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:				
a. Violate any water quality standards or waste discharge requirements?	☐	☐	☒	☐
b. 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)?	☐	☐	☐	☒
c. 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?	☐	☐	☒	☐
d. 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?	☐	☐	☒	☐
e. 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?	☐	☐	☒	☐
f. Otherwise substantially degrade water quality?	☐	☐	☒	☐
g. 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?	☐	☐	☐	☒
h. Place within a 100-year floodplain structures which would impede or redirect flood flows?	☐	☐	☒	☐
i. 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?	☐	☐	☒	☐
j. 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 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 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 µmho/cm). Additional historic flow and salinity information is available in Appendix A.

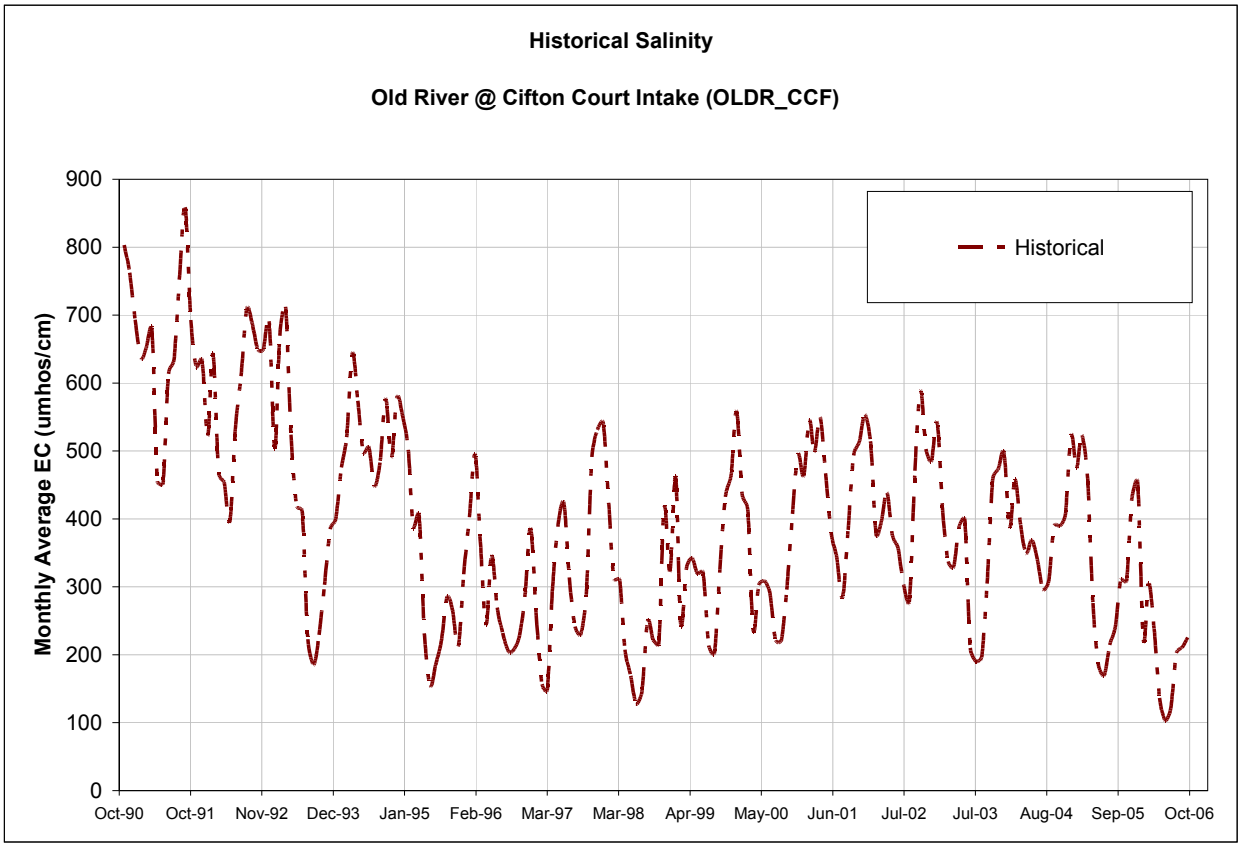

Figure 4.9-1 Historic Salinity (µmho/cm) at the 2-Gates Locations

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 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 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 the 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 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 USFWS and/or the NMFS of each permit request. Consultation with USFWS and/or NMFS is required for proposed discharges that could affect species protected by the federal 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, 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 SWRCB. The SWRCB administers federal and state water quality regulations for California's ocean waters and also oversees and funds the state's nine 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 CVRWQCB 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 (SWRCB 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, DFG 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 (2005) General Plan

The following policies are included in the Conservation Element (Contra Costa County 2005):

> 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 (1992) General Plan

The following policies are included in the Resources Element (San Joaquin County 1992):

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[1] 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 negligible 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.

a. 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. 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

[1] Detailed descriptions of this model are available at http://baydeltaoffice.water.ca.gov/modeling/deltamodeling/models/dsm2/dsm2.cfm.

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.

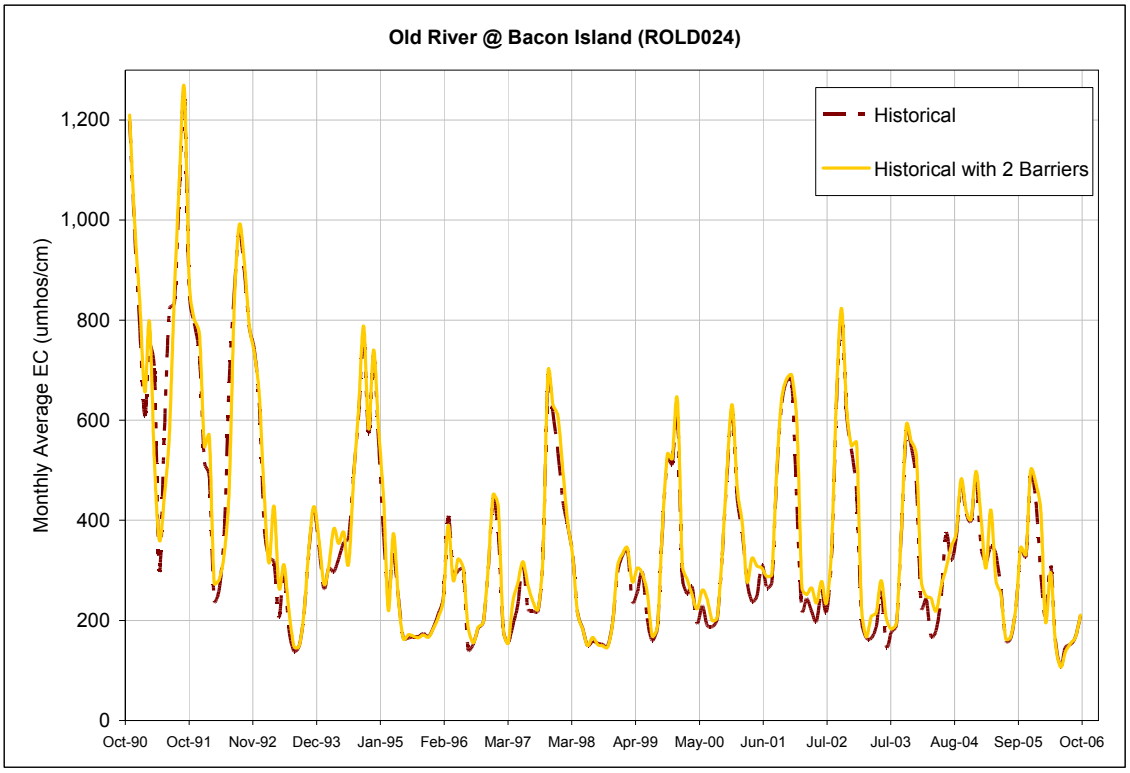

Figure 4.9-2 Projected Salinity near the CCWD Rock Slough Water Diversion Location

b. 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 35 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.

c. 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, 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.

d. 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.

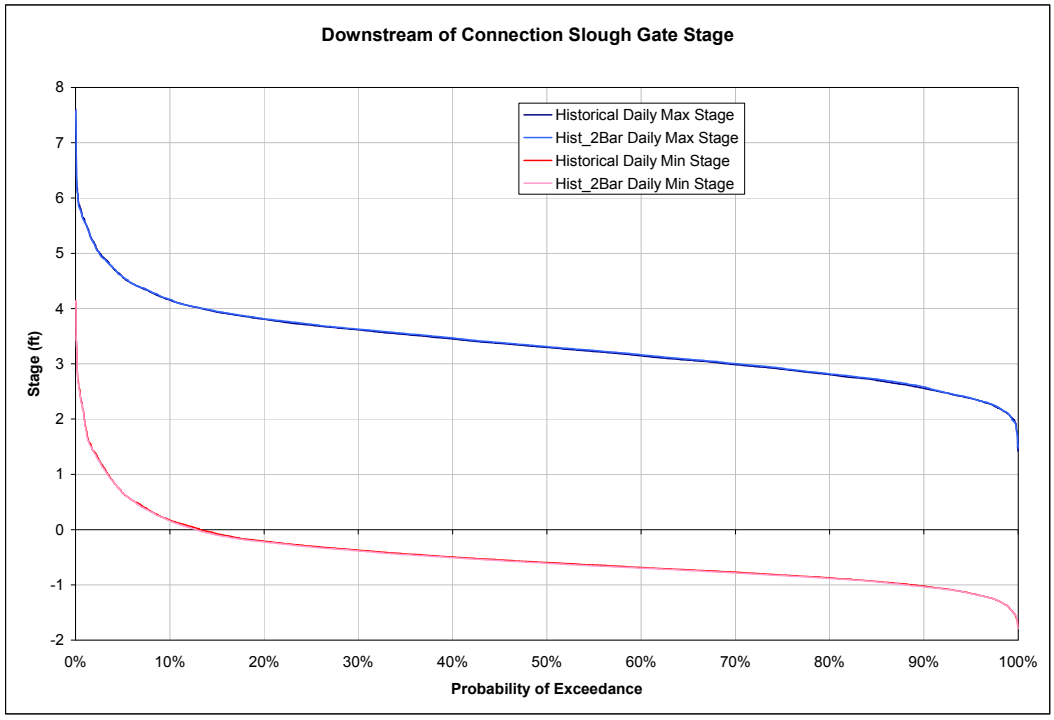

Figure 4.9-3 Change in Low and High Tide Water Surface Elevation near 2-Gates Facilities

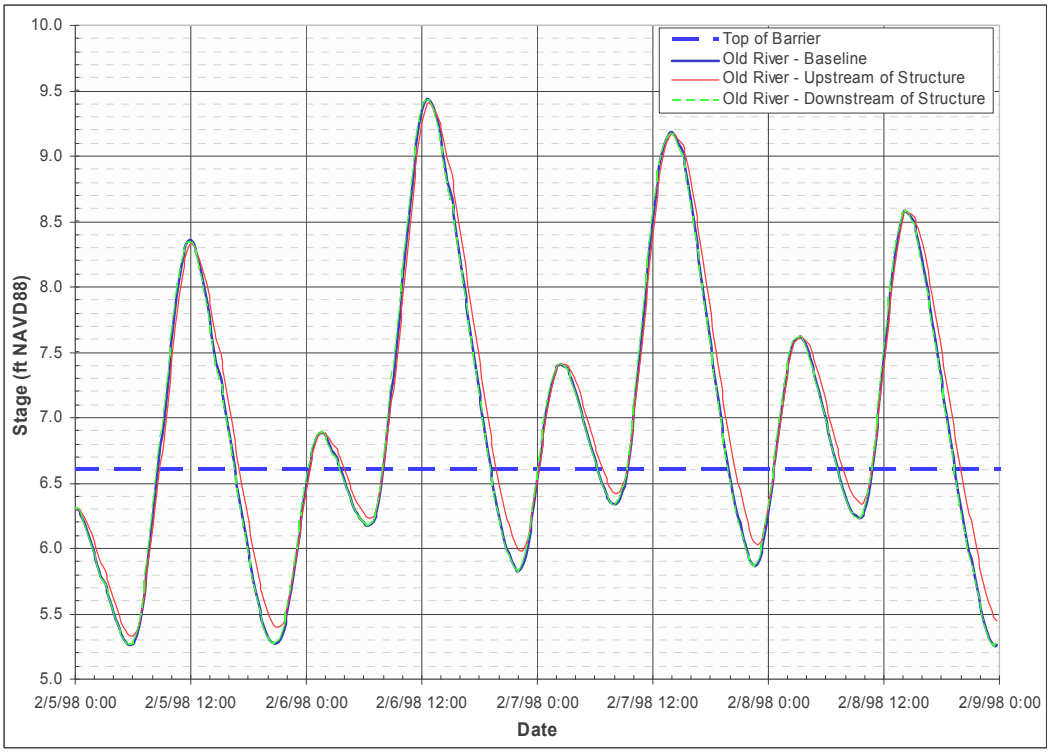

Figure 4.9-4 Stage Profiles for February 1998 Flood Event at Old River—2-Gates Barrier

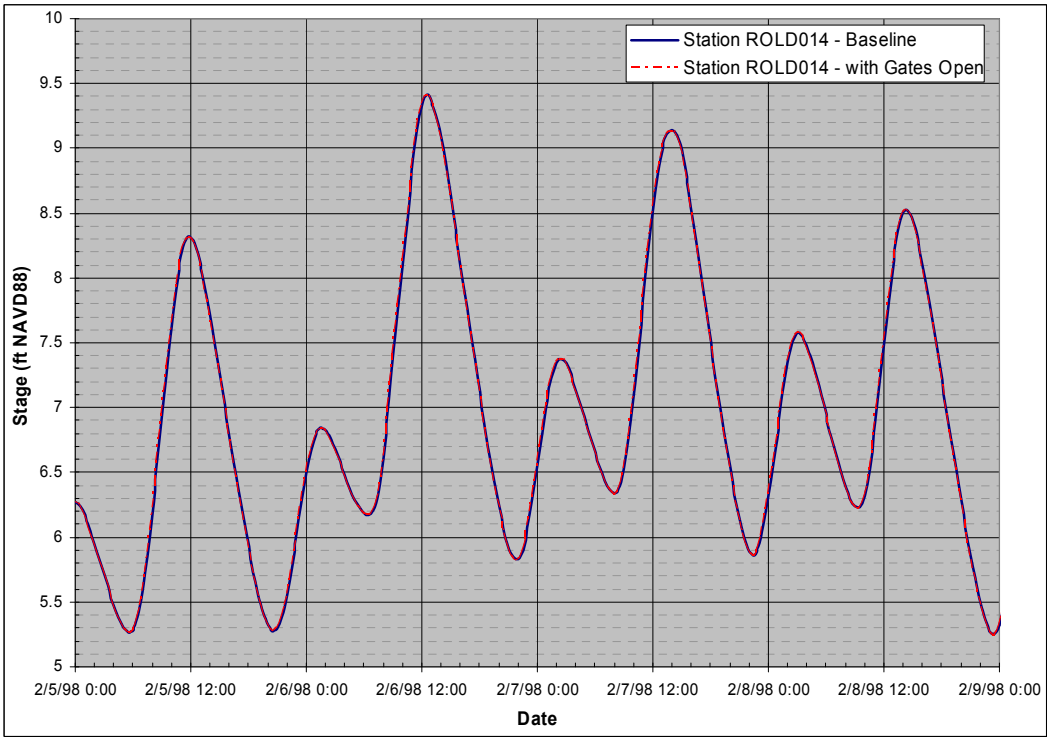

Figure 4.9-5 Stage Profiles for February 1998 Flood Event at Old River Gage Station ROLD014

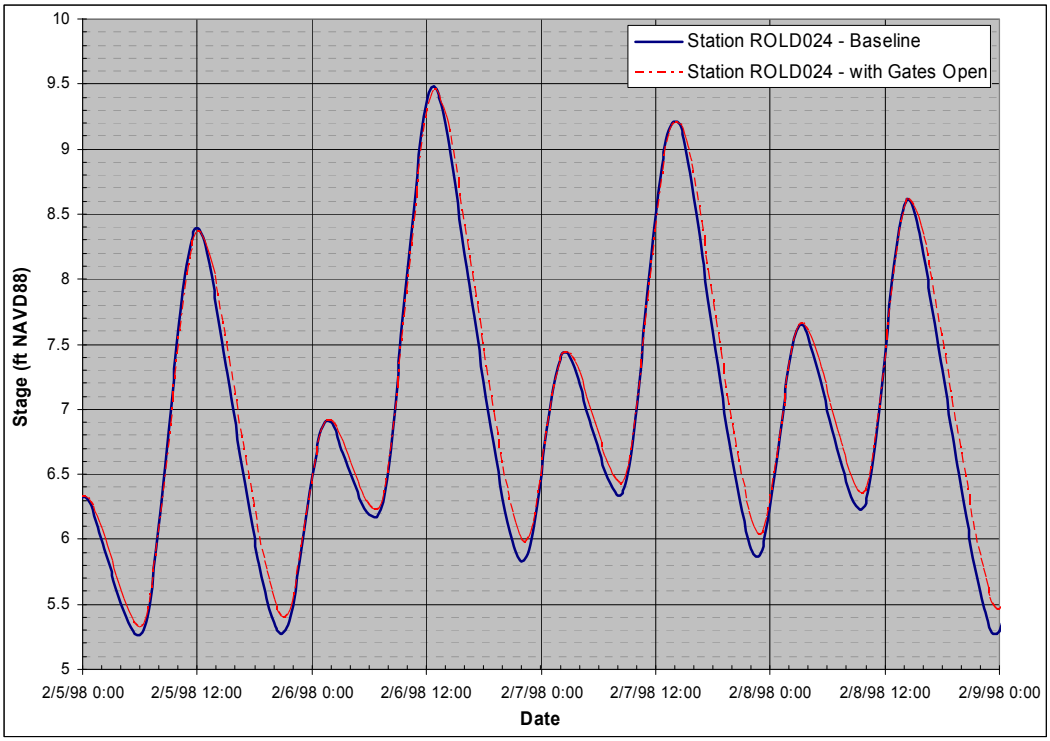

Figure 4.9-6 Stage Profiles for February 1998 Flood Event at Old River Gage Station ROLD024

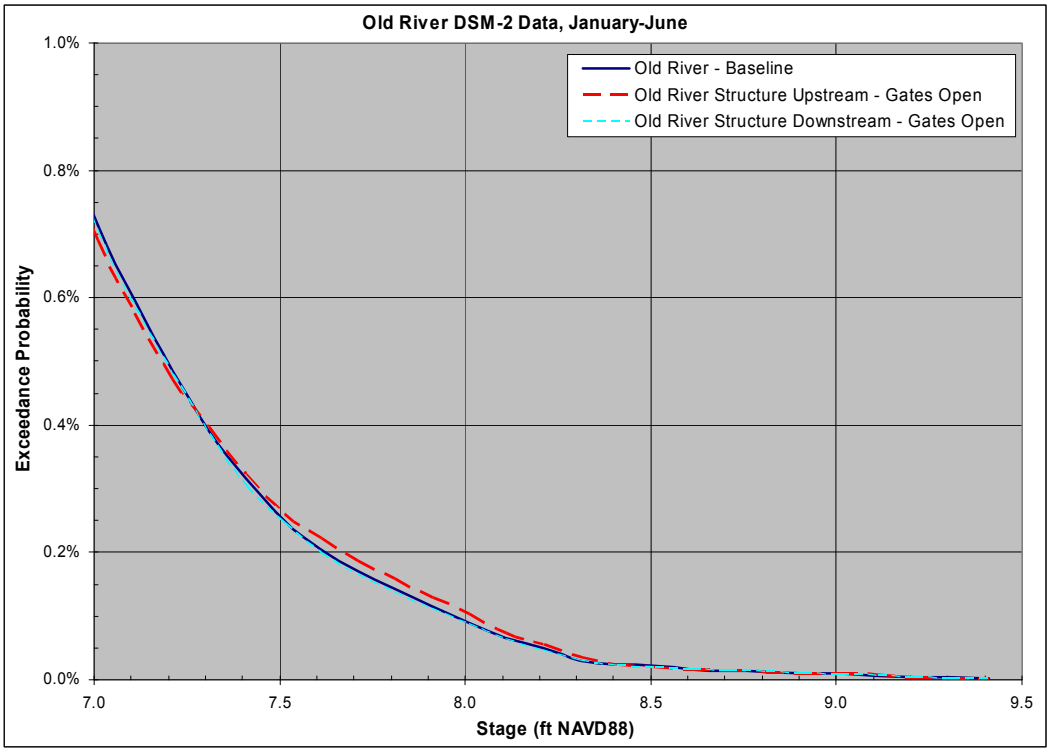

Figure 4.9-7 Exceedance Probabilities for High Stages at Old River—2-Gates Barrier

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. Refer to Appendices L and M for additional detail regarding flooding.

e. 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 BMPs for such sites.

f. 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.

g. 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 (Appendices L and M) and therefore would not alter the relationship of housing within the 100-year floodplain.

h. 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.

i. 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.

j. 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.