project expose people residing or working in the project area to excessive noise levels

No Impact. The Project sites are not located within the vicinity of a private air strip.

4.12.3.3 Cumulative Impacts

Noise impacts are highly localized. No other Projects would be located in the same general location as the 2-Gates Project, and no cumulative impacts would occur.

4.13 POPULATION AND HOUSING

Issues & Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
yyyyy. Induce substantial 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)?	☐	☐	☐	☒
zzzzz. Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
aaaaaa. Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

4.13.1 Environmental Setting

The Project is in a rural portion of Contra Costa and San Joaquin counties that does not contain occupied housing. The nearest populated area, other than live-aboards in the marinas located about 0.8 and 1.8 miles from the Old River site, is the in the city of Oakley, about 2.4 miles west of the Old River site.

4.13.2 Regulatory Setting

No federal, state, or local regulations regarding population and housing are directly applicable to this Project.

4.13.3 Impacts and Mitigation Measures

4.13.3.1 No Project

The No Project alternative would have no impacts on population or housing because no construction would occur.

4.13.3.2 2-Gates Project

bbbbbb. Induce substantial 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. Approximately 30 construction workers would be required to construct the Project facilities over a seven-week period. Given the small number of workers involved and the brief construction schedule, these workers would readily be available from the local population, and no influx of workers would be required. The only new permanent workers would be the gate operators, who would be required only from November to July. These workers could be drawn from the local population. No residences would be constructed as part of this Project, nor would infrastructure be extended into an area where it did not already exist. If electric power were used to operate the Project generators, it would be drawn from power lines that are already present at the sites.

cccccc. Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere

No Impact. No housing is present in the areas where Project construction would occur, and no housing would be displaced.

dddddd. Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere

No Impact. The Project is not located in a populated area, and no people would be displaced.

4.13.3.3 Cumulative Impacts

No cumulative impacts would occur because the Project would have no impacts on population or housing.

4.14 PUBLIC SERVICES

Issues & Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
eeeeee. Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☒	☐
Police protection?	☐	☐	☒	☐
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

4.14.1 Environmental Setting

This section focuses on fire and police protection because the Project would not result in population growth or otherwise affect schools, parks, or other public facilities.

4.14.1.1 Fire Protection

The Old River site is under the jurisdiction of the East Contra Costa Fire Protection District. The nearest fire station to the site is Station Number 58, located in Discovery Bay. However, the Marine Fire and Rescue Division operate out of two other stations, one on Bethel Island and the other in Knightsen. Twelve firefighters are assigned to these two stations and staff the 33-foot Fire Rescue Boat. In addition to the Fire Rescue Boat, the East Contra Costa Fire Protection District operates both Type I and Type III Fire Engines. Response time for a fire emergency is 6 minutes in most areas protected by the District (East Contra Costa Fire Protection District 2008). San Joaquin County also maintains a fire department in Isleton, located about 12 miles north of Connection Slough staffed by one career professional and 27 volunteers. Multiple stations also are located in Stockton.

4.14.1.2 Police Protection

The Project sites are under the jurisdiction of both the San Joaquin County and Contra Costa County Sheriff's Departments. The San Joaquin Sheriff Department Boating Safety Unit is the nearest unit that would respond to an emergency at the Project sites. This six-person unit is responsible for surveying over 700 miles of rivers and waterway in the Delta and is stationed at West Buckley Cove in Stockton, approximately 9 miles east of the Connection Slough site (actual miles traveled would be greater due to turns in river channels). Regular patrol units of the San Joaquin Sheriff Department operate out of the main station in French Camp (about 16 miles east of Connection Slough) and consist of 124 deputies divided between 8 patrol teams which patrol the county 24 hours a day, 7 days a week (San Joaquin County Sheriff 2008). The Contra Costa County Sheriff Department Marine Patrol is responsible for patrolling over 200 miles of linear coastline from Richmond to Discovery Bay. The nearest Marine Patrol station to the Project is the Delta Station located in Oakley, approximately 7 miles northwest of the Old River site (Contra Costa County 2008).

4.14.2 Regulatory Setting

No federal or state regulations are applicable to police or fire protection in the Project area. Both Contra Costa and San Joaquin counties establish appropriate service ratios.

4.14.3 Impacts and Mitigation Measures

4.14.3.1 No Project

The No Project alternative would have no impacts on public services because no development would occur.

4.14.3.2 2-Gates Project

ffffff. Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services

Less than Significant. The Project could result in increased demand for fire and police services during construction and operations in the event of accidents requiring emergency response. Such a demand is typical of all construction activities and would be within the capabilities of the local and regional emergency response providers. Operation of the gates does not pose a particular risk, and no increased staffing of police or fire departments would be required. As discussed in Section 4.16, the marine patrols would be granted 24-hour access through the gates, and it would not be necessary to construct new facilities as a result of the Project.

4.14.3.3 Cumulative Impacts

The Project would potentially result in a minor increase in the demand for police and fire protection services during the brief construction periods that would occur each year, but this minor, short-term potential increase would not require increased public services or new facilities and would not be cumulatively considerable (significant) in combination with the impacts of other projects in the area.

4.15 RECREATION

Issues & Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
ggggggg. Affect existing recreational opportunities?	☐	☒	☐	☐
hhhhhh. Would the project 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?	☐	☐	☒	☐
iiiiii. Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☒	☐

4.15.1 Environmental Setting

The Delta provides a wide variety of public recreational opportunities including motorized boating, fishing, camping, sailing, hunting, windsurfing, and waterskiing. The Delta accommodated approximately 6.5 million user days in 2000, while visitation is projected to increase to about 8 million user days in 2020 (Cal Boating 2002). A statewide survey of registered boat owners found that 30 to 40 percent of boaters who visit the Delta recreate in the winter months, compared to over 80 percent in the summer. Roughly two-thirds of those interviewed recreated in the Delta during the spring. Duck hunting is a popular activity on the weekends and holidays in the area in the fall and early winter; there is also some hunting on the weekdays at hunting clubs (DFG 2008).

The Old River and Connection Slough sites are in an area that the California Department of Boating and Waterways (Cal Boating) defines as the West Zone (one of six recreation zones in the Delta). Over half of the total acres of navigable waters in the Delta are in the West Zone, which encompasses the Old River and portions of the Middle River. This zone contains approximately 152 linear miles of navigable waterways, and is considered the water recreation hub of the Delta. About 15 percent of the total visitation in the Delta is in the West Zone. This zone contains over half of the 95 marinas in the Delta and the greatest number of boats on the water. Two marinas are located approximately 0.8 and 1.7 miles south and southwest of the Old River site (Holland Riverside Marina and Linquist Landing/Rock Slough Resort), and 21 additional marinas are located at Bethel Island, on the northwest side of Holland Tract. The West Zone is noted for fishing, sailing, and windsurfing; waterskiing is not as popular as in other zones in the Delta, although it does occur (Cal Boating 2002). A number of large vessels also are docked at Discovery Bay.

Boats are currently able to travel on the Old River between Bacon and Holland islands and on Connection Slough between Bacon and Mandeville Islands throughout the year, although a bridge just west of the Connection Slough site must be opened to allow large vessels to pass. Although the general area appears to be popular with boaters, no specific visitation information is available for the areas directly proximate to the proposed gate sites. Also, no specific information is available regarding the routes boaters travel when in the area. A Contra Costa County Sheriff's Department representative indicated that the Old River area is heavily used by recreational boaters, including water skiers and wakeboarders and those using personal watercraft. Some yachting also occurs. Connection Slough is less heavily used than Old River (personal communication, D. Powell 2008).

4.15.2 Regulatory Setting

The U.S. Coast Guard (USCG) manages maritime mobility as one of its missions and is the lead federal agency on waterways management. USCG creates guidelines (such as for signage or lighting) that are

subsequently incorporated by reference by Cal Boating, a state agency whose mission, in part, is providing safe and convenient public access to California waterways. The Project's waterway markers must be consistent with USCG standards (included in California Boating Law, Title 14, Article 6, Waterway Marking System). Each USCG District also prepares weekly Local Notices to Mariners, which are the primary means for disseminating information concerning aids to navigation, hazards to navigation, and other items of marine information of interest to mariners on the waters of the United States, including the Old River and Connection Slough. Specific types of information include reports of channel conditions, obstructions, hazards to navigation, dangers, restricted areas, and similar items. The Project must comply with California Harbors and Navigation Code, Section 660, which states that except in emergencies, any measure relating to boats or vessels adopted by any governmental entity other than Cal Boating shall be submitted to the department prior to adoption and at least 30 days prior to the effective date thereof. No local regulations relating to recreational boating are applicable to the Project.

4.15.3 Impacts and Mitigation Measures

4.15.3.1 No Project

The No Project alternative would not result in impacts to recreation because no development would occur.

4.15.3.2 2-Gates Project

jjjjjj. Affect existing recreational opportunities

Less than Significant with Mitigation Incorporated. Boating is the only recreational activity that would be affected by the Project. The Project would place temporary, operable gates across Old River and Connection Slough that would affect boaters by:

- Obstructing passage during construction
- Causing a delay for vessels requiring passage through the barriers while the gates are closed
- Limiting the maximum vessel size to the clear channel dimensions provided by the gate opening (75 feet at Old River and 60 feet at Connection Slough)
- Increasing the local current velocity through the gate opening due to the constriction of the channel cross-section
- Adding an obstruction to the river channels

Obstructing Passage during Construction

Most construction would occur within the Old River and Connection Slough river channels. Construction equipment, such as barges and dredges could obstruct vessel passage, as could the actual placement of the barge-gates. As discussed in Section 2.4.3.2, however, during construction, the contractor would be required to maintain vessel access as needed. Notices of construction would be posted at local marinas and in the Local Notice to Mariners. Navigational markers would be used to prevent boaters from entering the construction area, and speed limits would be posted. Safe vessel passage procedures would be coordinated with the USCG and Cal Boating.

Potential Delays

The Project has the potential to affect existing recreational opportunities by impeding vessel passage at certain times. Recreational vessel passage on the Old River section is of greater concern than along Connection Slough due to the higher volume of traffic. In 2009, the gates would be installed in the fall and early winter.

In 2009 through 2014 it is anticipated that the Project facilities would remain in place with gates in an open position from July through November. No restrictions to boater access would occur if the gates were removed at the end of the demonstration phase.

Facilities operations are described in Section 2. The gates would be operated to maximize the protection of aquatic resources. When the gates were open for such purposes, all vessels could pass and be minimally impeded. From Memorial Day through the end of June, the gates would be open on weekends, further facilitating access to the rivers.

The gate system was designed to be sufficiently flexible to allow for vessel passage as needed. Smaller vessels (24 feet or smaller and 10,000 pounds or less) could use the boat ramps, trailers, and tow vehicles that would be available to portage around the barrier while the gates are closed. Larger vessels that need to move through this part of the central Delta while the gates are closed could be accommodated by opening the gate briefly to allow passage; smaller recreational vessels in the vicinity could pass at this time as well. The gates would be manned and operated 24 hours per day. Depending upon vessel timing and density, a passage schedule may be developed to allow commercial and recreational users to schedule trips through the barriers. All major vessel users would be notified of the schedule.

Limits to Vessel Size

The vessel passage is being designed with a 75-foot clear channel, which is sufficiently large to accommodate the large recreational vessels that use the area (Moffatt & Nichol 2008). Such vessels are currently passing through a 75-foot-wide navigation opening at the Orwood Railroad Bridge, which is just south of the Old River barrier site.

Increased Local Current Velocity

The gates could be opened within minutes, providing sufficient time for the water levels to equalize and to ensure safe navigation through the gate. A boat safety exclusion zone would be established to keep small boats clear of the closed gates in case the gates began to open, both to avoid gate swing and changes in current velocity.

Channel Obstruction

Signage would comply with navigation requirements established by the U.S. Aids to Navigation System and the California Waterway Marker system. As noted above, a boat safety exclusion zone would be established to keep small boats clear of the closed gates to prevent collisions in case the gates began to swing open and to prevent accidents resulting from changes in current velocity. The exclusion zone would also keep small boats clear of the upstream side of the barrier during floods when the barrier is spilling and boats could be swept over the barrier. Channel markers also would be installed to show that the center opening (between the gate pivot posts) is the only navigable opening in the structure, and the side openings are not to be used (between the pivot post and the abutment). Gate structure markers would be used to indicate the limits of the structure and to indicate when the gate was closed or open to vessel traffic. The marker system would function for both day and night operation, and in times of reduced visibility (fog). Three sets of flood lights also would be included in the design, allowing the eastern and western gates and boat ramp to be illuminated.

A fender system is proposed to provide protection to the gate structure resulting from potential vessel impact. A range of protection levels are being considered to address this risk in a prudent and cost-effective manner. The fenders would consist of six timber pile dolphins constructed at each site. Three fenders would be placed at the sides of the navigation channels on the upstream and on the downstream approaches to the gates approximately 40 feet from the face of the barge. Vessel and recreational boating traffic intending to pass

through the gates would enter the channel aligned with the gate opening and would not change direction until it has passed through.

Summary of Impacts

The Project would have minimal effect on recreation from December through February because gate closures would last approximately 1 hour per day. From March through June, gate closures would be tidally driven and gates would be closed approximately 50 percent of the time. As described above, small vessels would be able to portage around the barrier using the boat ramps, trailers, and tow vehicles. The Project facilities would not substantially reduce the channel area available to recreational boating.

Recreational and commercial boaters that wish to traverse the Old River or Connection Slough sites would be able to pass through Project facilities on a scheduled basis depending on the time of year, as described above. The Project has been designed to allow access by vessels up to 75 feet wide at Old River and up to 60 feet wide at Connection Slough, which would accommodate the types of vessels that use the affected river channels. Changes in current velocity would not pose a hazard to boaters because the water would equalize during the three minutes it would take for the gates to open. The Project would comply with all navigation marking requirements imposed by the USCG and Cal Boating. Nonetheless, the delay in access to the Old River and Connection Slough that would periodically occur when the gates were closed is considered a potentially significant impact. The following measures would provide information about gate closures to recreational and commercial boaters to allow them to plan their trips to occur when gates are open or provide notice to the gate operator so that gates could be opened. Implementation of these measures would help boaters avoid delays and would mitigate this impact to less than significant.

Mitigation Measure REC-1: DWR and/or Reclamation will keep the Sector Waterways Management Division (USCG Station Yerba Buena Island) informed about the Project, so that relevant information regarding the gates, methods of vessel passage, expected closure schedule, and duration of barrier installation activities is included in the Local Notice to Mariners as appropriate. The USCG also will update navigation charts as appropriate.

Mitigation Measure REC-2: An interpretative program will be implemented to inform boaters of the purpose of the Project, expected duration of installation activities and gate closures, and operational characteristics of the gates. The program will include notices in local newspapers and boater publications as appropriate; notices also will be posted at local marinas and boat launches.

kkkkkk. b. 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

Less than Significant. The Project would not significantly affect other nearby or outlying recreation facilities. Some boaters may choose to launch their boats at other private facilities while the gates are closed, but fees paid by the boaters would offset any deterioration that might result. Public recreational facilities would not be affected. Some boaters might choose to take different routes during periodic gate closures, but this would not result in the deterioration of any recreational facilities.

llllll. c. Include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment

Less than Significant. The Project includes boat ramps, navigation markings, and other measures to facilitate the safe passage of vessels while the Project facilities are in place. The Project would not require the construction or expansion of other recreational facilities.

4.15.3.3 Cumulative Impacts

Both the South Delta Improvements Project (SDIP) and Franks Tract Project would add barriers across Delta waterways. The SDIP would replace three seasonal rock gates with permanent operable flow gates on Middle River, Grantline Canal and Old River (near the city of Tracy). The permanent gates (except the Middle River gate) will feature boat locks to avoid any potential adverse effects to Delta boaters. This project has completed its environmental review, which concluded that the project will be a net improvement to the existing rock gates, which have seasonal boat ramps at gate sites. No adverse effects to boating or recreation are expected from SDIP.

The Franks Tract project involves installing and operating flow control gates on up to two Delta waterways (3 Mile Slough and West False River). Four flow control gate locations on 3 Mile Slough are under consideration: 1) approximately 700 feet east of the State Route 160 bridge; 2) approximately 4,100 feet from the bridge; 3) approximately 8,600 feet north of the southwestern corner of Twitchell Island along 3 Mile Slough, and 4) approximately 1,600 feet north of the southwestern corner of Twitchell Island along 3 Mile Slough. On West False River, only one flow control gate location is being considered, approximately 1,800 feet east of the confluence with the San Joaquin River. Boat passage facilities would be installed to allow boat movement during periods when gates are operating. Cumulative impacts of these projects in combination with those of the proposed Project would be less than significant because each incorporates boat passage into the Project design.

4.16 TRANSPORTATION / TRAFFIC

Issues & Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
mmmmmm. Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☐	☐	☒	☐
nnnnnn. Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☐	☐	☒	☐
oooooo. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
pppppp. Substantially increase hazards to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☒	☐
qqqqqq. Result in inadequate emergency access?	☐	☐	☒	☐
rrrrrr. Result in inadequate parking capacity?	☐	☐	☐	☒
ssssss. Conflict with adopted policies supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒
tttttt. Result in rail, water borne or air traffic impacts?	☐	☐	☒	☐

4.16.1 Environmental Setting

4.16.1.1 Ground Transportation

The general Project area is accessed by SR 4, which begins in Hercules and passes through Martinez, Concord, Pittsburg, Antioch, and Oakley before intersecting with Interstate 5 in Stockton. Traffic counts at selected intersections in these communities are shown in Table 4.16-1. Local access roads to the Old River and Connection Slough sites are shown on Figure 2-2. The levee on Holland Tract is on the west bank of Old River and is accessible by road by proceeding through the Town of Knightsen and crossing Delta Road Bridge on Delta Road. Access to the Old River Project site is on a private road. The east side of Old River is accessible through West Bacon Island Road through an unpaved section of road approximately 10 miles from SR 4. The Bacon Island levee on Connection Slough is accessible by taking Bacon Island Road off SR 4. Mandeville Island can be accessed by a private bridge at Connection Slough.

Table 4.16-1 SR 4 Traffic Counts at Selected Intersections

Description	Back Peak Hour	Back AADT	Ahead Peak Hour	Ahead AADT
Hercules, Junction Route 80			3400	38,000
Junction Route 680	8000	89,000	7000	86,000
Concord, Port Chicago Highway West	7100	97,000	11,700	159,000
Pittsburgh, Railroad Avenue Interchange	8800	126,000	7900	114,000
Antioch, Contra Loma Boulevard Interchange	7800	112,000	7200	104,000
Oakley Road	2450	35,000	2150	30,500
Brentwood, South City Limits	1550	16,900	1900	20,600
Discovery Bay Boulevard	1550	19,600	820	9200
Contra Costa/San Joaquin County Line	830	9200		
Contra Costa/San Joaquin County Line			830	9200
Stockton, South Junction Route 5	2850	29,000	2050	17,200
Stockton, North Junction Route 5	2050	17,200	7200	88,000
Source: Caltrans, 2007 Traffic Counts				

4.16.1.2 Vessel Transportation

The inundated portions of the Connection Slough and Old River Project sites are navigable from the San Joaquin River. Boats are currently able to travel on the Old River between Bacon and Holland islands and on Connection Slough between Bacon and Mandeville Islands throughout the year, although the bridge just west of the Connection Slough site must be opened to allow large vessels to pass. Per USC Title 33: Navigation and Navigable Waters, Section 117.150, the drawbridge shall open on signal from May 1 through October 31 from 6 a.m. to 10 p.m., and from November 1 through April 30 from 9 a.m. to 5 p.m. At all other times, the draw shall open on signal if at least four hours notice is given to the drawtender during regular operating hours, or to the Rio Vista bridge across the Sacramento River, mile 12.8. The draw shall open on signal if at least one hour notice is given for emergency vessels owned, operated or controlled by the United States or the State of California, for commercial vessels engaged in rescue or emergency salvage operations, or for vessels in distress.

Although the general area appears to be popular with boaters, no specific visitation information is available for the areas directly proximate to the proposed gate sites. Also, no specific information is available regarding the routes boaters travel when in the area. A Contra Costa County Sheriff's Department representative indicated that the Old River area is heavily used by recreational boaters, including water skiers, wakeboarders, and those using personal watercraft. Some yachting also occurs. Connection Slough is less heavily used than Old River (personal communication, D. Powell 2008).

4.16.2 Regulatory Setting

No federal regulations are relevant to the ground transportation impacts associated with the Project. The California Department of Transportation (Caltrans) has authority over the state highway system, including mainline facilities, interchanges, and arterial state routes. Caltrans approves the planning and design of improvements for all state-controlled facilities. Both Caltrans and local jurisdictions generally assess the impact of long-term, not short-term, traffic conditions. Plans and policies included in the Contra Costa and San Joaquin County General Plans related to transportation seek to plan for and accommodate future growth and the vehicular, transit, pedestrian, and bicycle demand associated with that growth and are not applicable to short-term construction traffic, the primary source of traffic associated with the Project. Federal and state regulations relating to vessel traffic are described under Section 4.15, Recreation.

4.16.3 Impacts and Mitigation Measures

4.16.3.1 No Project

The No Project alternative would not affect either ground transportation or vessel transportation because no development would occur.

4.16.3.2 2-Gates Project

uuuuuu. Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)

Less than Significant. Most materials would be delivered to the site via barge. A maximum of four to eight daily truck trips would be required during the installation of the Project components, and approximately 60 daily trips would be associated with the up to 30 construction workers. During operations, trips would be limited to those associated with any inspection or maintenance that was required and trips generated by the operators arriving at and departing the control house at each of the sites. SR 4 is a heavily traveled road, and very little traffic is expected on local roads that allow access to the Project sites due to their remote location. The minor number of trips periodically generated by the Project would not cause a perceptible increase in traffic or affect the capacity of the street system.

vvvvvv. b. Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways

Less than Significant. The minor amount of intermittent traffic generated by the Project would not exceed any level of service standards.

wwwwww. c. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks

No Impact. The Project would not affect air traffic patterns.

xxxxxx. d. Substantially increase hazards to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)

Less than Significant. The Project would be located in a remote area and would not involve any design features that would affect roadways. Farm equipment could be present in the vicinity of each of the sites, but Project construction activities would be confined to limited areas and would not conflict with the equipment use. Any impacts to levee roads, associated maintenance roads and access roads that result from land based construction equipment use would be restored to pre-construction conditions. For example, it may be necessary to grade and apply gravel to the Holland Tract access road. It may be necessary to grade and gravel the access road across Bacon Island to the dredge disposal site. It may be necessary to pave small sections on the Bacon Island road between SR 4 and Connection Slough to ensure safe passage of land based construction equipment.

As discussed under Section 4.15, Recreation (a), the Project would comply with navigation requirements established by the U.S. Aids to Navigation System and the California Waterway Marker system, and therefore would not substantially increase hazards to navigation. Barges would be used to transport equipment to the Project sites, but they are commonly used on Delta waterways and would not substantially increase hazards to navigation.

yyyyyy. e. Result in inadequate emergency access

Less than Significant with Mitigation Incorporated. Passage along the levee roads in the immediate vicinity of the Old River and Connection Slough sites would be restricted during the construction period, but this area is remote, and the likelihood of emergency access being required is low. On Bacon Island, it is possible that one traffic lane could be kept open, but the roads are narrow on Holland Tract and Mandeville Island, and this may not be feasible at those locations. Impacts would be lessened during subsequent installation and removal because some of the sheet pile would be left in place and less would be located within the construction laydown area. This impact is considered potentially significant because there is a potential for emergency access to be restricted, but it would be reduced to less than significant given the implementation of the following mitigation measure:

Mitigation Measure TRANS-1: DWR/Reclamation will coordinate with the Contra Costa and San Joaquin County Sheriffs and Fire Departments to notify them of the construction schedule and identify alternative access methods if needed.

As discussed in Section 4.15, Recreation, the gates would restrict access to Old River and Connection Slough while they were closed, but they could be opened in about three minutes. They would be manned and operated 24 hours per day to accommodate any potential emergency and would be opened or closed at the request of the Contra Costa County Sheriffs office or the USCG. Thus, any impacts associated with emergency access requiring the use of waterways would be less than significant.

zzzzzz. f. Result in inadequate parking capacity

No Impact. Workers would park onsite and would not affect parking capacity elsewhere.

aaaaaaa. g. Conflict with adopted policies supporting alternative transportation (e.g., bus turnouts, bicycle racks)

No Impact. The Project would not affect policies supporting alternative transportation.

bbbbbbb. h. Result in rail, water borne or air traffic impacts

Less than Significant with Mitigation Incorporated. Rail and air traffic would not be affected by the 2-Gates Project. Sheriff and USCG vessels pass through Old River frequently and occasionally pass through Connection Slough. The vessel passage is being designed with a 75-foot clear channel and Old River and a 60-foot channel at Connection Slough, and discussions with commercial operators have confirmed that such an opening is adequate to accommodate commercial vessels (Moffatt & Nichol 2008). Impacts to recreational boaters are addressed in detail in Section 4.15, Recreation, and would be similar for commercial vessels. As discussed, the gates would cause a temporary delay while they were closed, but they would be opened upon request to accommodate larger, commercial vessels. Impacts would be significant, but mitigable to less than significant through the implementation of Mitigation Measures REC-1 and REC-2.

4.16.3.3 Cumulative Impacts

As discussed in Section 4.15, Recreation, both the SDIP and Franks Tract Project would create barriers across Delta waterways, but each project would provide vessel passage, and cumulative impacts would be less than significant.

4.17 UTILITIES AND SERVICE SYSTEMS

Issues & Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
ccccccc. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
ddddddd. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
eeeeeee. Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
fffffff. Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
ggggggg. Result in a determination by the wastewater treatment provider which 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?	☐	☐	☐	☒
hhhhhhh. Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐
iiiiiii. Comply with federal, state, and local statues and regulations related to solid waste?	☐	☐	☒	☐

4.17.1 Environmental Setting

The Project would not generate a need for additional wastewater treatment. The small number of construction workers and the gate operators would be drawn from the local population already served by wastewater treatment facilities. The Project would not require the construction of storm water drainage facilities. The Project would not require water supplies. Thus, these issue areas are not discussed further.

The nearest solid waste facility that accepts construction and demolition waste is Keller Canyon Landfill in Pittsburg, approximately 29 miles northwest of the Old River site. This private facility is one of two active, permitted facilities in Contra Costa County and is permitted to receive 3,500 tons of solid waste daily. Keller Canyon Landfill has approximately 84 percent remaining capacity available to accept new waste. It accepts municipal solid waste, non-liquid industrial waste, contaminated soils, ash, grit, and sludge. The site currently handles approximately 2,500 tons of waste per day (CIWMB 2008).

4.17.2 Regulatory Setting

The Project is subject to Title 14 of the California Code of Regulations, which outlines standards for solid waste handling and disposal.

4.17.3 Impacts and Mitigation Measures

4.17.3.1 No Project

The No Project alternative would not generate solid waste because no development would occur.

4.17.3.2 2-Gates Project

jjjjjjj. f. Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs

Less than Significant. The Project would generate minimal amounts of solid waste during construction and operations. Dredged material would be disposed of on Bacon Island, and any rock removed would be stored as needed on Holland Tract. The nearby landfill has sufficient capacity to accommodate solid waste generated by the Project.

kkkkkkk. g. Comply with federal, state, and local statues and regulations related to solid waste

Less than Significant. The solid waste would be disposed of in accordance with all regulatory requirements.

4.17.3.3 Cumulative Impacts

The Project would generate minimal solid waste during construction and operations that could readily be accommodated by area landfills. Any cumulative impacts would be less than significant.

4.18 MANDATORY FINDINGS OF SIGNIFICANCE

Issues & Supporting Information Sources	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
lllllll. Does the project have the potential to 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?	☐	☒	☐	☐
mmmmmmm. 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, effects of other current projects, and the effects of probable future projects.)	☐	☐	☒	☐
nnnnnnn. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☐

DISCUSSION:

ooooooo. Does the project have the potential to 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?

As discussed above in Sections 4.1 through 4.17, the Project would have no significant unavoidable impacts. The Project includes a number of design and operational features that would reduce or avoid most environmental impacts; mitigation measures have been included where appropriate that would reduce other impacts to less than significant.

ppppppp. 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, effects of other current projects, and the effects of probable future projects.)

The related projects are described in Section 3, and the cumulative impacts of those projects in combination with the 2-Gates Project are discussed above in Sections 4.1 through 4.17. In many instances, no impacts or less-than-significant cumulative impacts would occur because the 2-Gates Project's impacts would be short-term and localized. In other cases, they would be beneficial because a number of projects are being proposed to improve aquatic resources in the Delta. In other cases, significant cumulative impacts would not occur because the 2-Gates Project includes monitoring and sufficient operational flexibility to avoid such impacts.

qqqqqqq. c. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

See (a) above.

SECTION 5

Other Sections Required by CEQA and/or NEPA

This section addresses other issues that are required by California Environmental Quality Act (CEQA) and/or National Environmental Policy Act (NEPA). Climate change is not included in the standard CEQA environmental checklist (Section 4), but is now commonly addressed in many CEQA and NEPA documents. Additionally, NEPA requires that a project's impacts on wild and scenic rivers, Indian Trust Assets, socioeconomics, and environmental justice be considered.

5.1 CLIMATE CHANGE

5.1.1 Environmental Setting

Climate change refers to long-term fluctuations in temperature, precipitation, wind, and other elements of Earth's climate system. Natural processes such as solar-irradiance variations, variations in Earth's orbital parameters, and volcanic activity can produce variations in climate. The climate system can also be influenced by changes in the concentration of various gases in the atmosphere, which affect Earth's absorption of radiation. State law defines these greenhouse gases (GHG) to include the following: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (Health and Safety Code, Section 38505(g)). The most common GHG that results from human activity is carbon dioxide, followed by methane and nitrous oxide (OPR 2008).

The Bay Area Air Quality Management District (BAAQMD) has prepared a GHG emissions inventory using 2002 as the base year. The BAAQMD estimated that 85.4 million tons of CO_2-equivalent GHGs were emitted from anthropogenic sources in the Bay Area in 2002. Fossil-fuel consumption in the transportation sector (on-road motor vehicles) accounted for approximately 43 percent. Stationary sources, including industrial and commercial sources, power plants, oil refineries, and landfills, were responsible for approximately 49 percent. Construction and mining equipment was estimated to account for approximately 2 percent (or about 1.7 million tons of CO_2-equivalent) of the total anthropogenic GHG emissions (BAAQMD 2006). Comparable information is not available for the San Joaquin Air Basin.

5.1.2 Regulatory Setting

5.1.2.1 Global Warming Solutions Act (AB 32)

The Global Warming Solutions Act of 2006 (AB 32) codifies California's goal of reducing statewide emissions of GHGs to 1990 levels by 2020. This reduction will be accomplished through an enforceable statewide cap on GHG emissions that will be phased-in starting in 2012 to achieve maximum technologically feasible and cost-effective GHG reductions. In order to effectively implement the cap, AB 32 directs the California Air Resources Board (CARB) to develop appropriate regulations and establish a mandatory reporting system to track and monitor GHG emissions.

5.1.2.2 Executive Order S-3-05

On June 1, 2005 Governor Arnold Schwarzenegger signed S-3-05 (Order) which established GHG emission reduction targets as follows: by 2010, reduce GHG emissions to 2000 levels; by 2020, reduce GHG emissions to 1990 levels; and by 2050, reduce GHG emissions to 80 percent below 1990 levels.

5.1.3 Impacts and Mitigation Measures

5.1.3.1 No Project Alternative

The No Project alternative would not affect climate change because no development would occur.

5.1.3.2 2-Gates Project

There currently is no federal, state, or local regulatory guidance for determining whether a project advances or hinders California's greenhouse gas reduction goals, and no standards of significance for GHG impacts have been established. For purposes of this analysis, an impact would be considered significant if the Project would:

- Individually impede the state's ability to meet its 2020 GHG emission reduction goal
- Cumulatively impede the state's ability to meet its 2020 GHG emission reduction goal

During construction (gate installation and removal), the Project would temporarily cause direct GHG emissions from the combustion of fossil fuels (i.e., diesel, gasoline) used to run construction equipment and vehicles, both onsite and offsite. Over its lifetime, the Project would directly and indirectly cause negligible GHG emissions from occasional maintenance and personal vehicle use, the periodic use of diesel-powered generators, and/or the use of electric power used to run hydraulic pumps on an intermittent basis. Therefore, this analysis focuses on construction impacts.

Table 5-1 shows estimated GHG gas emissions for the Project based on the U.S. Environmental Protection Agency and CARB's Emission Factors model (EMFAC) for diesel and gasoline fuel internal combustion.

Table 5-1 Estimated Total GHG Emissions during Construction

Emission Type	Quantity (tons)	CO_2-Equivalent Quantity
Carbon Dioxide (GHG - CO_2)	802	802
Nitrous Oxide (GHG - N_2O)	0.021	6.22
Methane (GHG - CH_4)	0.045	1.04
Carbon Dioxide Equivalents (CO_2eq)	--	809

Source:
Compilation of Air Pollution Emission Factors (AP-42), Fifth Edition, USEPA, 1995
EMFAC 2007
Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006, 2008

As shown in Table 5-1, the entire Project would emit approximately 809 tons of CO_2–equivalent GHG. This amount is miniscule in comparison to the 85.4 million tons of CO_2 generated per year in the Bay Area alone. The generation of direct onsite and offsite GHG emissions would be intermittent and would terminate following completion of installation and removal activities. Additionally, in order to minimize emissions to the extent feasible, construction contractors would be required to implement the following measures:

- On-road and off-road vehicle tire pressures shall be maintained to manufacturer specifications. Tires shall be checked and reinflated at regular intervals
- Construction equipment engines shall be maintained to manufacturer's specifications
- Any onsite vegetation shall be preserved or replaced (if removal is necessary for Project activities) as a means of providing carbon sequestration

The Project would not impede the state's ability to meet its 2020 greenhouse gas emission reduction goal, and impacts associated with climate change would be less than significant.

5.1.3.3 Cumulative Impacts

Other projects described in Section 3 would generate GHG emissions, primarily during construction. The proposed Project's contribution to GHG emissions would be temporary and negligible in comparison to those emissions that already exist, and measures would be implemented to reduce emissions to the extent practicable. The Project, in combination with other projects, would not impede the state's ability to meet its 2020 GHG emission reduction goal. Thus, cumulative impacts would be less than significant.

5.2 ENVIRONMENTAL JUSTICE

5.2.1 Environmental Setting

5.2.1.1 Population Living below the Poverty Level

The Old River and Connection Slough sites are located in a sparsely developed, rural portion of unincorporated San Joaquin and Contra Costa counties. The nearest communities are the City of Oakley, located approximately 2.4 miles west of the Old River site, and Discovery Bay, located about 4.8 miles south of the Old River site. Nearby marinas, located about 0.8 and 1.8 miles from the Old River site, also include some live-aboard residents. The percentage of persons living below the poverty level in San Joaquin and Contra Costa counties is shown in Table 5-2, as is the percentage in Oakley and Discovery Bay. Information is not available for those living at the marinas. As shown, the percentage of persons living below the poverty level in the nearby communities is less than that of the counties as a whole.

Table 5-2 Percentage of Population Living below the Poverty Level

San Joaquin County (2006)	Contra Costa County (2006)	City of Oakley (2000)	Discovery Bay (2000))
14.2	7.9	5.0	3.3
Source: U.S. Census Bureau 2008			

5.2.1.2 Minority Populations

The percentage of minority residents of San Joaquin and Contra Costa counties, Oakley and Discovery Bay is shown in Table 5-3. The percentage of minorities in the nearby communities is considerably less than that of the counties as a whole.

Table 5-3 Population Distribution by Race/Ethnicity

Racial/Ethnic Background	San Joaquin County 2006 (Percent)	Contra Costa County 2006 (Percent)	City of Oakley 2000 (Percent)	Discovery Bay 2000 (Percent)
White (non-Hispanic)	26.3	37.8	50.5	77.2
Hispanic	35.7	21.9	25.0	10.4
Black	7.1	9.2	3.4	1.8
American Indian/Alaskan Native	1.3	0.4	0.9	0.8
Asian	14.2	13.3	2.9	1.8
Native Hawaiian/Pacific Islander	0.5	0.4	0.3	0.2
Some other race	11.1	13.0	10.6	4.0
Two or more races	4.3	4.0	6.5	3.8

Source: U.S. Census Bureau, 2008
Note: Numbers do not total 100 percent due to rounding

5.2.2 Regulatory Setting

In 1994, the president issued Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority and Low-income Populations. The objectives of the EO include developing federal agency implementation strategies, identifying minority and low-income populations where proposed federal actions could have disproportionately high and adverse human health and environmental impacts, and encouraging the participation of minority and low-income populations in the NEPA process.

Minority populations include all persons identified by the Census of Population and Housing to be of Hispanic or Latino origin, regardless of race, as well as non-Hispanic persons who are Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander. Low-income populations are those that fall within the annual statistical poverty thresholds from the Bureau of the Census "Current Population Reports, Series P-60 on Income and Poverty."

5.2.3 Impacts and Mitigation Measures

5.2.3.1 No Project Alternative

The No Project alternative would not result in environmental justice effects because no development would occur.

5.2.3.2 2-Gates Project

The Project is located in a remote, rural area, well-removed from the nearest populated areas. Moreover, the nearest communities have lower percentages of minorities and persons living below the poverty threshold than the counties as a whole, therefore, the Project would not have the potential to disproportionately affect minority or low-income populations in these communities. Farm workers on adjacent properties could potentially be minorities and/or considered low-income populations. No significant, unavoidable environmental impacts would result from the Project, however. Air and noise emissions would be temporary and would not exceed regulatory thresholds, and no health risks would be posed by the Project. Therefore, disproportionate effects would not occur.

5.2.3.3 Cumulative Impacts

No cumulative impacts would occur because the Project would not result in disproportionate effects on minority or low-income populations.

5.3 INDIAN TRUST ASSETS

Indian Trust Assets (ITAs) are legal interests in assets held in trust by the federal government for federally recognized Indian tribes or individual Indians. All federal bureaus and agencies are responsible for protecting ITAs from adverse impacts resulting from their programs and activities. Each federal bureau or agency, in cooperation with potentially affected tribe(s), must inventory and evaluate assets, and then mitigate or compensate for adverse impacts to the asset. While most ITAs are located on reservation lands, they can also be located off-reservation. Examples of ITAs include, but are not limited to, land; minerals; rights to hunt, fish, and gather; and water rights.

No ITAs are located on or near the Project site. The nearest ITA is Lytton Rancheria, which is approximately 41 miles west (P. Rivera, personal communication, 2008); thus no impacts on ITAs would occur.

5.4 SOCIOECONOMICS

The proposed Project would result in minor socioeconomic benefits by providing periodic jobs for construction workers and gate operators. These workers would be drawn from the local labor pool, and no impacts on housing would occur. (Refer also to Section 4.13, Population and Housing.)

5.5 WILD AND SCENIC RIVERS

Neither the San Joaquin River, Old River, nor Connection Slough is considered a wild and scenic river, nor are any of the other rivers located in the vicinity of the Project. No impacts on wild and scenic rivers would result from Project implementation.

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SECTION 6

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