Initial Study/Proposed Mitigated Negative Declaration

Emergency Drought Barriers Project

Prepared for:

California Department of Water Resources

January 2015

Initial Study/Proposed Mitigated Negative Declaration

Emergency Drought Barriers Project

Prepared for:

California Department of Water Resources
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January 2015

Date: January 23, 2015

To: Responsible and Trustee Agencies, Interested Parties, and Organizations

Subject: NOTICE OF AVAILABILITY AND INTENT TO ADOPT A PROPOSED MITIGATED NEGATIVE DECLARATION FOR THE EMERGENCY DROUGHT BARRIERS PROJECT

The California Department of Water Resources (DWR) has directed the preparation of an initial study (IS) and intends to adopt the proposed mitigated negative declaration (MND) for the Emergency Drought Barriers (EDB) Project (proposed project) in compliance with the California Environmental Quality Act (CEQA) and State CEQA Guidelines.

Project Title: Emergency Drought Barriers Project

Lead Agency: DWR

Project Location: Three temporary rock barriers would be installed, with a single barrier at three locations, in the north and central Sacramento–San Joaquin River Delta (Delta): Sutter Slough, Steamboat Slough, and West False River. The Sutter Slough site is located in the north Delta about 0.6 mile directly west of the Sacramento River at the northwest end of Sutter Island. This site is approximately 1 mile southwest of the community of Courtland and 7 miles northwest of Walnut Grove and is on the border between Yolo and Sacramento counties. The Steamboat Slough site is approximately 2.1 miles south-southeast of the Sutter Slough site, on the east side of Sutter Island, and approximately 1 mile southwest of the Sacramento River in Sacramento County. The West False River site is located approximately 0.4 mile east of the confluence with the San Joaquin River, between Jersey and Bradford Islands in Contra Costa County, and is about 4.8 miles northeast of Oakley.

Project Description: Rock (rip-rap) barrier weir structures would be installed at three sites (Sutter Slough, Steamboat Slough, and West False River) between 2015 and 2025. During this 10-year period, the barriers could be installed up to three times, including potentially in consecutive years. The purpose of the barriers is to reduce the intrusion of saltwater into the Delta during drought conditions when stored water in upstream reservoirs available for release is insufficient to meet Delta outflow required to repel San Francisco Bay salinity, which could (1) render Delta water undrinkable and affect roughly 25 million Californians, (2) render Delta water unusable by agriculture, and (3) decrease freshwater habitat in the Delta for sensitive aquatic species.

All rock structures would be trapezoid-shaped barriers with a wide base tapering up to a 12-foot-wide top width set perpendicular to the channel alignment. Rock fill would be placed along the base of the levees for support at the Sutter and Steamboat Slough sites. The West False River site levees are weaker than at the northerly sites because of peat soil foundations; therefore, the barrier would have transitions to the levees with 75-foot-long sheet pile walls supported by king piles and buttressed with rock.

The temporary rock barriers may be installed at each of the sites in spring or summer, beginning no sooner than May 7 at the West False River location, and May 22 at the Sutter and Steamboat Slough sites. The construction period would be approximately 30 to 60 days. If installed, barrier removal could start on or near October 1, but no later than November 1 for Sutter and Steamboat sloughs and November 15 for West False River. Removal would require approximately 30 to 60 days for Sutter and Steamboat sloughs and approximately 45 to 60 days for West False River.

Additional detail is provided in Chapter 2, "Project Description."

Environmental Review Process: DWR has directed the preparation of an IS/MND on the proposed project in accordance with the requirements of CEQA and the State CEQA Guidelines. The IS/MND describes the proposed project and provides an assessment of the proposed project's potentially significant adverse impacts on the physical environment. It concludes that the proposed project would not have any significant adverse effects on the environment after adoption and implementation of mitigation measures.

Public Review Period: The IS/MND is being circulated for public review and comment for a review period of 30 days from release of the document to the State Clearinghouse, starting on January 26, 2015. Written comments must be submitted to and received at the following address no later than close of business (5:00 p.m.) on February 25, 2015:

Jacob McQuirk
Supervising Engineer, Bay-Delta Office
California Department of Water Resources
PO Box 942836
Sacramento, CA 94236
Fax: (916) 653-6077
E-mail: DWREDBCOMMENTS@water.ca.gov

To Review or Obtain a Copy of the Environmental Document: Copies of the IS/MND may be reviewed at the following locations:

Online: http://www.water.ca.gov/waterconditions/emergencybarriers.cfm

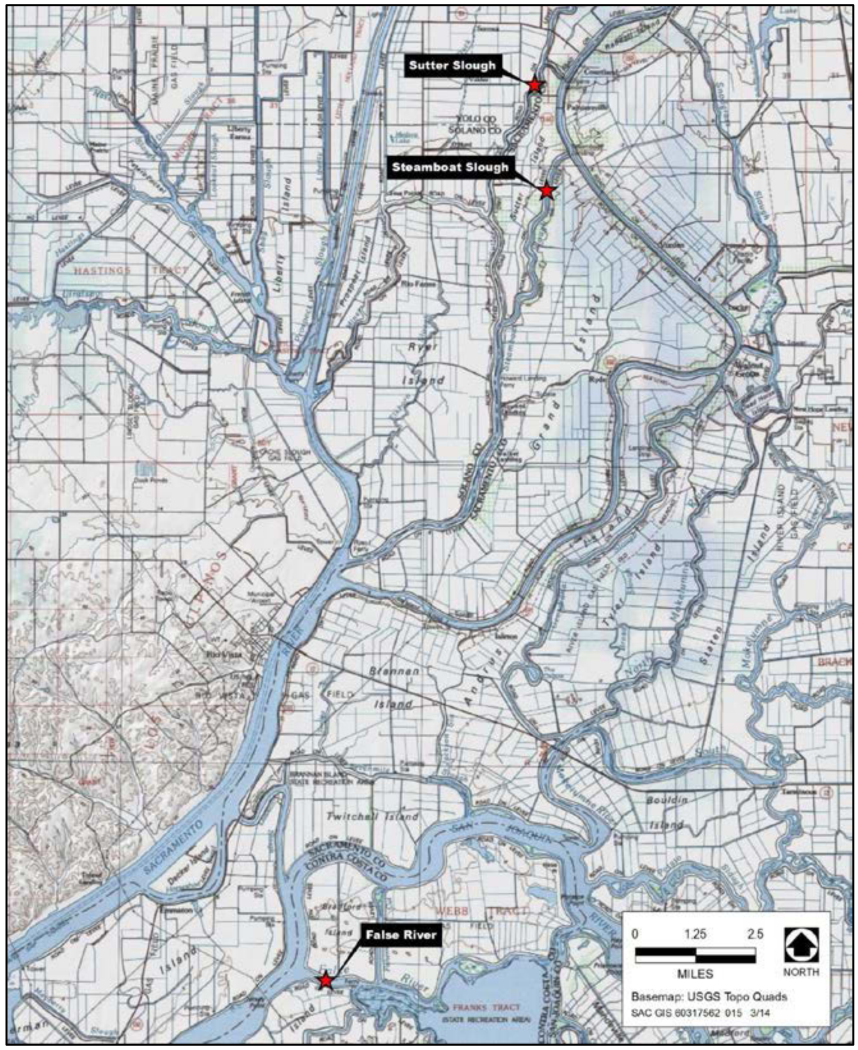
Sacramento Public Library
828 I Street
Sacramento, CA 95814

PROPOSED MITIGATED NEGATIVE DECLARATION

PROJECT TITLE: Emergency Drought Barriers Project

LEAD AGENCY: California Department of Water Resources (DWR)

PROJECT LOCATION: The Emergency Drought Barriers (EDB) Project (proposed project) consists of three temporary rock barriers that would be installed, a single barrier at three locations, in the north and central Sacramento–San Joaquin River Delta (Delta): Sutter Slough, Steamboat Slough, and West False River. The Sutter Slough site is located in the north Delta about 0.6 mile directly west of the Sacramento River at the northwest end of Sutter Island. This site is approximately 1 mile southwest of the community of Courtland and 7 miles northwest of Walnut Grove and is on the border between Yolo and Sacramento counties. The Steamboat Slough site is approximately 2.1 miles south-southeast of the Sutter Slough site, on the east side of Sutter Island, and approximately 1 mile southwest of the Sacramento River in Sacramento County. The West False River site is located approximately 0.4 mile east of the confluence with the San Joaquin River, between Jersey and Bradford Islands in Contra Costa County, and is about 4.8 miles northeast of Oakley.



PROJECT DESCRIPTION: Rock (rip-rap) barrier weir structures would be installed at three sites (Sutter Slough, Steamboat Slough, and West False River) between 2015 and 2025. During this 10-year period, the barriers could be installed up to three times, including potentially in consecutive years. The purpose of the barriers is to reduce the intrusion of saltwater into the Delta during drought conditions when stored water in upstream reservoirs available for release is insufficient to meet Delta outflow required to repel San Francisco Bay salinity, which could (1) render Delta water undrinkable and affect roughly 25 million Californians, (2) render Delta water unusable by agriculture, and (3) decrease freshwater habitat in the Delta for sensitive aquatic species.

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FINDINGS: An initial study/proposed mitigated negative declaration (IS/MND) has been prepared to assess the proposed project's potential effects on the physical environment and the significance of those effects. Based on the analysis conducted in the IS, it is determined that implementing the proposed project will clearly not have any significant adverse effects on the environment with incorporation of the Environmental Commitments in the project description and after adoption and implementation of mitigation measures. This conclusion is supported by the following findings:

1. The proposed project would have no effects on mineral resources and population and housing.

2. The proposed project would have a less-than-significant impact on aesthetics, geology and soils, hazards and hazardous materials, land use and planning, public services, recreation, transportation and traffic.

3. The proposed project would have a less-than-significant impact on agriculture and forestry resources, air quality, biological resources, cultural resources, greenhouse gas emissions, hydrology and water quality, noise, and utilities and service systems with the adoption and implementation of the mitigation measures proposed in the IS.

4. The proposed project would not have the potential to substantially degrade the quality of the environment; substantially reduce the habitat of a fish or wildlife species; cause a fish or wildlife population to drop below self-sustaining levels; threaten to eliminate a plant or animal community; substantially reduce the number or restrict the range of an endangered, rare, or threatened species; or eliminate important examples of the major periods of California history or prehistory.

5. The proposed project would not have the potential to achieve short-term environmental goals to the disadvantage of long-term environmental goals.

6. The proposed project would not have possible environmental effects that are individually limited but cumulatively considerable and contribute to a significant cumulative impact. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.

7. The environmental effects of the proposed project would not cause substantial adverse effects on human beings, either directly or indirectly.

8. The proposed project incorporates numerous Environmental Commitments in its project description, as well as all mitigation measures listed below and described in the IS.

MITIGATION MEASURES: The following mitigation measures will be implemented as part of the project to avoid, minimize, rectify, reduce or eliminate, or compensate for potentially significant environmental impacts. Implementation of these mitigation measures would reduce the potentially significant environmental impacts of the proposed project to less-than-significant levels:

Mitigation Measure AQ-1: Implement Bay Area Air Quality Management District and Sacramento Metropolitan Air Quality Management District Basic and Enhanced Construction Emission Control Practices to Reduce Fugitive Dust.

The construction contractor will implement the following applicable basic and enhanced control measures recommended by the Bay Area Air Quality Management District to reduce construction-related fugitive dust during site grading at the West False River project site (BAAQMD 2010a):

- All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) will be watered two times per day, as necessary to control fugitive dust.
- All haul trucks transporting soil, sand, or other loose material off-site will be covered.
- All visible mud or dirt track-out onto adjacent public roads will be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping will be prohibited.
- All vehicle speeds on unpaved roads will be limited to 15 miles per hour.
- All construction equipment will be maintained and properly tuned in accordance with manufacturer's specifications. All equipment will be checked by a certified mechanic and will be determined to be running in proper condition before operation.
- A publicly visible sign with the telephone number and person to contact at the lead agency (i.e., DWR) regarding dust complaints will be posted at the construction sites. The person identified as the contact will respond and take corrective action within 48 hours. The air district's phone number also will be visible, to ensure compliance with applicable regulations.
- Idling time of diesel-powered construction equipment will be no more than 5 minutes.
- All contractors will be required to use equipment that meets the California Air Resources Board's most recent certification standard for off-road heavy-duty diesel engines.

The construction contractor will implement the following applicable basic and enhanced control measures recommended by the Sacramento Metropolitan Air Quality Management District to reduce construction-related fugitive dust during site grading the Sutter Slough and Steamboat Slough project sites (SMAQMD 2010):

- All exposed surfaces will be watered two times daily. Exposed surfaces include, but are not limited to soil piles, graded areas, unpaved parking areas, staging areas, and access roads.

- Haul trucks transporting soil, sand, or other loose material on the site will be covered or will maintain at least 2 feet of free board space on. Any haul trucks that will be traveling along freeways or major roadways will be covered.

- Wet power vacuum street sweepers will be used to remove any visible trackout mud or dirt onto adjacent public roads at least once per day. Use of dry power sweeping will be prohibited.

- Vehicle speeds will be limited on unpaved roads to 15 miles per hour.

- Idling time will be minimized either by shutting equipment off when not in use or by reducing the idling time to 5 minutes (as required by California Code of Regulations, Title 13, Sections 2449[d][3] and 2485). Clear signage that posts this requirement for construction workers will be provided at the entrances to the sites.

- All construction equipment will be maintained in proper working condition according to manufacturer's specifications. The equipment will be checked by a certified mechanic and will be determined to be running in proper condition before it is operated.

In addition, the construction contractor will implement the following applicable enhanced measures to reduce operation-related diesel particulate matter:

- Acceptable options for reducing emissions may include use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, and other options as they become available.

Timing: Before and during construction and removal as appropriate

Responsibility: DWR

Mitigation Measure AQ-2: Reduce Construction-Related Emissions from Off-Road Equipment and Heavy-Duty Vehicles.

The following measure from the BAAQMD's Additional Construction Mitigation Measures will be implemented during construction at the West False River project site (BAAQMD 2010a):

- All contractors will be required to use equipment that meet California Air Resources Board's most recent certification standard for off-road heavy duty diesel engines.

Timing: Before and during construction and removal as appropriate

Responsibility: DWR

Mitigation Measure AQ-3: Fuel Tugboats/Barges with Renewable Diesel Fuel.

- All tugboats/barges will be fueled using renewable diesel fuel. The fuel provider could include, but is not limited to Golden Gate Petroleum. However, all renewable diesel fuel used from other providers will achieve a similar emissions reduction potential to Golden Gate Petroleum renewable diesel. In the case that renewable diesel cannot be used for tugboats/barges for logistic reasons, this will be recorded in the bi-weekly construction reports as part of Mitigation Measure AQ-5, and incorporated into the final emissions and mitigation fee calculations.

Timing: During construction and removal as possible

Responsibility: DWR and its contractor

Mitigation Measure AQ-4: Use Construction Monitoring and BAAQMD CMP or Another Verifiable Offset Program to Offset Regional Off-Site Emissions

DWR and/or its contractor will monitor construction activities throughout development of all three emergency drought barriers. Construction activities data will be collected, emissions associated with construction activities will be calculated, and these data will be reported to BAAQMD. The specifics of construction monitoring and reporting will be determined in consultation with BAAQMD. Construction activities data will include, but are not limited to the following items:

1. Tugboats/Barges
   a. Distance traveled by tugboats/barges separated by “loaded” travel and “unloaded” travel.
   b. Horsepower of tugboats and auxiliary engines
   c. Idling time of tugboats/barges
   d. Fuel use and fuel type (collection of this data will also ensure Mitigation Measure AQ-3 [Renewable Diesel] is implemented)
2. Construction Equipment
   a. Equipment type and number of pieces
   b. Horsepower
   c. Hours of actual operation
3. Haul Trucks (heavy-duty trucks)
   a. Number of heavy-duty haul truck trips
   b. Total trip distance for haul truck trips
4. Construction Workers
   a. Number of construction workers per day

BAAQMD will collect the construction activity and emissions reports for record keeping and monitoring purposes. Following completion (i.e., removal of emergency drought barriers) of the proposed project, the final construction emissions will be evaluated to calculate the total offset mitigation fee based on actual construction activities. DWR will work in coordination with BAAQMD to assess the specific mechanisms associated with construction monitoring, emission calculations, and payment logistics.

DWR will use BAAQMD’s Carl Moyer Program (CMP) or another verifiable program to offset the proposed project’s reactive organic gases (ROG), oxides of nitrogen (NO_X), and particulate matter emissions that exceed the BAAQMD 2010 threshold as determined through the construction monitoring program described above. DWR may achieve the required offset through any combination of the following:

- Reduce on-site emission sources and implement offset actions (i.e., construction or operational changes to site-specific emissions).
- Implement offset emissions and programs available within Contra Costa County and the San Francisco Bay Area Air Basin (SFBAAB).
- Submit payment to BAAQMD on a per ton of NO_X amount (i.e., dollars per ton of NO_X to offset) for emission reduction projects that will be funded by BAAQMD. The price of NO_X emission offsets will be determined by BAAQMD on an annual basis. The types of projects that will be funded by BAAQMD can include:
  - Projects within the Contra Costa County and/or the SFBAAB that are eligible for funding under the CMP guidelines, which are real, surplus, quantifiable, and enforceable.
  - Projects to replace older, high-emitting construction equipment operating in Contra Costa County and/or the SFBAAB with newer, cleaner, retrofitted, or more efficient equipment.

Timing: Before and during construction and removal

Responsibility: DWR and the selected project contractor

Mitigation Measure AQ-5: Use Construction Monitoring and SMAQMD's Mitigation Fee to Offset Regional Off-Site Emissions

DWR and/or its contractor will monitor construction activities throughout development of all three emergency drought barriers. Construction activities data will be collected, emissions associated with construction activities will be calculated, and these data will be reported to SMAQMD. The specifics of construction monitoring and reporting will be determined in consultation with SMAQMD. Construction activities data will include, but are not limited to the following items:

1. Tugboats/Barges
   a. Distance traveled by tugboats/barges separated by "loaded" travel and "unloaded" travel.
   b. Horsepower of tugboats and auxiliary engines
   c. Idling time of tugboats/barges
   d. Fuel use and fuel type (collection of this data will also ensure Mitigation Measure AQ-3 [Renewable Diesel] is implemented)
2. Construction Equipment
   a. Equipment type and number of pieces
   b. Horsepower
   c. Hours of actual operation

3. Haul Trucks (heavy-duty trucks)
    a. Number of heavy-duty haul truck trips
    b. Total trip distance for haul truck trips
4. Construction Workers
    a. Number of construction workers per day

SMAQMD will collect the construction activity and emissions reports for record keeping and monitoring purposes. Following completion (i.e., removal of emergency drought barriers) of the proposed project, the final construction emissions will be evaluated to calculate the total offset mitigation fee based on actual construction activities. DWR will work in coordination with SMAQMD to assess the specific mechanisms associated with construction monitoring, emission calculations, and payment logistics.

Timing: Before and during construction and removal

Responsibility: DWR and the selected project contractor

Mitigation Measure BIO-1: Conduct Real-Time Monitoring and Adjust Construction Activities Accordingly.

- DWR will monitor weather patterns and river forecasts for the period preceding the start of construction. If precipitation events or increases in river levels and flows are predicted to occur immediately before the start of construction, DWR will notify NMFS, USFWS, and CDFW before the start of construction and informally will confer with them to determine whether construction actions are still feasible as previously considered. Sudden increases in river flows, imminent precipitation events that create changes in river stage in the Sacramento and San Joaquin valleys, or observed sudden increases in turbidity in the Sacramento or San Joaquin rivers upstream of the Delta may initiate pulses of fish migration into the project channels (e.g., juvenile salmonids moving downstream, pre-spawning delta smelt moving upstream).

- DWR also will monitor the capture of listed fishes in the fish monitoring programs currently being employed in and close to the barrier sites, i.e., Sacramento area beach seines and trawling (Sherwood Harbor and Jersey Point) by USFWS; and Knights Landing and Tisdale Weir rotary screw traps (RSTs), 20-millimeter (mm) survey, Spring Kodiak Trawl, and fish salvage monitoring by CDFW. If increasing presence of listed fishes (principally juvenile salmonids and smelts) is detected in these monitoring efforts during project implementation, DWR will immediately contact NMFS, USFWS, and CDFW to allow informal consultation to determine whether construction actions will place fish at substantial additional risk near the barrier sites.

Timing: Before and during barrier construction and removal

Responsibility: DWR and its contractors

Mitigation Measure BIO-2: Phase Barrier Construction, Operation, and Removal in Collaboration with Permitting Fish Agencies and in Consideration of Real-Time Monitoring Data.

- DWR will collaborate with the permitting fish agencies to develop and implement if necessary a phased construction and operation plan intended to fulfill the main purpose of the proposed project (i.e., to prevent excessive salinity intrusion into the Delta and conserve water in reservoirs) while minimizing adverse potential effects on listed fishes. The plan would be developed in consideration of the latest real-time monitoring data to assess the temporal and spatial distribution of listed fishes that could be affected by project operations.

Timing: Before and during barrier construction, operation, and removal

Responsibility: DWR and its contractors

Mitigation Measure BIO-3: Facilitate Upstream Barrier Passage for Adult Anadromous Fishes (Culvert Opening and Slopes Leading to Culverts) and Monitor Effectiveness.

- DWR will facilitate upstream passage of adult anadromous fishes (Chinook salmon, steelhead, and sturgeon) at the Sutter and Steamboat Slough barriers by keeping a single culvert at each barrier fully open at all times. To increase the probability of sturgeon locating the culvert openings, DWR will provide a 4-foot pad in front of the downstream culvert mouths and a 2:1 slope from the pad to the channel bed. These slopes would be provided on the downstream sides of both barriers to facilitate passage.
- Passage success of adult anadromous fishes approaching the barriers will be assessed with DIDSON monitoring. Additional culverts will be opened as necessary should special-status fish congregate below the barriers as identified from monitoring observations. Additional culverts will be opened only when existing open culverts are fully open, and the minimum opening for any culvert will be 50 percent.

Timing: During barrier operation

Responsibility: DWR and its contractors

Mitigation Measure BIO-4: Conduct Pile Driving With a Vibratory Driver To The Extent Possible; Minimize Effects of Impact Driving.

- DWR will conduct pile driving using a vibratory hammer to minimize to the extent possible the noise generated from pile-driving activities. Compared to the standard impact driving method, vibratory driving substantially reduces the distance that noise exceeds NMFS thresholds, thereby substantially reducing or avoiding the potential to cause take of listed species. However, in certain circumstances (e.g., vibratory driving is not capable of reaching required embedment), impact pile driving may be necessary. Monitoring of underwater sound generated by the vibratory hammer during pile driving in the vicinity of the West False River barrier will be conducted to verify that sound level criteria are not being exceeded as calculated in the effects analysis (i.e., 214 decibels [dB] cumulative sound exposure level [SEL] at approximately 33 feet [10 meters], for each day of pile driving). If levels are exceeded, the permitting fish agencies will be notified and work halted until corrective actions are instituted to achieve sound level criteria.
- If impact driving is necessary, bubble curtains will be employed to attenuate noise. As noted above for vibratory driving, monitoring of underwater sound generated by impact driving will be conducted to verify that sound level criteria are not being exceeded as calculated in the effects analysis (i.e., 218

dB cumulative SEL at approximately 33 feet [10 meters], for each day of pile driving). If levels are exceeded, the permitting fish agencies will be notified and work halted until corrective actions are instituted to achieve sound level criteria.

- Should emergency drought barrier installation occur in summer (e.g., July), DWR will confer with the permitting fish agencies regarding the need for sound monitoring and restrictions on pile driving during a period in which few listed fishes would be likely to be exposed to excessive sound levels.

Timing: During barrier construction

Responsibility: DWR and its contractors

Mitigation Measure BIO-5: Implement Turbidity Monitoring during Construction.

- DWR will monitor turbidity levels in Sutter and Steamboat sloughs and West False River during ground-disturbing activities, including placement of rock fill material and any major maintenance. Monitoring will be conducted by measuring upstream and downstream of the disturbance area to ensure compliance with the Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins (Central Valley Regional Water Quality Control Board 2011). For Delta waters, the general objectives for turbidity apply except during periods of storm water runoff; the turbidity of Delta waters shall not exceed 50 Nephelometric Turbidity Units (NTUs) in the waters of the Central Delta and 150 NTUs in other Delta waters. Exceptions to the Delta specific objectives are considered when a dredging operation can cause an increase in turbidity. In this case, an allowable zone of dilution within which turbidity in excess of limits can be tolerated will be defined for the operation and prescribed in a discharge permit.

- DWR contractors will slow or adjust work to ensure that turbidity levels do not exceed the Basin Plan thresholds. If slowing or adjusting work to lower turbidity levels is not practical or if thresholds cannot be met, DWR will stop work and consult with the State Water Resources Control Board and permitting fish agencies to determine the most appropriate BMPs to minimize turbidity impacts to the maximum extent feasible.

Timing: During barrier construction and removal

Responsibility: DWR and its contractors

Mitigation Measure BIO-6: Develop a Water Quality Plan to Monitor Water Quality and Operate Barrier Culverts to Improve Water Quality.

- DWR will develop and implement a water quality plan to assess the effects of the proposed project on flow and water quality in the Central and North Delta. DWR will monitor water quality with solar-powered monitoring instruments upstream and downstream of the Sutter and Steamboat Slough barriers, in addition to assessing monitoring data from existing and recently upgraded stations in the Delta. DWR will open the slide gates of additional culverts to allow greater water flow into Sutter and Steamboat sloughs, should water quality issues arise. The permitting fish agencies will be provided regular updates on culvert operations.

- The water quality plan will document the procedures for producing the following elements:
  - Water quality data from new monitoring sites and augmentation of existing sites;
  - Monthly water quality summaries;
  - Monthly water quality maps for Franks Tract (discrete data);
  - Final report on project effects on water quality.

Timing: Before and during barrier construction, operation, and removal

Responsibility: DWR and its contractors

Mitigation Measure BIO-7: Return Disturbed Areas to Pre-Project Conditions And Conserve Habitat.

- DWR and its construction contractors will strive to limit riparian habitat removal during project-related construction activities, such as site access to Sutter and Steamboat sloughs. Following barrier removal, DWR will restore riparian habitat removal to approximate pre-project conditions using native vegetation only. DWR will develop and implement a conceptual mitigation and monitoring plan outlining restoration details. DWR will mitigate for impacts on shallow water habitat at a 3:1 ratio for permanent impacts and a 1:1 ratio for temporary impacts.

Timing: Before and during barrier construction and after barrier removal

Responsibility: DWR and its contractors

Mitigation Measure BIO-8: Implement Adaptive Management Program.

- DWR will adaptively manage the EDB in coordination with USFWS, NMFS, and CDFW on a weekly call during the construction, operation and removal of the barriers. Adaptive management will include reviewing first-year project monitoring reports with USFWS, NMFS, and CDFW identifying apparent problem areas; formulating potential solutions, and refining project elements for future-year implementation based on the best available solutions to address any identified problems. The success of these solutions would be monitored in the subsequent year of implementation, with the adaptive management cycle beginning again to allow correction of any further problems that were identified. Specific adaptive management measures would be identified during the process described above.

Timing: During barrier construction, operation, and removal

Responsibility: DWR and its contractor

Mitigation Measure BIO-9: Conduct Pre-construction Surveys for Special-status Plants and Implement Impact Avoidance and Minimization Measures.

- Implement Mitigation Measure BIO-3 to keep a single culvert in the Sutter Slough and Steamboat Slough barriers fully open at all times to reduce disruption of tidal fluctuations.

- Each year in which barrier installation may be required, a focused survey for delta tule pea, Mason's lilaeopsis, delta mudwort, Sanford's arrowhead, Suisun Marsh aster, woolly rose-mallow, and any other special-status plant that may occur at a project site will be conducted by a qualified botanist in areas of suitable habitat in the ground disturbance footprints and within 25 feet of the footprint boundaries. To the extent feasible depending on timing of barrier installation, surveys will be conducted at an appropriate time of year during which the species are likely to be detected, generally during the blooming period.

- If Mason's lilaeopsis is detected, a qualified botanist will ensure the area occupied by this species is fenced for complete avoidance during barrier installation, operation, and removal. Habitat occupied by other special-status species will also be fenced and avoided, to the extent feasible.
- If special-status plants (other than Mason's lilaeopsis) cannot be avoided, a qualified botanist will assess the feasibility of salvaging and transplanting individual plants to be removed, collecting and planting seeds of plants to be removed, and/or collecting and translocating seed- and rhizome-containing mud to nearby areas of suitable habitat. If such actions are deemed feasible, they will be implemented under the direction of the botanist, and in coordination with CDFW.

Timing: Before barrier construction

Responsibility: DWR

Mitigation Measure BIO-10: Implement Measures to Avoid Impacts on Elderberry Shrubs.

- DWR will implement protective buffers around known and previously unidentified elderberry shrubs adjacent to project sites or potential material storage sites before the start of construction. A minimum 100-foot buffer will be established and maintained around elderberry plants containing stems measuring 1.0 inch or greater in diameter at ground level.
- A fenced avoidance area will be established before the start of construction to protect all elderberry shrubs located adjacent to construction or storage areas. High-visibility fencing will be placed at least 100 feet from the dripline of the shrubs to prevent encroachment of construction workers and vehicles.
- If maintaining 100-foot protective buffers around all elderberry shrubs with a stem greater than 1 inch in diameter at ground level is not feasible, DWR will coordinate with USFWS to determine if the specific site conditions allow implementation of reduced buffers to adequately minimize impacts on and avoid take of valley elderberry longhorn beetle.

Timing: Before and during barrier construction, operation, and removal

Responsibility: DWR

Mitigation Measure BIO-11: Conduct Pre-construction Nest Surveys, Implement Impact Avoidance and Minimization Measures, and Provide Compensatory Mitigation for Swainson's Hawk.

- A biological monitor will survey all potential Swainson's hawk nesting trees within 0.5 mile of each of the project sites no more than 5 days before the start of barrier installation activities at each site. The biologist will conduct a second survey of potential nesting trees and Swainson's hawk nests no more than 3 days before beginning emergency drought barrier installation at each site. Surveys will also be conducted before geologic exploration that would occur during the Swainson's hawk nesting season (March 1 – September 15). Results will be reported to CDFW within 24 hours of each survey.

- During preconstruction surveys (described immediately above), a biological monitor will observe any nest(s) within 0.5 mile of the project sites for at least 1 hour. Nest status will be determined and normal nesting behaviors observed to provide a baseline against which to compare behaviors after construction begins. Results of preconstruction monitoring will be reported to CDFW within 24 hours of each survey.

- All active Swainson's hawk nests within 0.25 mile of the project sites (the area in which adverse effects are anticipated to occur) will be monitored during construction activities. Monitoring requirements will generally be based on proximity of construction activities to the nest site, as described below. These requirements may be adjusted, based on observed behavior patterns and response to construction activities by the nesting pair and/or their young. Potential adjustments will be evaluated on a case-by-case basis and in consultation with CDFW.

    - 25-Meter Construction Monitoring: Where a Swainson's hawk nest occurs within 25 meters (approximately 80 feet) of construction, a biological monitor will monitor the nesting pair during all construction hours to ensure the hawks are exhibiting normal nesting behavior. Construction activity will be limited to daylight hours.

    - 26–100-Meter Construction Monitoring: Where a Swainson's hawk nest occurs between 26 and 100 meters (approximately 80 to 330 feet) of construction, a biological monitor will observe the nest for at least 3 hours per construction day to ensure the hawks are exhibiting normal nesting behavior. Construction activity will be limited to daylight hours.

    - 101–200-Meter Construction Monitoring: Where a Swainson's hawk nest occurs between 101 and 200 meters (approximately 330 to 655 feet) of construction, a biological monitor will observe the nest for at least 1.5 hours per construction day to ensure the hawks are exhibiting normal nesting behavior.

    - 201–400-Meter Construction Monitoring: Where a Swainson's hawk nest occurs between 201 and 400 meters (approximately 655 to 1,310 feet) of construction, a biological monitor will observe the nest for at least 2 to 3 hours on each of 3 days per construction week to ensure the hawks are exhibiting normal nesting behavior and to check the status of the nest.

    - 401–800-Meter Construction Monitoring: Where a Swainson's hawk nest occurs between 401 and 800 meters (approximately 1,310 to 2,635 feet) of construction, a biological monitor will observe the nest for at least 2 to 3 hours on 1 day per construction week to ensure the hawks are exhibiting normal nesting behavior and to check the status of the nest.

- If personnel must approach closer than 25 meters (approximately 80 feet) to an active nest tree for more than 15 minutes while adults are brooding, the nesting adults will be monitored for signs of stressed behavior. If stressed behavior is observed, personnel will leave until the behavior normalizes. If personnel must approach closer than 50 meters (approximately 165 feet) for greater than 1 hour, the same applies. All personnel outside vehicles will be restricted to greater than 100 meters (approximately 330 feet) from the nest tree unless construction activities require them to be closer, and the personnel will remain out of the line of sight of the nest during work breaks.

- If a biological monitor determines that a nesting Swainson's hawk is significantly disturbed by project activities, to the point where nest abandonment is likely, the biological monitor will have the authority to immediately stop project activity and work will cease until the threat has subsided. The biological monitor will notify CDFW if nests or nestlings are abandoned, and if the nestlings are still alive, to determine appropriate actions.

- If an abandonment of a nest with eggs or nestlings occurs during construction, DWR will initiate action to retrieve any abandoned eggs or nestlings and deliver them to a CDFW-approved wildlife care facility for rearing and later return to the wild using methods acceptable to CDFW. DWR will fund the recovery, rearing, and controlled release of the young. Persons handling eggs and/or young birds will be qualified and approved by CDFW to conduct retrieval of abandoned eggs or nestlings.

- Removal of live trees with trunks in excess of 4 inches in diameter at breast height (dbh) will be avoided to the greatest extent practicable. To protect trees that can be preserved in the construction area, all trees 4 inches or greater in dbh located from the water edge to the levee crown will be flagged for avoidance prior to any work.

- DWR will provide compensatory mitigation for any loss of trees in excess of 4 inches dbh. Before the start of construction, DWR will conduct a survey of all trees that require removal and record characteristics of those greater than 4 inches dbh, including species, dbh, and height. Appropriate replacement ratios (minimum of 1:1), location of tree replacement plantings, and success criteria will be determined in consultation with and approved by CDFW.

  DWR will also provide mitigation to compensate for the potential impacts of reduced nest productivity or nest failure as a result of construction activities. If an active nest is present within 0.5 mile of a project site during barrier construction and project activities could result in reduced nest productivity, DWR will provide compensation for this potential impact. The circumstances under which compensation will be provided will depend on local conditions, such as distance from the nest to the project site, baseline human activity levels in the vicinity of the nest, and observed behavior of the nesting pair and will be determined in consultation with CDFW. If a monitored nest is abandoned and nestlings are still alive, DWR will fund the recovery and hacking (controlled release) of the nestlings. If a nest is abandoned and the nestlings do not survive, DWR will provide compensation for this loss. The appropriate amount and nature of the compensation will be determined in consultation with and approved by CDFW, based on the specific circumstances of the impact, and all mitigation will be implemented in accordance with the ITP issued for the project. Potential compensation mechanisms may include permanent protection and management of habitat for Swainson's hawk at a mitigation bank, contribution to a Swainson's hawk conservation fund, or other feasible means of promoting the long-term conservation of the species.

Timing: Before and during barrier construction and after barrier removal

Responsibility: DWR and its contractors

Mitigation Measure BIO-12: Conduct Pre-Construction Habitat Assessment and Burrow Survey and Implement Impact Avoidance and Minimization Measures for Burrowing Owl.

- A qualified biologist will conduct an assessment of burrowing owl habitat suitability at the West False River barrier site and the Rio Vista stockpile site (if applicable). The assessment will evaluate the area subject to direct impact, as well as adjacent areas within 150 to 500 meters (approximately 490 to 1,640 feet), depending on the potential extent of indirect impact.

- If suitable habitat or sign of burrowing owl presence is observed, surveys and reporting will be conducted in accordance with Appendix D of CDFW's Staff Report on Burrowing Owl Mitigation (CDFW 2012). At a minimum, an initial take avoidance survey will be conducted no less than 14 days before stockpiling activities begin and a second survey will be conducted within 24 hours before activities begin. If sign of burrowing owl presence is observed during the habitat assessment, the full survey protocol (four surveys during the breeding season and four surveys during the non-breeding season) will be implemented, to the extent feasible, depending on timing of project implementation and stockpiling activities.

- If any occupied burrows are observed, DWR will develop and implement avoidance and minimization measures, such as protective buffers, in consultation with CDFW. A qualified biologist will monitor the occupied burrows before and during stockpiling activities to inform development of and confirm effectiveness of these measures. If it is determined, in consultation with CDFW, that passive exclusion of owls from the stockpile area is an appropriate means of minimizing direct impacts, such exclusion will be conducted in accordance with an exclusion and relocation plan developed by DWR in coordination with and approved by CDFW.

- Burrows occupied during the breeding season (February 1 through August 31) will be provided a protective buffer until a qualified biologist verifies through noninvasive means that either (1) the birds have not begun egg laying or (2) juveniles from the occupied burrows are foraging independently and are capable of independent survival. The size of the buffer will depend on distance from the nest to the project footprint, type and intensity of disturbance, presence of visual buffers, and other variables that could affect susceptibility of the owls to disturbance.

Timing: Before and during barrier construction

Responsibility: DWR and its contractors

Mitigation Measure BIO-13: Conduct Pre-Construction Nest Surveys and Implement Impact Avoidance and Minimization Measures for Nesting Raptors Other than Swainson's Hawk and Burrowing Owl.

- If removal of suitable nest trees is required for barrier installation, such removal will be conducted between September 16 and January 31 (outside of the raptor nesting season), to the extent feasible.

- Focused surveys for active nests of Cooper's hawk, white-tailed kite, and other common raptors will be conducted by a qualified biologist in areas of suitable nesting habitat within 500 feet of project activity areas at each barrier site. Surveys will be conducted within 10 days before the start of project activities (including geologic exploration) that would occur during the raptor nesting season (February 1 – September 15).

- If an active nest is identified, an appropriate protective buffer will be determined by the biologist, in coordination with CDFW. The size of the buffer will depend on site-specific conditions and potential disturbance levels. Construction-related activities within the buffer will be avoided to the extent feasible until the nest is no longer active. If construction activity is necessary within the buffer, a qualified biologist will monitor the nesting adults and/or young for signs of stressed behavior. If behavior suggesting potential for nest failure is observed, project activity within the buffer will be reduced until behavior normalizes. Frequency and duration of monitoring will depend on the location and intensity of construction activity within the buffer and will be determined by the biologist, in coordination with CDFW.

Timing: Before and during barrier construction

Responsibility: DWR and its contractors

Mitigation Measure CUL-1: Avoid Historic Vessel P-34-4455.

To avoid inadvertently affecting the historic vessel P-34-4455 during construction, DWR, in consultation with a qualified professional archaeologist, will advise construction workers that the location of the vessel is an environmentally sensitive area that is to be avoided during construction and subsequent removal of the temporary Steamboat Slough barrier.

Timing: Before the start of construction

Responsibility: DWR

Mitigation Measure CUL-2: Halt Ground-Disturbing Construction Activities if Cultural Materials Are Discovered.

If cultural materials (e.g., unusual amounts of shell, animal bone, flaked stone, bottle glass, ceramics, or structure/building remains) are discovered during construction, ground disturbances in the immediate vicinity of the find will be halted immediately, and a qualified professional archaeologist will be notified regarding the discovery. The archaeologist will determine whether the resource is potentially significant as per the California Register of Historical Resources (CRHR) and will determine the appropriate management steps necessary to protect and secure the identified resources.

Timing: During construction

Responsibility: DWR

Mitigation Measure CUL-3: Halt Construction Activities if Any Human Remains Are Discovered.

The procedures for the treatment of discovered human remains are described in Sections 7050.5 and 7052 of the California Health and Safety Code and Section 5097 of the California Public Resources Code. In accordance with the California Health and Safety Code, if human remains are uncovered during ground-disturbing activities, such activities that may affect the remains will be halted, and DWR or its designated representative will be notified. DWR immediately will notify the county coroner and a qualified professional archaeologist. If the coroner determines that the remains are those of a Native American, the coroner will contact the Native American Heritage Commission (NAHC) by telephone within 24 hours of making that determination (California Health and Safety Code, Section 7050.5[c]).

DWR's responsibilities for acting on notification of a discovery of Native American human remains are identified in Section 5097.9 of the California Public Resources Code. DWR or its appointed representative and the professional archaeologist will consult with a Most Likely Descendant (MLD), determined by the NAHC, regarding the removal or preservation and avoidance of the remains, and will determine whether additional burials could be present in the vicinity.

Timing: During construction

Responsibility: DWR

Mitigation Measure GHG-1: Conform to Best Management Practices (BMPs) for Construction and Maintenance Activities to Reduce Greenhouse Gas Emissions that are Contained in the Climate Action Plan Phase I: Greenhouse Gas Emissions Reduction Plan Implementation Procedures (DWR 2012).

DWR will implement the following measures for the proposed project:

Pre-Construction and Final Design BMPs

- Evaluate project characteristics, including location, project work flow, site conditions, and equipment performance requirements, to determine whether specifications of the use of equipment with repowered engines, electric drive trains, or other high efficiency technologies are appropriate and feasible for the project or specific elements of the proposed project.
- Evaluate the feasibility and efficacy of performing on-site material hauling with trucks equipped with on-road engines.
- Ensure that all feasible avenues have been explored for providing an electrical service drop to the construction site for temporary construction power. When generators must be used, use alternative fuels, such as propane or solar, to power generators to the maximum extent feasible.
- Limit deliveries of materials and equipment to construction sites to off-peak traffic congestion hours.

Construction BMPs

- Minimize idling time by requiring that construction equipment be shut down after 5 minutes when not in use, as required by the State airborne toxics control measure in Section 2485 of Title 13 in the California Code of Regulations. Provide clear signage that posts this requirement for construction workers at the entrances to construction sites and provide a plan for the enforcement of this requirement.
- Maintain all construction equipment in proper working condition and perform all preventative maintenance. Required maintenance will include compliance with all manufacturer's recommendations, proper upkeep and replacement of filters and mufflers, and maintenance of all engine and emissions systems in proper operating condition.

- Implement a tire inflation program at the construction sites to ensure that equipment tires are correctly inflated. Check tire inflation when equipment arrives on-site and every 2 weeks for equipment that remains on-site. Check vehicles used for hauling materials off-site weekly for correct tire inflation.

- Develop a project-specific ride share program to encourage carpools, shuttle vans, transit passes, and/or secure bicycle parking for construction worker commutes.

- Reduce electricity use in temporary construction offices by using high efficiency lighting and requiring that heating and cooling units be Energy Star compliant. Require that all contractors develop and implement procedures for turning off computers, lights, air conditioners, heaters, and other equipment each day at close of business.

- For deliveries to construction sites where the haul distance exceeds 100 miles and a heavy-duty class 7 or class 8 semi-truck or 53-foot or longer box-type trailer is used for hauling, a SmartWay2 certified truck will be used to the maximum extent feasible.

- Develop a project-specific construction debris recycling and diversion program to achieve a documented 50 percent diversion of construction waste.

- Evaluate the feasibility of restricting all material hauling on public roadways to off-peak traffic congestion hours. During construction scheduling and execution, minimize, to the extent possible, uses of public roadways that will increase traffic congestion.

Timing: Before and during construction as appropriate

Responsibility: DWR

Mitigation Measure HYDRO-1: Minimize Downstream Water Surface Elevation Impacts and Work with North Delta Water Agency to Minimize Salinity Changes for Water Users within the Agency's Boundaries

DWR will work with affected agricultural diverters and the North Delta Water Agency to agree upon acceptable measures to minimize potential water surface elevation decreases caused by the Sutter and Steamboat Slough barriers. In the event of a diversion deficiency downstream from the Sutter and Steamboat Slough barriers, and in coordination with affected landowners, DWR will:

- Respond with a site visit within 24 hours of phone notification of a diversion deficiency from an affected landowner,

- Determine if the diversion deficiency is due to reduced stage caused by the Sutter and Steamboat Slough barriers, and

- Identify and implement a preferred corrective action. Corrective actions will be implemented in accordance with the following criteria:

  - The performance standard is to return affected diversions to their pre-project equipment capacities.

- The type of diversion cannot be changed, e.g., siphons cannot be replaced with a permanent pump or vice versa. Temporary pumps may be installed to assist any type of diversion. Intake size cannot be increased, e.g., an 8-inch pipe replaced with a 12-inch pipe.

- Intake depth may be changed, e.g., a length of pipe can be attached to extend an existing pipe or a pipe shortened if buried in sediment.

- Intakes will not be relocated; maintenance dredging will not be conducted; and corrective actions cannot require additional U.S. Army Corps of Engineers (USACE) permit application and approval, which would require substantial delays in implementing the corrective action.

DWR will also reach agreement with North Delta Water Agency to ensure that any salinity increases remain below the State Water Resources Control Board limits set in Water Rights Decision 1641 as amended. DWR remains committed to fulfilling its commitments in the 1981 Contract between State of California Department of Water Resources and North Delta Water Agency for the Assurance of a Dependable Water Supply of Suitable Quality.

Timing: During barrier operation

Responsibility: DWR

Mitigation Measure NOISE-1: Employ Noise-Reducing Construction Measures.

DWR will employ noise-reducing construction practices during construction. Measures that may be used to limit noise will include the following:

- ► Written notification of heavy construction activities will be provided to all noise-sensitive receptors located adjacent to the project site and heavy construction operations, or within 50 feet of such operations. Notification will include anticipated dates and hours when construction activities are anticipated to occur, and contact information, including a daytime telephone number, for the project representative to be contacted in the event that noise levels are deemed excessive. Recommendations to assist noise-sensitive land uses in reducing interior noise levels (e.g., closing windows and doors) will be included in the notification.

- ► Fixed/stationary equipment (e.g., generators, compressors) will be located as far as possible from noise-sensitive receptors. All impact tools will be shrouded or shielded, and all intake and exhaust ports on powered construction equipment will be muffled or shielded.

- ► All construction equipment will be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturers' recommendations. Equipment engine shrouds will be closed during equipment operation.

- ► All motorized construction equipment will be shut down when not in use, to prevent excessive idling noise.

- All construction equipment powered by gasoline or diesel engines will have sound control devices that are at least as effective as those originally provided by the manufacturer, and all equipment will be operated and maintained to minimize noise generation.

- Noise reducing enclosures will be used around noise generating equipment, and temporary barriers will be used between noise sources and noise sensitive land uses, where feasible and when noise levels would exceed the threshold of 10 decibels (dB) above ambient noise levels.

Timing: During construction

Responsibility: DWR

INITIAL STUDY

EMERGENCY DROUGHT BARRIERS PROJECT

1. Project Title	Emergency Drought Barriers Project
2. Lead Agency Name and Address	California Department of Water Resources PO Box 942836 Sacramento, CA 94236
3. Contact Person and Phone Number	Paul Carlson, Information Officer California Department of Water Resources Phone: (916) 653-5114 E-mail: DWREDBCOMMENTS@water.ca.gov
4. Project Location	Three temporary rock barriers would be installed, a single barrier at three locations, in the north and central Sacramento–San Joaquin River Delta (Delta): Sutter Slough, Steamboat Slough, and West False River. The Sutter Slough site is located in the north Delta about 0.6 mile directly west of the Sacramento River at the northwest end of Sutter Island. This site is approximately 1 mile southwest of the community of Courtland and 7 miles northwest of Walnut Grove and is on the border between Yolo and Sacramento counties. The Steamboat Slough site is approximately 2.1 miles south-southeast of the Sutter Slough site, on the east side of Sutter Island, and approximately 1 mile southwest of the Sacramento River in Sacramento County. The West False River site is located approximately 0.4 mile east of the confluence with the San Joaquin River, between Jersey and Bradford Islands in Contra Costa County, and is about 4.8 miles northeast of Oakley.
5. Project Sponsor's Name	California Department of Water Resources
6. General Plan Designation	Various, See Section 3.10, "Land Use and Planning"
7. Zoning	Various, See Section 3.10, "Land Use and Planning"
8. Project Description	Rock (rip-rap) barrier weir structures would be installed at three sites (Sutter Slough, Steamboat Slough, and West False River) between 2015 and 2025. During this 10-year period, the barriers could be installed up to three times, including potentially in consecutive years. The purpose of the barriers is to reduce the intrusion of saltwater into the Delta during drought conditions when stored water in upstream reservoirs available for release is insufficient to meet Delta outflow required to repel San Francisco Bay salinity, which could (1) render Delta water undrinkable and affect roughly 25 million Californians, (2) render Delta water unusable by agriculture, and (3) decrease freshwater habitat in the Delta for sensitive aquatic species. All structures would be trapezoid-shaped rock barriers with a wide base tapering up to a 12-foot-wide top width set perpendicular to the channel alignment.

Rock fill would be placed along the base of the levees for support at the Sutter and Steamboat Slough sites. The West False River site would have transitions to the levees with 75-foot-long sheet pile walls supported by king piles and buttressed with rock because the levees are weaker in this area than at the northerly sites because of peat soil foundations. The temporary rock barriers may be installed at each of the sites in spring or summer, beginning no sooner than May 7 at the West False River location, and May 22 at the Sutter and Steamboat Slough sites. The construction period would be approximately 30 to 60 days. Barrier removal may require approximately 30 to 60 days for Sutter and Steamboat sloughs with removal commencing on or near October 1 and approximately 45 to 60 days for West False River with removal also commencing on or near October 1. The barriers would be removed entirely no later than November 1 for Sutter and Steamboat sloughs and November 15 for West False River, prior to the rainy season when freshwater runoff typically occurs and flood risk increases.

Additional detail is provided in Section 2, "Project Description."

9. Surrounding Land Uses and Setting	Active agricultural fields are located around the proposed barrier site. See "Environmental Setting" discussion under each issue area in Chapter 3, "Environmental Checklist."
10. Other Public Agencies Whose Approval Is Required	See Section 2.10, "Regulatory Requirements, Permits, and Approvals."

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ACRONYMS AND OTHER ABBREVIATIONS

µS/cm	microsiemens per centimeter
µin/sec	microinches per second
AB	Assembly Bill
APE	area of potential effects
APNs	Assessor Parcel Numbers
ARB	California Air Resources Board
BAAQMD	Bay Area Air Quality Management District
BMP	best management practice
BO	Biological Opinion
B.P.	Before Present
CAA	federal Clean Air Act
CAAA	Clean Air Act Amendments
CAAQS	California Ambient Air Quality Standards
Cal Boating	California Department of Parks and Recreation Division of Boating and Waterways
CAL FIRE	California Department of Forestry and Fire Protection
CalOES	Governor's Office of Emergency Services
Caltrans	California Department of Transportation
CCAA	California Clean Air Act
CDFG	California Department of Fish and Game (now CDFW)
CDFW	California Department of Fish and Wildlife (formerly CDFG)
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFD	Courtland Fire Department
CFPD	Clarksburg Fire Protection District
CFS	cubic feet per second
CGS	California Geological Survey
CH_4	methane
CMP	Carl Moyer Program
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CPTs	cone penetrometer tests
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
Cortese List	Hazardous Waste and Substances Sites List

ACRONYMS AND OTHER ABBREVIATIONS

CRHR	California Register of Historical Resources
CRPR	California Rare Plant Rank
CVP	Central Valley Project
CWA	Clean Water Act
dB	decibel(s)
dBA	A-weighted decibel
dbh	diameter at breast height
DCC	Delta Cross Channel
Delta	Sacramento–San Joaquin River Delta
DO	dissolved oxygen
DPC	Delta Protection Commission
DPR	California Department of Parks and Recreation
DPS	distinct population segment
DSC	Delta Stewardship Council
DSM2	Delta Simulation Model 2
DTSC	California Department of Toxic Substances Control
DWR	California Department of Water Resources
EC	electrical conductivity
ECCFPD	East Contra Costa County Fire Protection District
EDB	Emergency Drought Barriers
EIR	environmental impact report
EPA	U.S. Environmental Protection Agency
ESA	federal Endangered Species Act
ESU	Evolutionarily Significant Unit
GGERP	DWR's Climate Action Plan Phase 1: Greenhouse Gas Emissions Reduction Plan
GHG	greenhouse gas
GPS	global positioning system
HAZMAT	hazardous materials
HCP	Habitat Conservation Plan
HFC	hydrofluorocarbon
HMMP	Hazardous Materials Management Program
HSA	hollow stem auger
in/sec	inches per second
IS	initial study
ITP	Incidental Take Permit
L_{dn}	day-night average level

ACRONYMS AND OTHER ABBREVIATIONS

L_{eq}	equivalent sound level
$L_{eq[h]}$	1-hour equivalent sound level (the sound energy averaged over a continuous 1-hour period)
LMA	Local Maintaining Agency
L_{max}	maximum sound level
L_v	velocity level in decibels (VdB) referenced to 1 microinch per second and based on the root mean square velocity amplitude
Management Plan	Land Use and Resource Management Plan for the Primary Zone of the Delta
MBTA	Migratory Bird Treaty Act
mg/L	milligrams per liter
MHHW	mean higher high water
MLD	Most Likely Descendant
mm	millimeter
MND	mitigated negative declaration
MOU	Memorandum of Understanding
MT	metric tons
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NAVD	North American Vertical Datum of 1988
NCCP	Natural Community Conservation Plan
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_X	oxides of nitrogen
NO_2	nitrogen dioxide
NRHP	National Register of Historic Places
NTU	Nephelometric Turbidity Unit
OHP	California Office of Historic Preservation
PFC	perfluorocarbon
PM	particulate matter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PM_{10}	particulate matter less than 10 microns in diameter
PPV	peak particle velocity
proposed project	Emergency Drought Barriers Project
RBDD	Red Bluff Diversion Dam
Reclamation	U.S. Department of the Interior, Bureau of Reclamation

ACRONYMS AND OTHER ABBREVIATIONS

RMS	root-mean-square
ROG	reactive organic gases
RST	rotary screw trap
SCSD	Sacramento County Sheriff's Department
SEL	sound exposure level
SFBAAB	San Francisco Bay Area Air Basin
SF_6	sulfur hexafluoride
SHPO	State Historic Preservation Officer
SMAQMD	Sacramento Metropolitan Air Quality Management District
SO_2	sulfur dioxide
SR	State Route
SSBMI	Shingle Springs Band of Miwok Indians
SVAB	Sacramento Valley Air Basin
SWP	State Water Project
TAC	toxic air contaminant
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
YCSD	Yolo County Sheriff's Department
VdB	vibration decibels
VHFHSZ	very high fire hazard severity zone
VMT	vehicle miles traveled
YSAQMD	Yolo-Solano Air Quality Management District

1 INTRODUCTION

The California Department of Water Resources (DWR) has prepared this initial study/proposed mitigated negative declaration (IS/MND) in compliance with the California Environmental Quality Act (CEQA) and State CEQA Guidelines to address the environmental consequences of the proposed Emergency Drought Barriers (EDB) Project (proposed project). DWR is the lead agency under CEQA.

To satisfy CEQA requirements, this document includes:

- a notice of availability and intent to adopt an IS/MND for the proposed project,
- a proposed MND, and
- an IS.

After the required public review of this document is complete, DWR will consider adopting the proposed MND and a mitigation monitoring and reporting program, and will decide whether to proceed with the proposed project.

1.1 PURPOSE OF THE INITIAL STUDY

This document is an IS, prepared in accordance with CEQA (Public Resources Code, Section 21000 et seq.) and the State CEQA Guidelines (Title 14, Section 15000 et seq. of the California Code of Regulations). The purpose of this IS is to (1) determine whether project implementation would result in potentially significant or significant effects on the environment; and (2) incorporate Environmental Commitments into the project design and propose feasible mitigation measures, as necessary, to eliminate the project's potentially significant or significant project effects or reduce them to a less-than-significant level.

An IS presents environmental analysis and substantial evidence in support of its conclusions regarding the significance of environmental impacts. Substantial evidence may include expert opinion based on facts, technical studies, or reasonable assumptions based on facts. An IS is neither intended nor required to include the level of detail provided in an environmental impact report (EIR).

CEQA requires that all State and local government agencies consider the environmental consequences of projects that they propose to carry out or over which they have discretionary authority, before implementing or approving those projects. The public agency that has the principal responsibility for carrying out or approving a project is the lead agency for CEQA compliance (State CEQA Guidelines Section 15367). DWR has principal responsibility for carrying out the proposed project, and therefore is the CEQA lead agency for this IS.

DWR has prepared this IS to evaluate the potential environmental effects of the proposed project and has incorporated mitigation measures to reduce or eliminate any potentially significant project-related impacts. Therefore, an MND has been prepared for this project.

1.2 SUMMARY OF FINDINGS

Chapter 3, "Environmental Checklist," contains the analysis and discussion of potential environmental impacts of the proposed project. Based on the issues evaluated in that chapter, DWR has determined that the proposed project would not result in any significant impacts after mitigation measures are implemented.

The proposed project would result in no impacts related to the following issue areas:

- Land use and planning
- Mineral resources
- Population and housing

The proposed project would result in less-than-significant impacts related to the following issue areas:

- Aesthetics
- Geology and soils
- Hazards and hazardous materials
- Public Services
- Recreation
- Transportation and traffic

The proposed project would result in less-than-significant impacts *after* mitigation related to the following issue areas:

- Agriculture and Forestry Resources
- Air Quality
- Biological Resources
- Cultural Resources
- Greenhouse Gas Emissions
- Hydrology and Water Quality
- Noise
- Utilities and Service Systems
- Mandatory Findings of Significance

1.3 DOCUMENT ORGANIZATION

This document is divided into the following sections:

Table of Contents: This section outlines the organization of the IS.

Acronyms and Other Abbreviations: This section is a list of the acronyms and other abbreviations used in the IS.

Chapter 1, Introduction: This chapter briefly summarizes the proposed project and describes the purpose of the IS, presents a summary of the findings, and specifies how the document is organized.

Chapter 2, Project Description: This chapter discusses the purpose of and need for the proposed project, general project background, and project elements, including construction and operations and maintenance activities.

Chapter 3, Environmental Checklist: This chapter presents an analysis of environmental issues identified in the CEQA environmental checklist and determines whether the proposed project would result in a beneficial impact, no impact, less-than-significant impact, less-than-significant impact with mitigation incorporated, potentially significant impact, or significant impact on the environment in each resource issue area. If any impacts are determined to be potentially significant or significant after mitigation, an EIR would be required. For the proposed project, however, mitigation measures have been incorporated as needed to reduce all potentially significant and significant impacts to a less-than-significant level.

Chapter 4, References: This chapter lists the references used in preparation of this IS.

Chapter 5, Report Preparers: This chapter identifies the preparers of this document.

2 PROJECT DESCRIPTION

This chapter describes the Emergency Drought Barriers (EDB) Project (proposed project). The project location and background are described along with project objectives, project characteristics, construction activities, project operations, and discretionary actions and approvals that may be required.

2.1 INTRODUCTION

Water quality conditions in the Sacramento-San Joaquin River Delta (Delta) during 2014 were difficult to control as a result of persistent drought conditions, and put municipal, industrial, and agricultural water supplies at risk. The brackish conditions also were degrading habitat for threatened and endangered fish dependent on the Delta. In response to the statewide drought conditions, the U.S. Department of Agriculture identified 57 counties in California, including Sacramento, Yolo, and San Joaquin counties, as eligible for natural disaster assistance, including funding for emergency watershed protection and water assistance for rural communities (USDA 2014) . This announcement came in the spring of 2014, following President Obama's earlier announcement of an administration-wide drought response in February 2014.

In addition, on January 17, 2014, California's Governor Edmund G. Brown Jr. signed a proclamation declaring a State of Emergency, prompted by record dry conditions and projections that 2014 will be the driest year on record (see http://gov.ca.gov/news.php?id=18368). In his proclamation, he found that the lack of precipitation is beyond the ability of local authorities to address, placing the safety of people and property existing within California in peril because of water shortage from persistent drought conditions. Governor Brown issued a number of directives calling for immediate action to implement conservation programs, secure water supplies for at-risk communities, and protect critical environmental resources. A Proclamation of a Continued State of Emergency was issued on April 25, 2014, and an Executive Order was issued on December 22, 2014 extending the waiver of CEQA and Water Code Section 13247 in paragraph 9 of the January 17, 2014 Proclamation, and paragraph 19 of the April 25, 2014 Proclamation through May 31, 2016.

Many of the actions in the drought proclamation are being undertaken by the California Department of Water Resources (DWR) and its various federal, state, and local partners. These actions include temporary modifications of requirements included in the State Water Resources Control Board's Revised Decision 1641 (D-1641) to meet water quality objectives in the Water Quality Control Plan for the Bay-Delta, including increased flexibility for water transfers, regulating diversions, and Delta Cross Channel (DCC) gate operations. The drought proclamation also directed DWR to take other necessary actions to protect water quality and water supply in the Delta, including installation of temporary barriers or temporary water supply connections as needed, and coordination with the California Department of Fish and Wildlife (CDFW) to minimize impacts on affected aquatic species.

The proposed project seeks to protect the quality of water for users that rely on Delta water. The proposed project would include installation of three temporary rock barriers. The selection of the locations of the emergency drought barriers was based mainly on the Draft Emergency Barriers Report (DWR 2009). In that report, the impact on salinity at the export locations for various individual locations and a combination of barrier locations was evaluated. For each barrier or combination of barriers, improvement in salinity at the export locations was evaluated, and if the improvement was less than 5 percent, the barrier(s) were not considered a viable alternative and other barriers and combinations of barriers became the focus. Based on that analysis, two possible combinations of barriers were chosen. After further analysis, the combination of Steamboat Slough, Sutter Slough, and West False River was decided on to minimize impacts while meeting the project objectives.

The proposed barriers at the heads of both Sutter and Steamboat sloughs would decrease the rate of flow from the Sacramento River and into Sutter and Steamboat sloughs, therefore increasing the flow of water in the Sacramento River. Therefore, increased flows through Georgiana Slough and the DCC would repel salinity from the Central/South Delta. An additional barrier in West False River near its confluence with the San Joaquin River would be installed to limit salinity intrusion along the lower San Joaquin River and the channels leading from it.

Setting precedent for the proposed project, several rock barriers were installed at Delta locations during 1976 and 1977 to help mitigate for drought conditions. In 1976, one barrier was installed at Sutter Slough to help meet water quality criteria and allow for conserving additional water in upstream reservoirs. A second barrier was installed at Old River at its divergence from the San Joaquin River (often referred to as head of Old River) to protect fishery resources by keeping special-status fish in the San Joaquin River, thereby reducing entrainment risk at Central Valley Project/State Water Project (CVP/SWP) export facilities in the South Delta. In 1977, as drought conditions continued, barriers were installed at six different locations in the Delta. In addition, control facilities were built at two additional locations. The six barrier locations constructed in 1977 included Old River east of Clifton Court, San Joaquin River near Mossdale, Rock Slough, Indian Slough, Dutch Slough, and the head of Old River.

With the proposed project, the temporary barriers could be installed up to three times over a 10-year period between 2015 and 2025, including potentially in successive years. While this document covers the possibility of either three consecutive year installations or up to three installations in 10 years, the barriers would only be constructed if the drought reduced SWP water storage to critical levels such that projected Delta outflow could not control increased salinity in the Delta such that worsening water quality threatened the drinking and irrigation water supply, as described in Section 2.2, “Purpose and Objectives,” and Section 2.3, “Need for Project.” Operation of the drought barriers as part of overall CVP and SWP operations occurs through existing rules and regulations under relevant federal and state regulatory agencies (for more information on the CVP and SWP Operations Criteria and Plan see http://www.usbr.gov/mp/cvo/ocap_page.html).

Installation of the proposed project in 2015 is considered as part of the Interagency 2015 Drought Contingency Strategy developed by Bureau of Reclamation (Reclamation), DWR, U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and CDFW. The December 11, 2014 draft of the Interagency 2015 Drought Contingency Strategy includes several core principles for CVP and SWP operations, one of which is to control salt water intrusion in the Delta. As noted in the draft, installation of emergency drought barriers will be considered in 2015 only when necessary to lessen water quality impacts if winter forecasts suggest that there will be insufficient water in upstream reservoirs without installation of the barriers necessary to protect water quality and to meet health and safety and other critical water supply needs.

2.2 PURPOSE AND OBJECTIVES

The purpose of the proposed project is to reduce the intrusion of saltwater into the Delta during drought conditions when stored water in upstream reservoirs is insufficient to meet Delta outflow required to repel San Francisco Bay salinity, which could (1) render Delta water undrinkable and affect roughly 25 million

Californians, (2) render Delta water unusable by agriculture, and (3) decrease freshwater habitat in the Delta for sensitive aquatic species.

The project objectives are to:

- Benefit communities and farmers in and adjacent to the Delta that rely exclusively on this source for municipal water and irrigation;

- Benefit upstream resources and communities, because once installed, the barriers would reduce demand on reservoir releases to maintain salinity objectives in the Delta, thus leaving more water in upstream reservoirs that could later be released for critical upstream fisheries and community needs; and

- Benefit the CVP and SWP operators as they attempt to maintain access to water supplies for human health and safety.

2.3 NEED FOR PROJECT

EDB would be installed to protect the water supply for nearly all those dependent on the water in the Delta if water quality conditions in the Delta decline due to the severe drought conditions. Increased salinity in the Delta could render the water undrinkable by 25 million Californians and unusable by farms reliant upon this source. In January 2014, large amounts of saltwater began intruding into the Delta. The resulting water quality approached human health criteria at many locations in the South Delta and spread as far south as the CVP and SWP intakes near Tracy, putting several communities and local water purveyors dependent on that water supply at risk. The bromide levels also increased along with salinity (bromide concentrations are typically low in freshwater and higher in seawater). This is important because bromide plays a role in the formation of disinfection by-products (trihalomethanes and bromate), which are carcinogens and difficult to treat with existing drinking water purification processes.

The Delta is a complex system of interconnecting channels that provide numerous pathways for the tides to push saltwater inland. Normally, outflow is sufficient to prevent San Francisco Bay's saline water from migrating eastward into the Delta with each tidal pulse, but the record dry January experienced dramatically lower outflow levels. Because of the degraded water conditions during the start of 2014, temporary emergency drought barriers at strategic locations were evaluated for their potential to repel and minimize saltwater intrusion into the Delta and thus help conserve limited fresh water resources in upstream reservoirs. Runoff and snow pack data show that February and March storms in 2014 increased reservoir storage modestly. While not nearly enough to take California out of the current extreme drought, this minimal increase in water supply allowed the CVP and SWP to limit saltwater intrusion into the interior Delta without installing rock barriers in Delta channels in 2014 (DWR 2014a).

The 2014 CVP and SWP Drought Operations Plan and Operational Forecast for April 1, 2014 through November 15, 2014 called for DWR to reassess the need for barriers in the future if dry conditions persist. This CEQA document is being prepared should another drought occur from 2015 to 2025, and water quality monitoring and reservoir storage capacity data indicate that barriers are needed to reduce the intrusion of saltwater into the Delta during drought conditions when upstream reservoir resources are insufficient to meet Delta outflow required to repel San Francisco Bay salinity.

Water content in the Sierra Nevada snowpack that normally provides about a third of the water for California cities and farms was at only 32 percent of its historical average in early April 2014 and was down to 21 percent of its historical average by mid-April (DWR 2014a).

As of mid-April 2014, the state's key reservoirs were well below normal levels. For example, Lake Oroville in Butte County, the SWP's principal reservoir, was at 52 percent of its 3.5 million acre-foot capacity (66 percent of its historical average for the date). Shasta Lake north of Redding, California's and the federal CVP's largest reservoir, was at 53 percent of its 4.5 million acre-foot capacity and 63 percent of its historical average for mid-April. San Luis Reservoir, a critical south-of-Delta pool for both the CVP and SWP, was at 46 percent of its 2 million acre-foot capacity (52 percent of normal for the date) as of mid-April (DWR 2014a).

Should there be insufficient water in the natural runoff or stored in upstream reservoirs that can be released to minimize saline intrusion into the Delta, low Delta tributary inflows will allow salinity intrusion to the extent that interior portions of the Delta will exceed water quality objectives. The maximum mean daily salinity objective for municipal and industrial use in all water year types established by the State Water Resources Control Board in D-1641 is approximately 415 milligrams per liter (mg/L) (Table 1, Water Quality Objectives for Municipal and Industrial Beneficial Uses). Should salinity peak and exceed this threshold, such high salinity levels (with associated bromide levels) could preclude pumping and/or compromise municipal and irrigation water supplies. This would be particularly devastating for communities without alternative water supplies, including the Contra Costa Water District, which serves approximately 500,000 people and is almost entirely dependent on the Delta for its water supply (Contra Costa Water District 2011), and for agricultural water users that may not have access to alternate water supplies.

After salinity intrudes into the Delta, moving it back toward San Francisco Bay is difficult; thus, high salinity could persist for an extended period if high winter and spring freshwater flows are not available to dislodge it. This would effectively eliminate the Delta as a water supply for the Californians who depend on it. This condition would exist, perhaps for many months, until sizeable storms provide the necessary Delta tributary inflow and outflow to flush out the saline waters. In addition to critical urban water uses, water flowing through the Delta is essential to the agricultural industry and businesses that drive the state's economy (DWR 2014b). Consequently, increased salinity levels in the Delta, especially over a sustained period of many months, would have a profound detrimental effect throughout the State.

Increased salinity levels also would have an adverse effect on the sensitive aquatic resources that live in and pass through the Delta. This is both due to exceedances of water quality objectives and because the already limited water supplies stored in the upstream reservoirs would need to be released to meet objectives. As a result, cool water resources would be insufficient in late spring and summer to protect salmon eggs incubating in the gravels, and rearing habitat for juvenile salmon below Keswick, Oroville, and other dams would be depleted. Construction of the barriers would conserve cold water pools in upstream reservoirs to protect natural resource values later in the year because less water would need to be released from the reservoirs for water quality earlier in the year. In addition, more reservoir storage would be available for community needs in upstream areas.

The EDB would impede the intrusion of saltwater into the Central and South Delta and optimize the use of fresh water flows to maintain water quality that meets human health criteria. Modeling of salinity intrusion with variable installation dates demonstrated the greatest benefits are gained if the barriers are installed in spring; however, benefits are gained from a later installation.

2.4 PROJECT LOCATION

Three temporary rock barriers would be installed at three locations in the North and Central Delta:

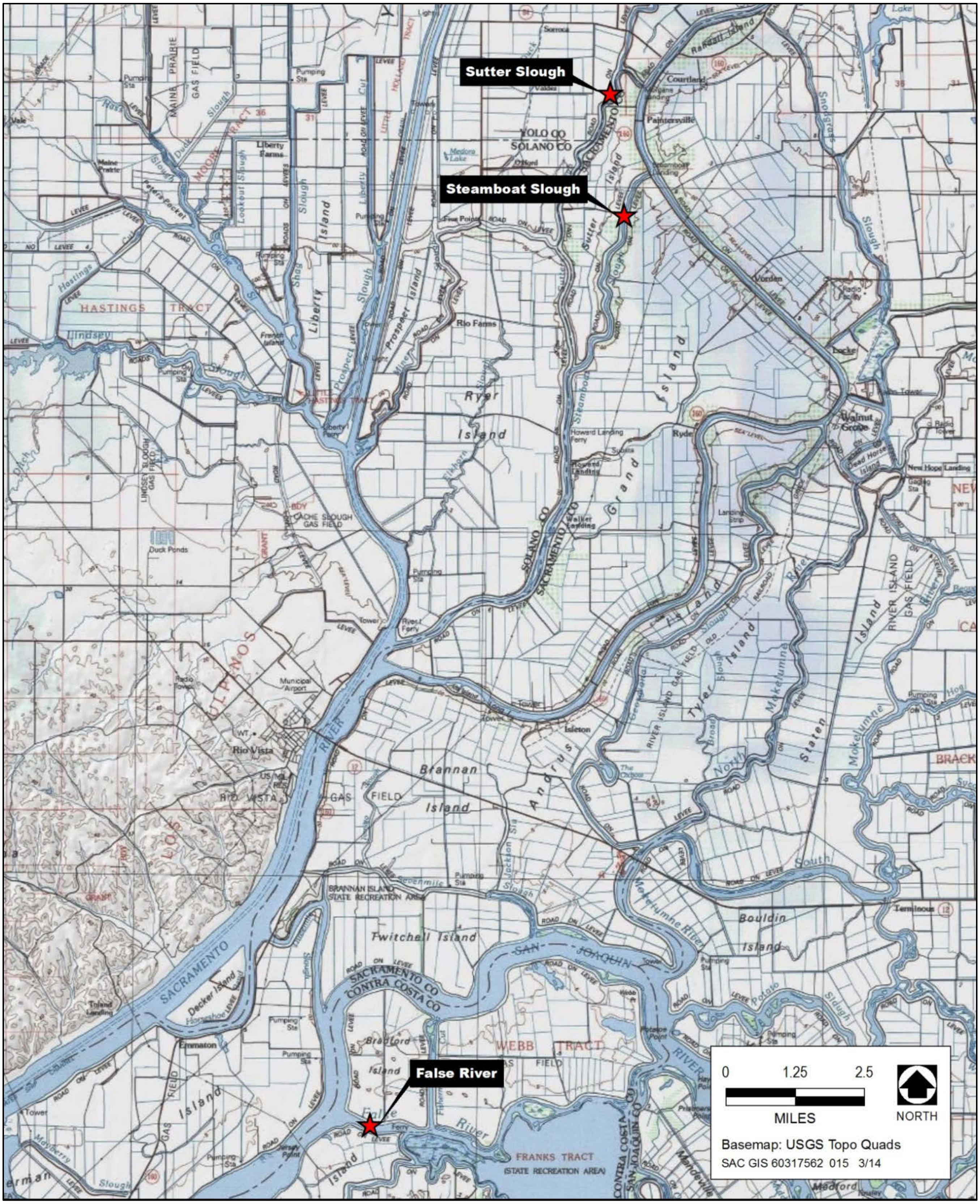
- Sutter Slough
- Steamboat Slough
- West False River

The general locations of these sites are shown in Figures 2-1 and 2-2, and their specific locations are shown in Figures 2-3 through 2-5. Photographs of the levee banks at the project sites for the Sutter Slough, Steamboat Slough, and West False River barriers are presented in Figures 2-6 through 2-8, respectively.

The Sutter Slough site is located in the North Delta about 0.6 mile directly west of the Sacramento River at the northwest end of Sutter Island. This site is approximately 1 mile southwest of the community of Courtland and 7 miles northwest of Walnut Grove and is on the border between Yolo and Sacramento counties. The barrier site is located about 1.25 miles downstream from the confluence of Sutter Slough and the Sacramento River. The banks of Sutter Slough where the barrier would be placed vary (Figure 2-6). The east levee has a rock-lined shoreline with woody and herbaceous vegetation on the levee slope. The west levee is not rock-lined and has mature woody riparian and upland vegetation and herbaceous vegetation.

The Steamboat Slough site is approximately 2.1 miles south-southeast of the Sutter Slough site, on the east side of Sutter Island, and approximately 1 mile southwest of the Sacramento River in Sacramento County. The Steamboat Slough barrier site is located about 1 mile downstream from the confluence of Steamboat Slough and the Sacramento River and is between Sutter and Grand Islands. The banks of Steamboat Slough where the barrier would be placed are largely rock-lined levees (Figure 2-7).

The West False River site is located approximately 0.4 mile east of the confluence with the San Joaquin River, between Jersey and Bradford Islands in Contra Costa County, and is about 4.8 miles northeast of Oakley. The banks of the West False River site are rock-lined levees (Figure 2-8).

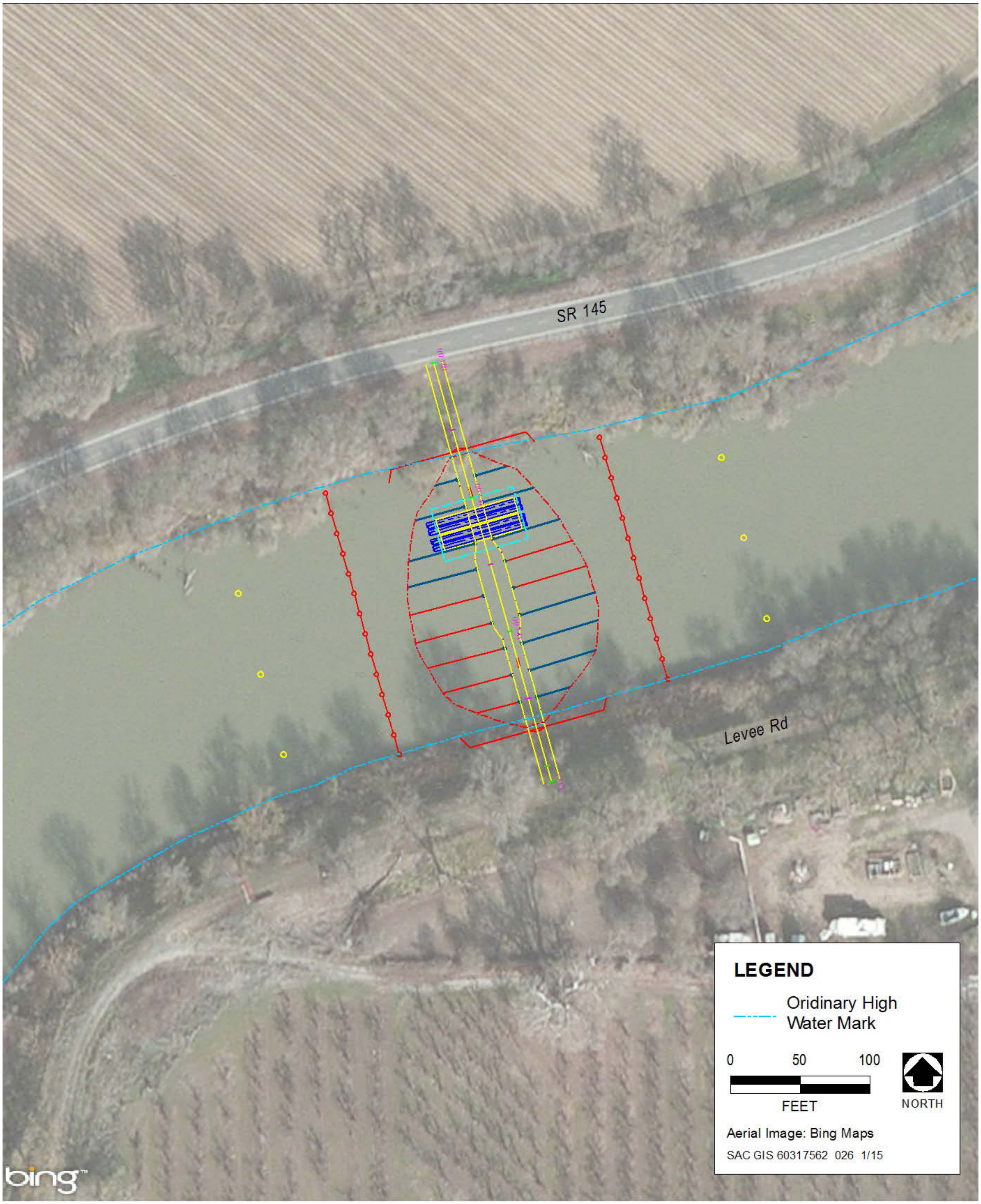


Source: Moffatt & Nichol 2014, AECOM 2014

Figure 2-1 **Locations of Proposed Emergency Drought Barriers**

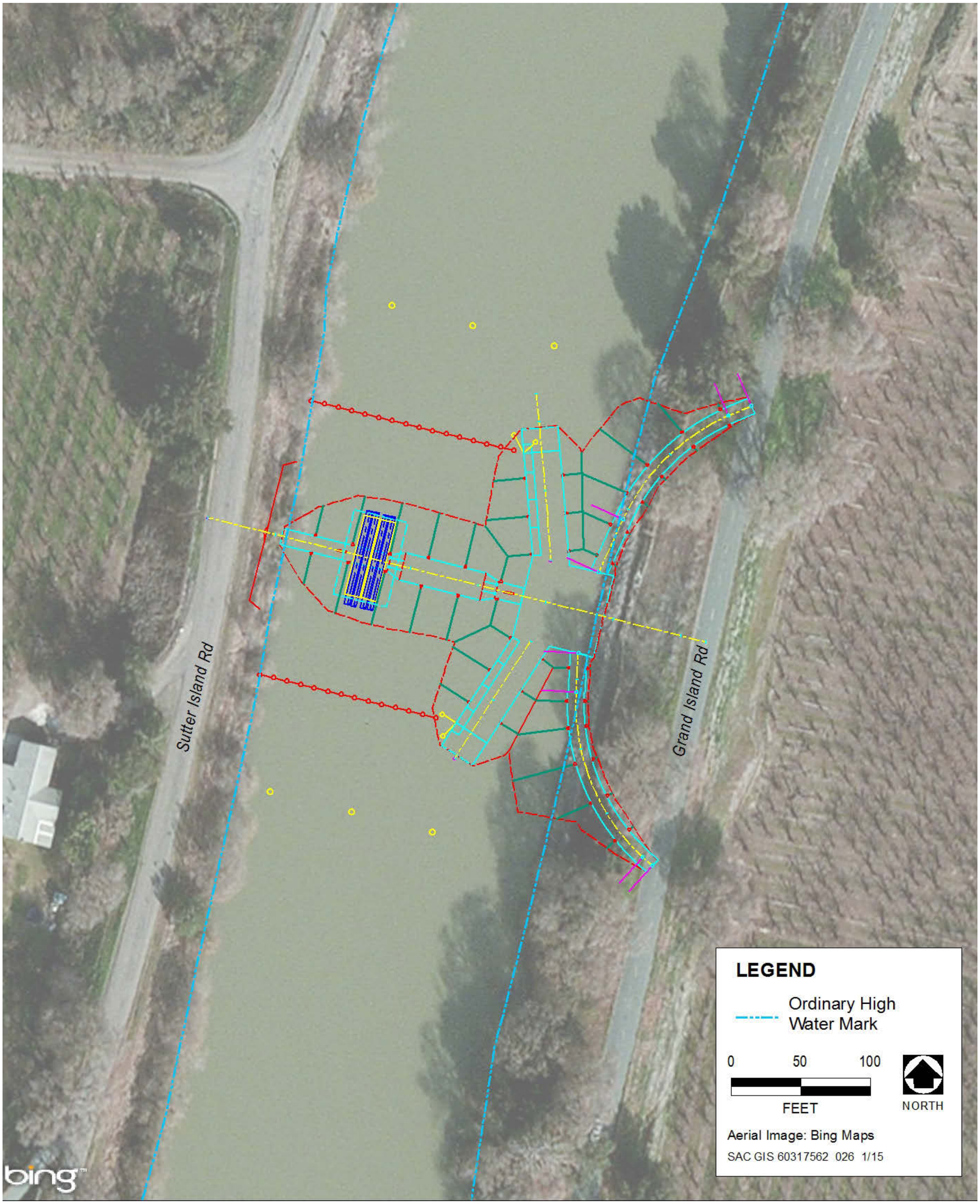
Source: Moffatt & Nichol 2014, AECOM 2014

Figure 2-2 **Aerial View of Locations of Proposed Emergency Drought Barriers**



Source: Moffatt & Nichol 2014, AECOM 2014

Figure 2-3 **Project Site – Sutter Slough**



Source: Moffatt & Nichol 2014, AECOM 2014

Figure 2-4 **Project Site – Steamboat Slough**

Source: Moffatt & Nichol 2014, AECOM 2014

Figure 2-5 **Project Site – West False River**

Figure 2-6 **Project Site – Sutter Slough East Levee (top) and West Levee (bottom)**

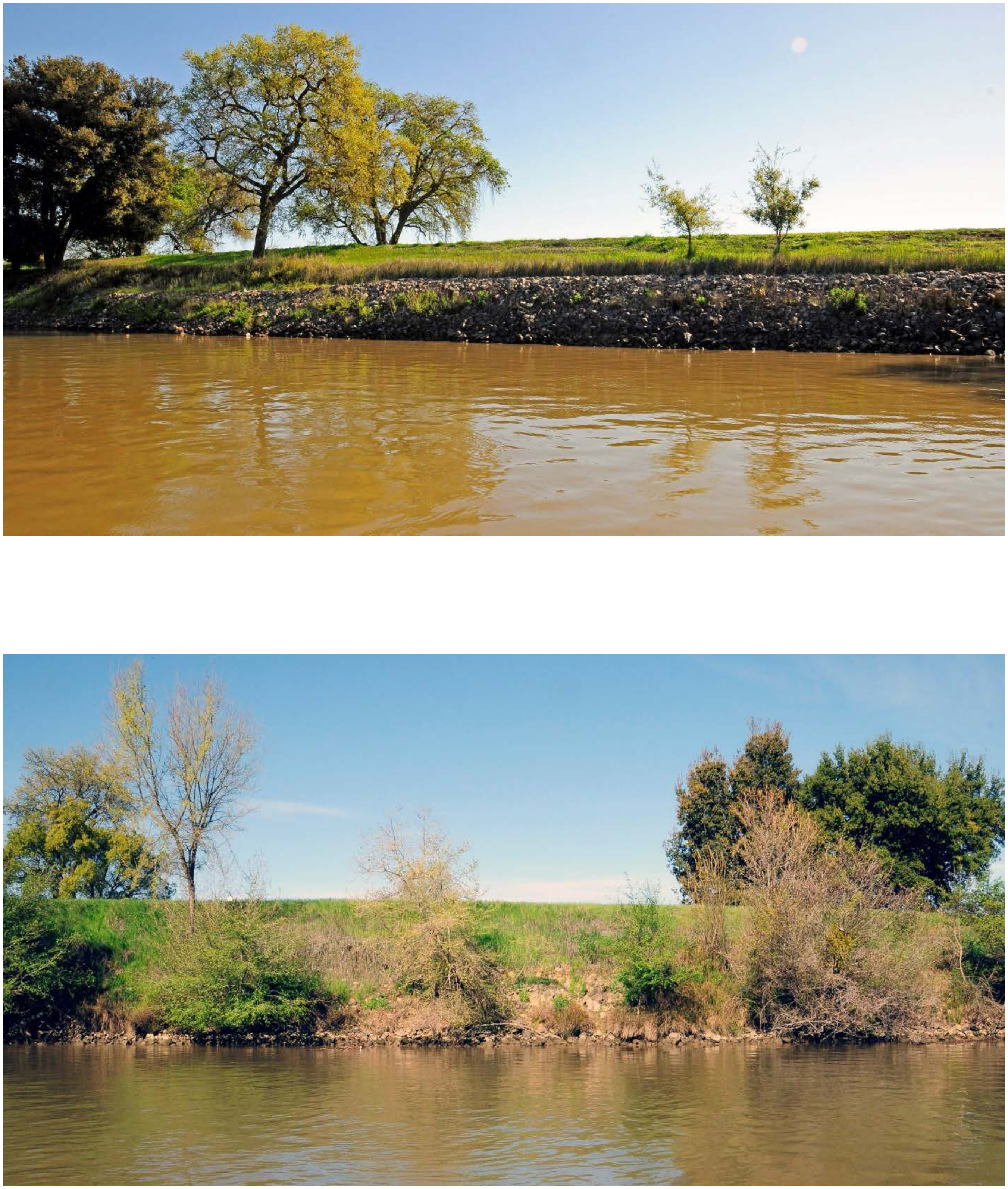


Figure 2-7 **Project Site – Steamboat Slough East Levee (left) and West Levee (right)**

Figure 2-8 **Project Site – West False River South Levee (top), North Levee (middle), and North Levee at USGS Gaging Station East of the Barrier Site (bottom)**

2.5 GEOLOGIC EXPLORATION

Geologic exploration would potentially occur in any year from 2015 to 2025 that the EDB would not be installed. A total of 12 cone penetrometer tests (CPTs), six drill holes, and three overwater drill holes would be completed. Geotechnical exploration is required to reduce uncertainty associated with the underlying ground that would support the barriers, locate poor foundation soils like peat, and better estimate engineering design parameters.

2.5.1 CONE PENETROMETER TEST SOUNDINGS

Two CPT soundings would be conducted on each side of the channel at each site, one on the crown and one at the landside toe of the levee. The crown CPTs would be approximately 100 feet deep, and the toe CPTs would be approximately 70 feet deep. The CPT soundings are anticipated to be completed within approximately 2-3 days at each site and to be abandoned by backfilling the boreholes using cement/bentonite grout through a tremie pipe.

2.5.2 LAND DRILL HOLES

At each site, a hollow stem auger (HSA)/mud rotary drill hole would be drilled through the levee crown on each side of the channel, to a depth of approximately 100 feet. The drill holes would be advanced by a truck-mounted rotary drill rig, accompanied by a drill rig tender/tool truck. Eight-inch-diameter HSAs would be used; the augers may be removed and replaced with casing or left in place to act as casing to protect the embankment during mud rotary drilling. In this case, the term “mud” refers to the use of bentonite clay added to the boring to allow removal of drill cuttings and to stabilize the drill hole.

Standard penetration tests with a 140-pound autohammer would be conducted a minimum of every 5 feet during drilling, and the cleanout interval would be continuously cored using a geo-barrel or equivalent continuous soil coring method. Based on CPT findings, fine-grained soils would be sampled using thin-walled samplers such as Shelby tube, Pitcher barrel, or piston, depending on the consistency of the soil. Drill cuttings and drilling fluid would be contained in drums, large containers, or vacuum truck and disposed of at an appropriate landfill. The two drill holes are anticipated to be completed in approximately 3 days at each site and to be abandoned using the same method described above for the CPT soundings.

2.5.3 OPTIONAL OVERWATER EXPLORATION

One overwater geotechnical drill hole may be completed in the channel at each site to a planned depth of approximately 80 feet below the mud line (river bottom). If overwater exploration is conducted, it would occur between August 1 and November 30 to minimize the potential for adverse effects on fish and other aquatic resources. The drilling would be conducted with a rotary drilling rig mounted on a shallow-draft barge anchored into the bottom of the channel with two to four spuds (steel pipes). Personnel would access the barge via a support boat from an established marina. When a drill rig remains on a boring location for more than 1 day, the drill apparatus and casing would remain in the water column and drill hole to minimize sediment disturbance of the river bottom.

The drill apparatus would consist of a 6- to 8-inch-diameter conductor casing that would extend from the barge deck, through the water column, and into the soft sediments of the river bottom. The casing would be smaller than most piers and would not impede water flow. All of the drilling rods, samplers, and other down-hole equipment would pass through the inside of the casing, which would separate them effectively from the water.

The drill hole would be advanced using mud rotary method and would be drilled and sampled to a maximum depth of approximately 80 feet below the mud line. Initially, the boring would be advanced by pushing the conductor casing to approximately 10 feet or more below the mud line. The conductor casing would be used to confine the drill fluid and cuttings within the drill hole and operating deck of the barge and prevent any inadvertent spillage into the water. Soil samples would be collected from within the conductor casing using the same methods described above for the land drill holes.

The drill hole below the conductor casing would be approximately 3.5 to 5.5 inches in diameter. Only water would be circulated through the pumps and conductor casing when drilling and sampling within 15-20 feet of the mud line. For drilling deeper than 15-20 feet, the drilling fluid, consisting of a mixture of circulating water and bentonite clay, would be introduced into the conductor casing via the drill string to create a more viscous drilling fluid (drilling mud). The drilling fluid would pass down the center of the drill rod to the cutting face in the formation being drilled and would return up the drilled hole with the suspended cuttings. The drilling fluids and cuttings would be confined by the borehole walls and the conductor casing. Return drill fluids would pass through the conductor casing to the barge and then through a tee connection or similar device at the head of the conductor casing into the drilling fluid recirculation tank.

The conductor casing and the recirculation tank would create a closed system at the top of the hole on the barge deck to contain the drill fluids. A heavy plastic sleeve would be placed over the conductor casing and would drape into an external mud tank to reduce drilling fluid leaks between the casing and the barge deck. This system would provide a reliable seal and prevent significant spillage of the drilling fluid into the water. The drill rod and sample rod connections would be disconnected either directly over the conductor casing or the recirculation tank. Furthermore, positive barriers consisting of straw wattles and/or other suitable types of spill-stoppage materials would be placed around the work area on the barge. Drill cuttings (sand) that settle out in the recirculation tank would be collected into 55-gallon storage drums. Good work practices would be observed and maintained in containing the drilling fluid, including taking care when transferring drill cuttings from the recirculation tank to the drums. The drums would be placed adjacent to the recirculation tank. If drilling fluid or drill cuttings material accidently spill onto the barge deck outside of the containment area, they would be picked up immediately with a flat blade shovel and placed either into the recirculation tank or a storage drum, and the affected area would be cleaned. Discarded soil samples also would be placed in the storage drums.

An engineering geologist would be onsite at the drill rig to supervise activities at all times during the operation to ensure that all drilling fluid and cuttings are kept and confined within the recirculation tanks and storage drums. The engineering geologist would pay special attention to the river water for the presence of colored or increasingly opaque plumes when drilling, grouting, and pulling the conductor casing. Colored plumes are an indication that material may be leaking into the water. All personnel on the barge would report any observations of colored plumes in the water or leaking of the drilling fluids to the engineering geologist. If an unauthorized discharge is discovered by any of the personnel on board the barge, drilling activities would cease until appropriate corrective measures are completed. Cuttings and excess drilling fluid would be contained in drums or bins, periodically off-loaded to a land-based staging area, and disposed at a State-approved landfill site. The overwater borings would take place a maximum 200 feet from each of the proposed barrier locations and would be performed by a licensed drilling contractor under the direction of DWR or its contractor. The overwater drilling is anticipated to be completed in approximately 3 days at each site.

2.6 GENERAL DESIGN AND INSTALLATION CONCEPTS

Rock (rip-rap) barrier weir structures would be installed at three sites (i.e., Sutter Slough, Steamboat Slough, and West False River) between 2015 and 2025. During this 10-year period, the barriers could be installed up to three times, including potentially in consecutive years. All structures would be trapezoid-shaped rock barriers with a wide base tapering up to a 12-foot-wide top width set perpendicular to the channel alignment. Rock fill would be placed along the base of the levees for support at the Sutter and Steamboat Slough sites. The West False River site would have transitions to the levees with 75-foot-long sheet pile walls supported by king piles and buttressed with rock because the levees are weaker in this area than at the northerly sites due to peat soil foundations.

Construction of the barriers may include land-based staging of equipment and materials. Before the start of construction, DWR would work with adjacent property owners at the Sutter Slough and Steamboat Slough sites to obtain temporary rights to access parcels for barrier installation up to three times in a 10-year period, including potentially in consecutive years. This applies to the following Assessor Parcel Numbers (APNs):

- APN 142-0010-002-0000 (Sutter Slough site, Sacramento County)
- APN 043-030-006-000 (Sutter Slough site, Yolo County)
- APN 142-0020-056-0000 (Steamboat Slough site, Sacramento County
- APN 142-0030-016-0000 (Steamboat Slough site, Sacramento County)

Temporary rights for construction of the West False River barrier may be obtained before securing the necessary permanent easement rights required for those portions of the piping preventers, sheet pile walls, king piles, and rock abutments that would be permanent installations. This applies to the following APNs:

- APN 027-010-005-0 (West False River site, Contra Costa County)
- APN 026-040-005-6 (West False River site Contra Costa County)

Temporary access rights for construction inspection and fence installation purposes would be required from the following APNs on Bradford Island:

- APN 026-040-003-1 (West False River site, Contra Costa County)
- APN 026-050-006-1 (West False River site, Contra Costa County)
- APN 026-050-018-6 (West False River site, Contra Costa County)
- APN 026-050-024-4 (West False River site, Contra Costa County)

The rock barriers may be installed at each of the sites in spring or summer, beginning no sooner than May 7 at the West False River location, and May 22 at the Sutter and Steamboat Slough sites. The construction period would be approximately 30 to 60 days. Barrier removal may require approximately 30 to 60 days for Sutter and Steamboat sloughs with removal commencing on or near October 1 and approximately 45 to 60 days for West False River with removal also commencing on or near October 1. The barriers would be removed entirely no later than November 1 for Sutter and Steamboat sloughs and November 15 for West False River, before the rainy season when freshwater runoff typically occurs and flood risk increases.

The Sutter and Steamboat Slough sites would be designed to allow fish passage (primarily for Chinook salmon, steelhead, green sturgeon, and white sturgeon) and manage water quality on the downstream side of the barriers using a combination of a an overflow weir designed to be inundated in the event of a very high tide or high river discharge and the installation of four 48-inch culverts with slide gates. The West False River barrier does not include these features. Tidal flows would be the main factor influencing water quality conditions at the West False River barrier. Fish movement can occur through the adjacent San Joaquin River and through other channels, including Fisherman's Cut, East False River, and Dutch Slough during the West False River closure.

Vessel traffic would be blocked at each barrier site. Boat ramps would be provided on either side of the Steamboat Slough barrier. Vessels up to 24 feet and 10,000 pounds would be moved around the barrier by equipment and an operator provided by the State. Boats heading into Sutter Slough would be directed by signage to Steamboat Slough for passage. Larger vessels would need to transit the Sacramento River channel instead of passing through Sutter or Steamboat sloughs between Courtland and Rio Vista. Boat access would not be provided at the West False River site because alternative routes are available via the Stockton Deep Water Ship Channel in the San Joaquin River between Antioch and eastern Delta locations, or via Fisherman's Cut or East False River to South Delta destinations.

Solar-powered monitoring instruments would be placed at appropriate locations upstream and downstream at each site and would monitor parameters like dissolved oxygen, turbidity, salinity as measured by electrical conductivity (EC), river stage, and flow velocity. Additional monitoring, including the use of DIDSON cameras, would be used to assess the Sutter and Steamboat Slough sites for interaction with and passage of migratory fish through the culverts. One 48-inch culvert would remain fully open at all times at the Sutter and Steamboat Slough barriers primarily for fish passage.

Appropriate navigation signage would be installed at each of the sites and would comply with navigation requirements established by the U.S. Aids to Navigation System and the California Waterway Marker system, as appropriate. Signs would be posted at upstream and downstream entrances to each waterway or other key locations, informing boaters of the restricted access. A Notice to Mariners would include information on the location, date, and duration of channel closures. Signs would be posted on each side of each barrier, float lines with orange ball floats would be located across the width of the channels to deter boaters from approaching the barriers, and solar-powered warning buoys with flashing lights would be present on the barrier crest to prevent accidents during nighttime hours. Additional information regarding navigational issues at each of the sites is provided in Section 2.7, "Structural Components."

2.7 STRUCTURAL COMPONENTS

2.7.1 SUTTER SLOUGH SITE

The Sutter Slough rock barrier (Figure 2-3) would be 200 feet long and up to143 feet wide at the base and 12 feet wide at the top. The top of the barrier would be set at an elevation of 9.5 feet across the crest and would include about a 50-foot overflow weir 20 feet wide at the top, set at 7.5 feet elevation.[1] The weir would allow overflows at high stage, keep flow in the middle of the channel, and minimize the potential for erosion of the river banks. The barrier would include a submerged structure placed on a bed of crushed rock consisting of two steel frames with four 48-inch diameter corrugated metal culverts, approximately 60 feet long, set at an invert elevation of approximately -4 feet. The culverts would be operated to allow fish passage and to regulate water levels and water quality on the downstream side of the barrier. One culvert would remain fully open at all times for fish passage,

1 Vertical elevations are based on the North American Vertical Datum of 1988 (NAVD 88).

and the other culvert slide gates would be operated such that the culverts are fully open, fully closed, or at least 50 percent open as needed to improve water quality and/or stage downstream of the barriers.

The monitoring equipment and operable culverts would be accessed by the levee road on the north or via State Route 145. The site is navigable and is used primarily by recreational traffic, but signs would be posted at both entrances to the slough, informing boaters that Steamboat Slough provides boat passage for vessels up to 24 feet long and up to 10,000 pounds.

2.7.2 STEAMBOAT SLOUGH SITE

The Steamboat Slough rock barrier would be 220 feet long, up to 110 wide at the base, and 12 feet wide at the top (Figure 2-4). The top of the structure would be at elevation 9.5 feet and would include about a 60-foot overflow weir 20 feet wide at the top, set at 7.5 feet and is designed to operate similar to the weir in Sutter Slough. Like the Sutter Slough site, it would include a submerged steel frame set at an invert elevation of -4 feet with four 48-inch corrugated metal culverts, approximately 60 feet long, to allow fish passage and management of downstream water surface elevation and quality. One culvert would remain open at all times for fish passage, and the other culvert slide gates would be operated such that the culverts are fully open, fully closed, or at least 50 percent open as needed to improve water quality, stage downstream of the barriers, and/or fish passage.

This site is navigable by commercial and recreational traffic, and boat ramps on each side of the barrier would be provided on the east side of the channel. Two new 12-foot-wide gravel roads would connect to Grand Island Road. The south access road would be about 180 feet long, and the north access road would be about 200 feet long. A State-provided boat tender would be present on the apron during daytime hours with a pickup truck and trailer. When a boat approaches, the trailer would be backed into the water, the boat would be placed on the trailer, and it would be driven to the boat ramp on the other side, where it would be placed back in the river. Boats up to 24 feet and 10,000 pounds could be accommodated. The site would not be available for launching boats from the land. The ramps would be approximately 22 feet wide and would be placed on rock fill with a 15 percent slope. The south ramp would be approximately 90 feet long, and the north ramp would be approximately 120 feet long. Dock anchors (comparable to mooring lines) would be used to stabilize the boat ramps. Bollards and a chain would be installed to restrict access to the boat ramp from the public road.

Workers would access the boat ramps via Grand Island Road, and the monitoring equipment and operable slide gates would be accessed via Sutter Island Road, both of which are public roads, or by boat.

2.7.3 WEST FALSE RIVER SITE

The West False River barrier would be approximately 800 feet long and up to 200 feet wide at the base, and 12 feet wide at the top (Figure 2-5). The toe fill would extend approximately 100 feet upstream and downstream of the barrier centerline. The top of the structure would be at an elevation of 7 feet across the entire crest. The barrier would include two king pile-supported sheet pile walls extending out from each levee into the channel for a distance of 75 feet. The sheet piles/king piles would be required because the levees are weaker at this location; they sit on peat, and placing a large volume of rock directly on the levees would cause too much stress. The walls would be buttressed with some rock on both sides, however. After barrier removal, rock would be used to make smooth transitions around the sheet pile abutments which would remain in place for possible future use. DWR would assure that this rock is maintained and either contract with the Local Maintaining Agency (LMA) or use DWR resources or contractors to repair and or replace the transition rock as needed. The annual inspection of the rock would compare actual conditions with as constructed plans and/or bathymetric survey data. The results of the inspections and any bathymetric survey data collected would be made available to the LMAs. Any necessary repairs of the rock would be made using land or water-based construction equipment during summer and fall (July through October) when special-status species are less likely to be affected.

The piles to be installed at West False River site would include in total:

- Eight 36-inch-diameter king piles (barrier abutments)
- About 70 sheet piles (barrier abutments), or about 35 pairs of sheet piles totaling approximately 160 wall feet (including approximately 5 feet on either side that would be in the levee)
- Four 24-inch steel pipe piles (float line attachment, i.e., two piles upstream and downstream of the barrier)
- Four 12-inch steel pipe piles (monitoring equipment)

In addition to river sheet piles, approximately 300 feet of sheet piles would be installed parallel to the channel to prevent water piping from the river through the levee to a depth of approximately 35 feet. These piping preventer sheet piles would be set into the tops of the levees on each side of the barrier and would remain in place for possible future use.

No boat passage is provided around this barrier because alternative routes (Fisherman's Cut or False River east for vessel traffic between the South Delta to the San Joaquin River; and the Main San Joaquin River for vessel traffic between the Antioch and the eastern Delta) are available. No fish passage has been provided because migrating fish would use the adjacent San Joaquin River, Fisherman's Cut, or Dutch Slough and their access would not be restricted.

To monitor water quality in the Central Delta and the associated changes in water quality and flow resulting from the West False River barrier, DWR proposes to install up to four water quality monitoring and/or flow monitoring stations at Fisherman's Cut (approximately 1.5 miles east of the barrier), Franks Tract, and potentially two additional sites. The stations, which would be able to monitor EC, turbidity, dissolved oxygen, chlorophyll, nutrients, bromide, and organic carbon, would be installed on 12-inch-diameter steel pipe piles. DWR would place navigational aids as needed at the stations.

2.8 PROJECT CONSTRUCTION

2.8.1 CONSTRUCTION PRACTICES

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 immediate construction area, and speed limits would be posted. Safe vessel passage procedures would be coordinated with the U.S. Coast Guard District 11 and California Department of Parks and Recreation Division of Boating and Waterways (Cal Boating). An educational program would be implemented to inform boaters of the purpose of the proposed project and the expected duration of installation activities. The program would include notices in local newspapers and boater publications as appropriate; notices also would be posted at local marinas and boat launches and on the proposed project website. Approximately 116,000 cubic yards of rock would be required to construct the barriers, which would include approximately 12,000 cubic yards at the Sutter Slough site, approximately 11,500 cubic yards at the Steamboat Slough site, and approximately 92,500 cubic yards at the West False River site (including approximately 21,000 cubic yards that would remain around the West False River sheetpiles and on the adjacent levee). Clean, unwashed rock would be used. The rock source would likely be one or more existing quarries, near San Rafael. Structures such as the steel frames used to support culverts that allow fish passage and articulated concrete mats for boat ramps would be prefabricated. Most materials and construction equipment (e.g., cranes and clamshells and the vibratory pile driver used at the West False River site) would be brought to the site by barges, and most construction would take place from the water. The exceptions would be construction of the gravel roads used to access the boat ramps at Steamboat Slough, the transport of road materials and boat ramps to this site, and perhaps the installation of portions of the king piles and sheet piles at the West False River site. In addition, minimal vegetation and clearing would be required on the levees prior to placement of rock or the installation of sheet piles. This would be accomplished by a dozer or backhoe and hand clearing. The gravel access roads at the Steamboat Slough site also would be cleared and grubbed of trees and other vegetation, which would be hauled off-site and disposed of in an appropriate location. The terrestrial footprint would be about 0.003 acre at the Sutter Slough site, and about 0.212 acre at the Steamboat Slough site (includes roads and ramps). The extent of clearing and grubbing would likely be more restricted, and would depend on existing vegetation and maneuvering of construction equipment. The east Steamboat Slough levee, where the access roads and boat ramps would be installed, is mostly a rock-lined levee with almost no vegetation on the levee face, with some herbaceous vegetation and a few trees on the levee top.

Any levee access roads that are damaged as a result of construction equipment or truck use would be restored to pre-construction conditions or better after construction is completed.

The rock barriers would be constructed using a barge-mounted crane and clamshell to place the rock in the channel at the Sutter and Steamboat Slough sites. Because of the greater width of the channel at the West False River site, a dump scow may be used to transport the rock and place it in the channel. Some rock placement at this site would require the use of a barge-mounted crane and bucket. Although some rock slope protection may need to be temporarily moved out of the sheet pile abutments alignments at False River, no channel dredging or excavation in the levee profiles would be required.

The sheet and king piles are anticipated to be installed by an appropriately-sized vibratory hammer, which appears to be feasible given the anticipated ground conditions and modest pile penetration of 20 feet to 50 feet in the ground. Vibratory penetration rates are normally limited to 20 inches per minute (per North American Sheet Piling Associations – Best Practices, www.nasspa.com), which would result in the following vibration times per pile assuming normal driving conditions:

- 20-foot ground penetration: 12 minutes
- 50-foot ground penetration: 30 minutes

Due to uncertainties of the ground conditions and the possibility of encountering dense soil layers and/or obstructions such as left-in-place rip-rap on the existing levee side slopes, a larger impact hammer would be available as a contingency measure, in the event unexpected difficult driving is encountered. The impact hammer would only be used if the vibratory hammer cannot reach design tip elevation of the pilings. In the absence of detailed geotechnical information, it is not known whether an impact hammer would be required, and the exact location and timing of its use. If piles are driven by impact hammers in water deeper than 3.3 feet, a bubble curtain would be employed if underwater noise exceeds pre-established levels (peak pressure levels or cumulative sound exposure level) that would indicate potential injury to fish.

A complete list of construction equipment anticipated to be used at the three sites is provided in Tables 2-1 through 2-3.

Table 2-1
Anticipated Construction Equipment at Sutter Slough Site

Type of Equipment	Maximum Number	Type of Equipment	Maximum Number	Type of Equipment	Maximum Number
Place Rock					
Tug/barge	4	Dozer	1	Rock haul/dump truck	4
Crane	1	Loader	4	Conveyor	3
Work boat	1				
Place Culverts					
Off-road fork lift	2	Air compressor	1	Off-road fork lift	1
Crane	1	Power generator	1	Skid steer loader	1
Pickup	3	Tug/barge	1	Service truck	1
Removal					
Tug/barge	4	Excavator	3	Front-end loader	2
Long-reach excavator	2	Dump truck	4	Grader	1
Work boat	2	Dozer	1		
Source: DWR 2014					

Table 2-2
Anticipated Construction Equipment at Steamboat Slough Site

Type of Equipment	Maximum Number	Type of Equipment	Maximum Number	Type of Equipment	Maximum Number
Place Rock					
Tug/barge	4	Dozer	1	Rock haul/dump truck	4
Crane	1	Loader	4	Conveyor	3
Work boat	1				
Place Culverts					
Off-road fork lift	2	Power generator	1	Service truck	1
Crane	1	Tug/barge	1	Grader	1
Pickup	3	Off-road fork lift	1	Front-end loader	2
Air compressor	1	Skid steer loader	1	Work boat	1
Removal					
Tug/barge	4	Excavator	3	Front-end loader	2
Long-reach excavator	2	Dump truck	4	Grader	1
Work boat	2	Dozer	1		
Source: DWR 2014					

Table 2-3 Anticipated Construction Equipment at West False River Site					
Type of Equipment	Maximum Number	Type of Equipment	Maximum Number	Type of Equipment	Maximum Number
Place Rock					
Tug/barge	8	Dozer	1	Rock haul/dump truck	4
Crane	2	Loader	4	Conveyor	3
Work boat	2				
Drive Piles					
Tug/barge	2	Skid steer loader	1	Crane	1
Crane	2	Off-road crane	1	Pickup	4
Work boat	2	Service truck	1	Air compressor	1
Grader	1	Off-road fork lift	2	Power generator	1
Compactor	1				
Removal					
Tug/barge	8	Excavator	3	Front-end loader	2
Long-reach excavator	3	Dump truck	4	Grader	1
Work boat	2	Dozer	1		
Source: DWR 2014					

2.8.2 CONSTRUCTION SCHEDULE

Construction would occur during regular daytime hours. Construction may occur concurrently at more than one project site, if adequate equipment is available.[2] The overall schedule for construction of the three barriers is estimated to be approximately 30 to 60 days. The barriers may be installed in spring or summer and removed in fall. Removal would take approximately 30 to 60 days. Construction would require approximately 10 to 30 workers.

The following construction, operation, and removal dates are proposed for each barrier location:

- West False River barrier: in-water construction to begin no sooner than May 7, with full barrier closure on or near approximately 30 to 60 days after starting work; removal would take approximately 45 to 60 days, with full removal by November 15;
- Sutter Slough barrier: in-water construction to begin no sooner than May 22, with full barrier closure approximately 30 to 60 days after starting installation; removal would take approximately 30 to 60 days, with full removal by November 1; and
- Steamboat Slough barrier: in-water construction to begin no sooner than May 22, with full barrier closure approximately 30 to 60 days after starting installation and after full closure of the Sutter Slough barrier; removal would take approximately 30 to 60 days, with full removal by November 1.

[2] As described in Mitigation Measure BIO-2, potential phasing of construction/operations would be coordinated with the permitting fish agencies to meet the purpose of the EDB while minimizing effects to listed fishes.

2.8.3 Facilities Removal

All rock, gravel, and structures would be removed from the project sites in fall, with the exception of the sheet pile abutments at the West False River site. Bathymetric surveys would be completed after rock fill removal to confirm that the rock is removed. The materials would be transported from the area, primarily on barges. Materials would be stored at a nearby DWR storage facility, likely located in Hood, Rio Vista, or the Port of Stockton, based on capacity availability and permitting coverage at the storage facility. These potential material storage locations are depicted in Figure 2-9. If lease arrangements can later be made with local landowners near the barrier sites, rock may be stored close to the barrier sites for use in future drought conditions if needed.

2.8.4 Site Restoration

Disturbed areas would be restored after initial construction and after each time EDB are removed (potentially up to three times in 10 years, including potentially in consecutive years). The affected areas would be restored to pre-project conditions (see Section 3.4.2, "Discussion").

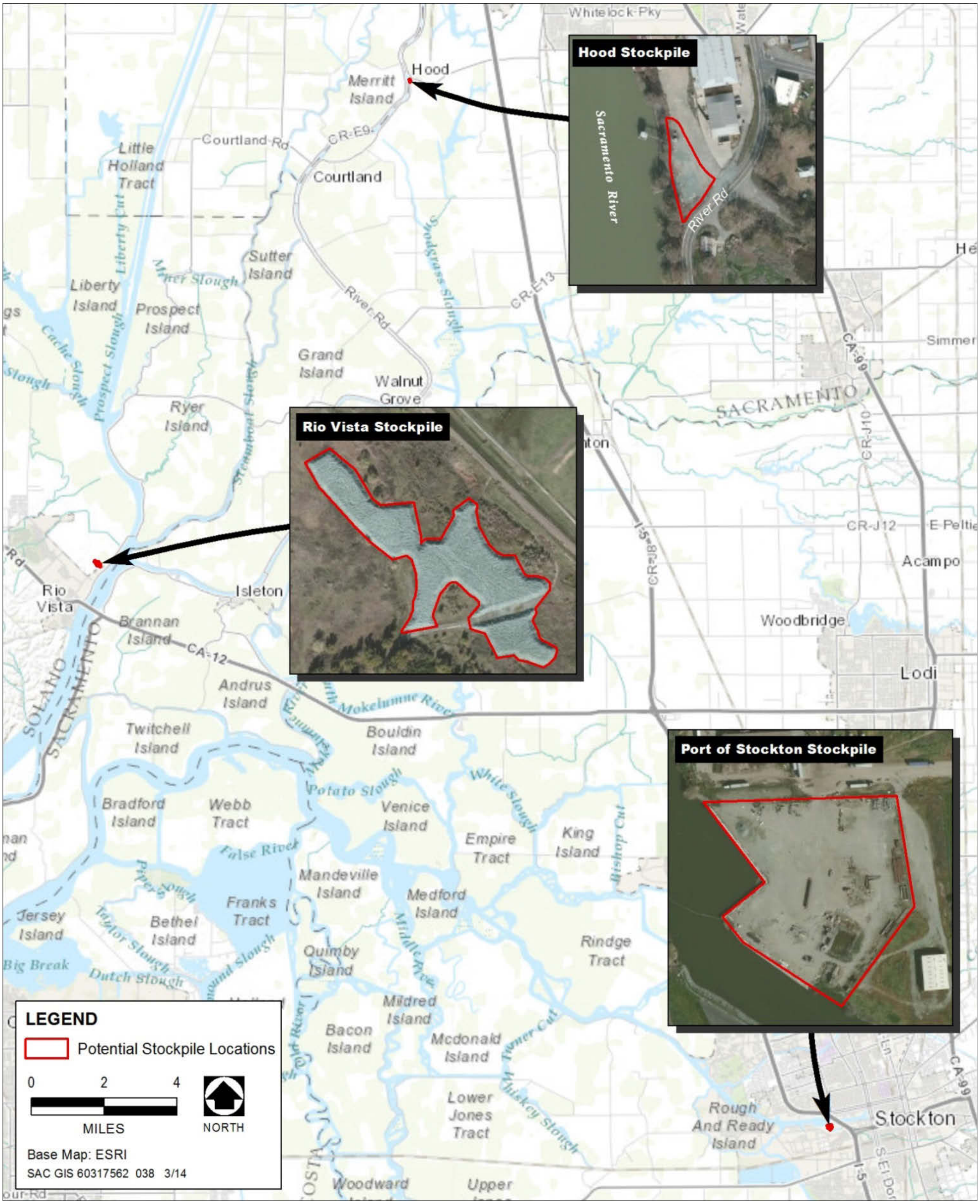
A restoration plan addressing each site would be developed, as required by applicable regulatory agencies, and would be completed before the start of construction. Restoration activities would be implemented following construction, as needed. The restoration plan would identify areas that would be restored and restoration methods. Seed mixes, schedules, success criteria, and success monitoring for restoration, as needed, of any adversely affected wetlands and riparian habitats would be identified. The restoration plan would be included in the contract specifications.

2.8.5 Operations and Maintenance

EDB operations essentially would be limited to opening or closing the culvert slide gates at the Sutter and Steamboat Slough sites as necessary for water quality or maintenance purposes. As described in Section 3.4.2, "Discussion," monitoring data from nearby data stations would be used to inform the need to open or close the culverts. DWR would inform the permitting fish agencies (CDFW, USFWS, and NMFS) if any major maintenance activities are required during the period of operation (estimated to be June through October).

A log of project operations and a summary report of monitoring activities would be provided to the permitting agencies following completion of operations, with notification of any change on culvert operations during the operation period.

Given the temporary nature of the EDB, maintenance would be minimal or nonexistent.



Source: DWR, adapted by AECOM 2014

Figure 2-9 **Potential Stockpile Locations**

2.9 ENVIRONMENTAL COMMITMENTS

DWR would implement the following Environmental Commitments as part of the proposed project to assist with minimizing potential environmental impacts from the proposed project.

1. PREPARE AND IMPLEMENT AN EROSION CONTROL PLAN

An Erosion Control Plan will be prepared before construction activities that will cause ground disturbance. Site-specific erosion-control, spill-prevention, sedimentation control, and runoff measures will be developed and implemented during construction activities as part of the plan to minimize the potential for erosion and sedimentation during barrier construction and removal.

If applicable, tightly woven fiber netting (mesh size less than 0.25 inch) or similar material will be used for erosion control and other purposes at the project sites to ensure wildlife does not become trapped or entangled in the erosion control material. Coconut coir matting is an acceptable erosion control material, but no plastic mono-filament matting will be used for erosion control. If feasible, the edge of the material will be buried in the ground to prevent wildlife from crawling underneath the material.

2. PREPARE AND IMPLEMENT A SPILL PREVENTION AND CONTROL PROGRAM

A spill prevention and control program will be prepared before the start of construction to minimize the potential for hazardous, toxic, or petroleum substances to be released into the project area during construction and operation. The program will be implemented during construction. In addition, DWR will place sand bags, biologs, or other containment features around the areas used for fueling or other uses of hazardous materials to ensure that these materials do not accidentally leak into the river. DWR will adhere to the standard construction best management practices described in the current California Department of Transportation Construction Site Best Management Practices Manual (California Department of Transportation 2003).

The spill prevention and control program will include procedures for mitigating potential spills caused by collision/stranding of vessel traffic with the barriers during their operation. Spill control materials will be kept at the Steamboat Slough barrier site and at additional DWR-owned locations in the Delta. All barriers will have clear signage with telephone contact details for DWR personnel as well as the Governor's Office of Emergency Services (CalOES) hazardous materials (HAZMAT) spill notifications contact number (1-800-852-7550).

3. PREPARE AND IMPLEMENT A HAZARDOUS MATERIALS MANAGEMENT PROGRAM

A Hazardous Materials Management Program (HMMP) will be prepared and implemented to identify the hazardous materials to be used during construction; describe measures to prevent, control, and minimize the spillage of hazardous substances; describe transport, storage, and disposal procedures for these substances; and outline procedures to be followed in case of a spill of a hazardous material. The HMMP will require that hazardous and potentially hazardous substances stored onsite be kept in securely closed containers located away from drainage courses, storm drains, and areas where stormwater is allowed to infiltrate. It will also stipulate procedures to minimize hazard during onsite fueling and servicing of construction equipment. Finally, the HMMP will require that adjacent land uses be notified immediately of any substantial spill or release.

4. Conduct a Worker Environmental Awareness Program

Construction workers will participate in a worker environmental awareness program that addresses species under jurisdiction of the permitting agencies (CDFW, USFWS, and NMFS). Workers will be informed about the potential presence of listed and other protected species, and habitats associated with such species, and that unlawful take of the species or destruction of their habitat is a violation of the Federal Endangered Species Act (ESA), California Endangered Species Act (CESA), and/or Migratory Bird Treaty Act (MBTA). Before the start of construction activities, a qualified biologist approved by the permitting agencies will instruct all construction workers about the life histories of the protected species and the terms and conditions of the EDB Biological Opinions (BOs), CESA Incidental Take Permit (ITP), and other regulatory permits that include biological resource protection measures. Proof of this instruction will be submitted to the permitting agencies.

5. Conduct Biological Monitoring

A qualified biologist approved by the permitting agencies will be onsite daily to conduct compliance inspections and monitor all in-water construction activities. The qualifications of the biologist(s) will be presented to the permitting agencies for review and written approval at least 10 working days prior to project activities at the project sites. Prior to approval, the biologist(s) will submit a letter to the permitting agencies that states that they understand the terms and conditions of the permitting documents (BOs, CESA ITP). The biologist(s) will keep a copy of the permitting documents in their possession when onsite. The biologist(s) will be given the authority to stop work that may result in, or in the event that there is, take of listed species in excess of limits provided by the permitting agencies in any permitting documents (BOs, CESA ITP). If the biologist(s) exercise(s) this authority, the permitting agencies will be notified by telephone and electronic mail within 1 working day.

A report of daily records from monitoring activities and observations will be prepared and provided to the permitting agencies upon completion of project activities.

6. Install In-Water Navigational Buoys, Lights, and Signage

Navigational buoys, lights, and signage will be installed in Sutter and Steamboat sloughs and West False River upstream and downstream from the emergency drought barrier, to advise boaters about the presence of the emergency drought barrier and maintain navigation along both waterways. DWR will coordinate with the U.S. Coast Guard on signage and buoys.

7. Limit Land-Based Access Routes and Construction Area

The number of land-based access routes and each construction area will be limited to the minimum area necessary. Access routes will be restricted to established roadways. Construction area boundaries will be clearly demarcated.

8. Implement Protocols for Migratory Birds

The following protocols will be implemented to determine if migratory birds are nesting on or immediately adjacent to any of the project sites, and to avoid and minimize potential impacts if active nests are found.

8.1 Vegetation Removal

If removal of woody or herbaceous vegetation is required for barrier installation, such removal will be conducted between September 1 and March 1 (outside of the migratory bird nesting season), to the extent feasible.

8.2 Preconstruction Surveys

Focused surveys for active nests of migratory birds will be conducted by a qualified biologist on and immediately adjacent to each barrier site. Surveys will be conducted within 10 days before the start of project activities (including geologic exploration) that would occur during the nesting season (March 1 to August 31).

8.3 Impact Avoidance and Minimization

If an active migratory bird nest is found within the construction footprint, the biologist will develop appropriate measures, such as implementation of a protective buffer, to avoid disturbance of the nest until it is no longer active.

9. MINIMIZE WILDLIFE ATTRACTION

To eliminate attraction of wildlife to the project sites, all food-related trash items, such as wrappers, cans, bottles, and food scraps, will be disposed of in closed containers and removed from the sites on a daily basis.

10. CONDUCT SCOUR MONITORING

Prior to installation of the emergency drought barriers, DWR will use low-level aerial surveys to conduct aerial video and photo documentation of the existing conditions, critical channels, and levees (mainly at Fisherman's Cut and Dutch Slough). Similar flights would also be conducted following barrier removal. Aerial video and photo documentation both before barrier installation and after barrier removal would be compared. Additional surveys of existing conditions and post project conditions will also be conducted by boat as needed. Although damage to levees or property is not anticipated based on the expected worse case velocities, DWR would be responsible for repairing any damage documented and verified through the pre- and post-construction surveys.

2.10 REGULATORY REQUIREMENTS, PERMITS, AND APPROVALS

As the lead agency, DWR has the principal responsibility for approving and carrying out the proposed project and for ensuring that the requirements of CEQA, the State CEQA Guidelines, and all other applicable regulations are met. The following permitting agencies also may have permitting approval or review authority over portions of the proposed project:

- NMFS: ESA Section 7 Consultation
- USFWS: ESA Section 7 Consultation
- U.S. Army Corps of Engineers (USACE): Clean Water Act (CWA) Section 404 Standard (Individual) Permit, Rivers and Harbors Act Section 10 Permit, Rivers and Harbors Act Section 408 Permit
- U.S. Coast Guard: Rivers and Harbors Act Section 9 Permit

- CDFW: California Fish and Game Code Section 1602 Notification of a Streambed Alteration, California Endangered Species Act Section 2081 Incidental Take Permit
- California State Lands Commission: Lease Agreement or Memorandum of Understanding (MOU)
- Central Valley Flood Protection Board: Encroachment Permit
- State Water Resources Control Board: CWA Section 401 Water Quality Certification and Section 402 National Pollutant Discharge Elimination System Permit
- State Historic Preservation Officer (SHPO): National Historic Preservation Act (NHPA), Section 106 Compliance
- Delta Stewardship Council (DSC): Consistency determination with Delta Plan requirements
- Sacramento County: Encroachment Permit
- Reclamation District No. 3, No. 349, No. 830, No. 999, and No. 2059: Encroachment Permits

3 ENVIRONMENTAL CHECKLIST

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:					
The environmental factors checked below would be potentially affected by this proposed project, involving at least one impact that is a “Potentially Significant Impact” as indicated by the checklist on the following pages.					
☐	Aesthetics	☒	Agriculture and Forestry Resources	☒	Air Quality
☒	Biological Resources	☒	Cultural Resources	☐	Geology and Soils
☒	Greenhouse Gas Emissions	☐	Hazards and Hazardous Materials	☒	Hydrology and Water Quality
☐	Land Use and Planning	☐	Mineral Resources	☒	Noise
☐	Population and Housing	☐	Public Services	☐	Recreation
☐	Transportation and Traffic	☒	Utilities and Service Systems	☒	Mandatory Findings of Significance

DETERMINATION (To be completed by the Lead Agency)

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 in the project have been made by or agreed to by the project proponent. 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" impact 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** or **NEGATIVE DECLARATION** pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier **EIR** or **NEGATIVE DECLARATION**, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature	Date
Printed Name	Title

California Department of Water Resources

Agency

3.1 AESTHETICS

ENVIRONMENTAL ISSUES	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) Substantially 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?	☐	☐	☒	☐

3.1.1 ENVIRONMENTAL SETTING

Proposed project-related temporary barriers would be installed at three sites in Sutter Slough, Steamboat Slough, and West False River. All three project sites are located in rural agricultural areas with nearby residences, as described next.

SUTTER SLOUGH

Three rural residences are located in the immediate vicinity of the Sutter Slough project site, on both sides of the river. One house is located on the east bank of the river channel, approximately 400 feet upstream from the project site for the emergency drought barrier, and therefore would have a clear view of the barrier and associated project construction. A second house is located approximately 300 feet upstream from the project site but is set back approximately 275 feet from the east side of the river channel, and views to the southwest, where the barrier would be installed, would be partially blocked by intervening vegetation. The third house is set back approximately 670 feet from the west side of the river channel, and views to the east from this house, including the project site where the emergency drought barrier would be located, also would be partially blocked by intervening vegetation. Motorists have access to and views of Sutter Slough from the east side, on Sutter Island Road, and from the west side, on Road 145. The surrounding land uses in the vicinity of the Sutter Slough project site are agricultural—predominately row crops on the west side of the channel and orchards on the east side of the channel.

STEAMBOAT SLOUGH

Three rural residences are located in the immediate vicinity of the Steamboat Slough project site, on both sides of the river channel. One residence is located on the west side of the channel, behind the levee, approximately 150 feet downstream from the emergency drought barrier site. The proposed south-side boat transfer ramp would be installed in front of this residence, on the east side of the channel. However, the existing elevated bank of the levee and the intervening vegetation would partially screen views of the temporary barrier from this residence. A second residence also is located on the west side of the channel, behind the levee, approximately 515 feet upstream from the emergency drought barrier and boat transfer ramps site. The existing elevated bank of the levee and the intervening vegetation also would partially screen views of the temporary barrier from this residence. The third residence, on the east side of the river channel, is located approximately 900 feet downstream from the emergency drought barrier and boat transfer ramps site. It is set back approximately 250 feet from the channel, and views of the river are limited by existing vegetation. Motorists have access to and views of Steamboat Slough from the east side, on Grand Island Road, and from the west side, on Sutter Island Road. The surrounding land uses in the vicinity of the Steamboat Slough project site are agricultural, predominately orchards, on both sides of the channel.

WEST FALSE RIVER

One rural residence is located in the immediate vicinity of the West False River project site. This residence is approximately 1,800 feet east of the project site for the emergency drought barrier. It sits on the bank of the north side of the channel, with no intervening vegetation. Therefore, the occupants of this residence would have a clear view of the temporary rock barrier and associated project construction. Motorists have access to and views of West False River from the north side, on Bradford Island Levee Road, and from the south side, on Jersey Island Road. The surrounding land uses in the vicinity of the West False River project site are agricultural, predominately row crops, on both sides of the channel.

3.1.2 DISCUSSION

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

Less-than-Significant Impact. Construction activities associated with the proposed project would occur primarily in the river channels, but would involve some land-based activities, including staging of equipment and materials, access to each project site, construction of two new gravel access roads on the east side of the Steamboat Slough site, and potentially geologic exploration between 2015 and 2025 at the three sites. Workers would access the boat transfer ramps at the Steamboat Slough site from Grand Island Road, and the monitoring equipment and operable slide gates would be accessed from Sutter Island Road (both of which are public roads), or by boat. At the Sutter Slough project site, the monitoring equipment and operable culverts would be accessed from Sutter Island Road or from State Route 145. Most materials and construction equipment (e.g., cranes, clamshells, and the vibratory pile driver to be used at the West False River site) would be brought to the three project sites by barges, and most construction would take place from the water. The exceptions would be construction of the gravel roads to be used to access the boat ramps at Steamboat Slough, the transport of road materials and boat ramps to the Steamboat Slough site, possibly the installation of portions of the king piles and sheet piles at the West False River site, and land-based geologic exploration at the three sites. In addition, minimal vegetation and clearing would be required on the levees before placement of rock or the installation of sheet piles. Construction would take place over approximately 30 to 60 days, and removal would take place over an approximate 30 to 60-day period for Sutter and Steamboat sloughs, and over an approximately 45 to 60-day period for West False River. Disturbed areas would be restored after initial construction is completed, and again after the structures are removed. During operation, the tops of the temporary barriers in the river channels would be visible. The temporary barriers would extend approximately 7.0 to 9.5 feet above the water surface and would be 12 feet wide at the top.

Viewer groups that would be affected by project-related construction and operation consist of the rural residences in the immediate vicinity of each of the three project sites; motorists or recreationists using any of the local roadways on either side of each project site (i.e., Sutter Island Road, Road 145, Grand Island Road, Jersey Island Road, and Bradford Island Levee Road); and boaters in Sutter Slough, Steamboat Slough, and West False River.

During the construction and removal phases, a few large pieces of construction equipment, including the barge, workboat, and floating dock, would be visible from roads, residences, and the river, and would temporarily degrade the visual quality of the area. Limited vegetation pruning also would result in small, localized, adverse changes to the visual character, primarily at the Sutter Slough project site. Residents adjacent to each project site would experience temporary changes in the visual character of the river, but these would be limited to the short period necessary to construct, operate, and remove each temporary barrier. In addition, the primary land use in the areas surrounding the project sites is agricultural, which requires use of farm equipment that is similar in visual character to the equipment proposed for project-related construction and barrier removal.

During project operation, the tops of the temporary barriers at each project site, and the boat transfer ramps and associated boat trailering activities at Steamboat Slough, would be visible from adjacent roads, residences, and the river. However, the temporary barriers would be consistent with the appearance of the existing levees on each side of the channels, and with existing boating operations present throughout the Delta. Furthermore, views of these barriers would be temporary because they would be in place only for up to approximately 6 months.

Furthermore, as described in Chapter 2, "Project Description," DWR would limit the land-based access routes and construction areas to the minimum size necessary, and would restrict access routes to established roadways wherever feasible. During construction and operation, land-based staging of materials and equipment may occur and rock may be stored close to the barrier sites for use in future drought conditions if needed, but DWR would work with adjacent property owners before the start of construction to obtain temporary rights to access parcels for barrier installation.

For the reasons stated above, the proposed project would not have a substantial adverse effect on a scenic vista. Therefore, the impact would be less than significant.

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

Less-than-Significant Impact. None of the three project sites would be visible from any state- or county-designated scenic highway (California Department of Transportation 2013).

No designated scenic waterways are found in Yolo County (Yolo County 2009:Chapter 3). However, West False River is a locally-designated scenic waterway (Contra Costa County 2005:Figure 9-1). The Sacramento River is protected in Sacramento County by scenic corridors extending 500 feet to each side of the river, as measured from the middle of the channel or by a minimum of a corridor 300 feet from the edge of the river (Sacramento County 2011:3-28). Construction activities associated with installing and removing the temporary barriers at the three project sites would result in a temporary, short-term (i.e., up to approximately 60 days) degradation of scenic resources at Sutter Slough, Steamboat Slough, and West False River, which are locally designated scenic waterways. The portion of the barriers that would be visible during the up to approximately 6-month-long operational phase would be consistent with the existing visual character of the Delta. Because of the short-term, temporary nature of project-related construction activities and the limited number of viewers (described in more detail in Question a) above), the impact would be less than significant.

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

Less-than-Significant Impact. For the same reasons discussed in Question a) above, the proposed project would not substantially degrade the existing visual character or quality of the project sites or their surroundings. Therefore, the impact would be less than significant.

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

Less-than-Significant Impact. Solar-powered warning buoys with flashing lights would be installed on the crest of each emergency drought barrier to prevent boating accidents during the nighttime hours. As described in Section 3.1.1, "Environmental Setting," only two of the residences that are in close proximity to the project sites would have clear views of the temporary barriers; views of the barriers from the other five residences would be partially or completely blocked by the levee banks and/or vegetation. Inhabitants of the residence on West False River and the residence on the east bank of Sutter Slough would be able to see the flashing nighttime warning lights at each of these project sites. However, these residences are located 1,800 feet and 400 feet, respectively, from the proposed lighting, and therefore the effects of the project-related nighttime lighting would be attenuated by distance. The nighttime lighting would be removed at the completion of the project. Other than the warning lights on top of the temporary barriers and navigation aids, no other nighttime lighting would be used as part of the proposed project. All project-related construction activities would occur during the daytime. The project-related temporary barriers would not be constructed of materials that would introduce new sources of light or glare. Therefore, the impact would be less than significant.

3.2 AGRICULTURE AND FORESTRY RESOURCES

ENVIRONMENTAL ISSUES	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 (1997, as updated) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board.				
Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☒	☐	☐
b) Conflict with existing zoning for agricultural use or a Williamson Act contract?	☐	☒	☐	☐
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e) Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?	☐	☒	☐	☐

3.2.1 ENVIRONMENTAL SETTING

Active agricultural fields are located adjacent to all three project sites and predominately consist of row crops and orchards. These agricultural lands are designated as Important Farmland (DOC 2011, 2012a, 2014). Additional information about land uses within and adjacent to the project sites is presented in Section 3.10, "Land Use and Planning."

FARMLAND MAPPING AND MONITORING PROGRAM

DOC's Important Farmland classifications—Prime Farmland, Farmland of Statewide Importance, Unique Farmland, and Farmland of Local Importance—recognize the land's suitability for agricultural production by considering physical and chemical characteristics of the soil, such as soil temperature range, depth of the groundwater table, flooding potential, rock fragment content, and rooting depth. The classifications also consider location, growing season, and moisture available to sustain high-yield crops. Together, Important Farmland and Grazing Land are defined by DOC as "Agricultural Land" (Public Resources Code, Sections 21060.1 and 21095).

According to the Sacramento County and Yolo County Important Farmland maps, published by DOC's Division of Land Resource Protection, the lands adjacent to the Sutter and Steamboat Slough project sites are designated as Prime Farmland (DOC 2011, 2012a).

According to the Contra Costa County Important Farmland maps, the lands adjacent to the West False River project site are designated as Prime Farmland, Farmland of Statewide Importance, and Farmland of Local Importance (DOC 2014).

The Farmland Mapping and Monitoring Program provides the following definitions of these types of Important Farmland:

- **Prime Farmland**—Land that has the best combination of physical and chemical features able to sustain long-term agricultural production. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. The land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.

- **Farmland of Statewide Importance**—Land similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store soil moisture. The land must have been used for irrigated agricultural production at some time during the 4 years prior to the mapping date.

- **Farmland of Local Importance**—Land that is of importance to the local agricultural economy, as defined by each county's local advisory committee and adopted by its board of supervisors. Farmland of Local Importance either is currently producing or has the capability to produce, but does not meet the definition of Prime Farmland, Farmland of Statewide Importance, or Unique Farmland.

Appendix G of the State CEQA Guidelines focuses the analysis of conversion of agricultural land on Prime Farmland, Farmland of Statewide Importance, or Unique Farmland. Therefore, conversion of Prime Farmland or Farmland of Statewide Importance potentially would be considered a significant impact under CEQA.

WILLIAMSON ACT

Under the California Land Conservation Act of 1965, also known as the Williamson Act, local governments can enter into contracts with private property owners to protect land (within agricultural preserves) for agricultural and open space purposes. Lands under active Williamson Act contracts are located on both sides of the Sutter Slough and east of Steamboat Slough (DOC 2012b, 2013a). No parcels are held under Williamson Act contracts are located in the immediate vicinity of the proposed West False River barrier location (DOC 2013b).

Agricultural Zoning

The portion of the Sutter Slough project site within Sacramento County is zoned Agricultural (20 acres), with adjacent areas zoned Agricultural (80 acres).The Steamboat Slough project site is zoned by Sacramento County as Agricultural (80 acres); the area just west of the project site is zoned Agricultural (40 acres). These Agricultural districts were established to eliminate the encroachment of land uses that are incompatible with the long-term agricultural use of land, preserve the maximum amount of the limited supply of agricultural land, discourage the premature and unnecessary conversion of agricultural land to urban uses, assure the preservation of agricultural lands, and encourage the retention of sufficiently large agricultural lots to assure maintenance of viable agricultural units (Sacramento County 2014).

The portion of the Sutter Slough project site within Yolo County is zoned Agricultural General Zone (A1), with adjacent areas zoned Agricultural Preserve (A-P). The A1 zone was established to provide uses on lands best suited for agriculture, and the A-P zone was established to preserve land best suited for agricultural use from the encroachment of nonagricultural uses (Yolo County 2014).

The West False River project site is zoned by Contra Costa County as General Agricultural (A-2); the area just south of the proposed barrier is zoned Heavy Agricultural (A-3). These districts were established for all types of agriculture, agricultural uses, a farm stand, detached single-family dwellings, foster homes, family day care, and residential second units (Contra Costa 2014).

3.2.2 Discussion

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

Less than Significant with Mitigation Incorporated. As discussed above, lands adjacent to the Sutter Slough and Steamboat Slough project sites are designated by the DOC as Prime Farmland, and lands adjacent to the West False River project site are designated as Prime Farmland and Farmland of Statewide Importance (DOC 2011, 2012a, 2014).

Implementation of the proposed project would consist of construction and removal of the EDB at the three project sites up to three times in 10 years, potentially geologic exploration between 2015 and 2025 at the three sites, and construction of two new gravel access roads on the east side of the Steamboat Slough project site. The temporary drought barriers would be located in Delta waterways. Most materials and construction equipment (e.g., cranes and clamshells and the vibratory pile driver used at the West False River site) would be brought to the site by barges, and most construction would take place from the water. The exceptions would be the transport of road materials and boat ramps to the Steamboat Slough project site, perhaps the installation of portions of the king piles and sheet piles at the West False River site, and land-based geologic exploration at the three sites. Access to the project sites for these activities would be via existing access roads. The two new gravel access roads on the east side of the Steamboat Slough project site would not be constructed on existing agricultural lands. Materials would be stored at a nearby DWR storage facility or, if lease arrangements can be made later with local landowners near the barrier sites, rock may be stored close to the barrier sites for use in future drought conditions, if needed. None of these proposed project activities would directly convert Important Farmland to nonagricultural uses.

It is unlikely that the proposed project would have a significant indirect effect on agricultural land uses in the immediate vicinity of the EDB (discussed further in Section 3.9, "Hydrology and Water Quality"). However, water intakes close to the downstream side of the barriers may temporarily experience lower water levels during low tide (up to approximately 1.5 feet lower during the daily tidal cycle) while the barriers are in place, affecting pumping ability during low tide while the barriers are in place. To reduce this potential impact to a less-than-significant level, DWR would implement Mitigation Measure HYDRO-1 to provide emergency temporary pumps for any siphon or pump diversion that is adversely affected by the barriers.

The barriers may be installed in spring or summer, and full removal is anticipated to be no later than November 1 at the Sutter Slough and Steamboat Slough project sites and no later than November 15 at the West False River project site, with the potential for up to three installations in 10 years, potentially in consecutive years. Because of the temporary nature of the proposed project, the use of the project sites for the EDB would not preclude the overall agricultural land uses after the barriers' removal and would not result in the permanent conversion of Important Farmland to nonagricultural uses. With the incorporation of Mitigation Measure HYDRO-1, this impact would be less than significant.

Mitigation Measure HYDRO-1: Minimize Downstream Water Surface Elevation Impacts and Work with North Delta Water Agency to Minimize Salinity Changes for Water Users within the Agency's Boundaries

Timing: During barrier operation

Responsibility: DWR

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

Less than Significant with Mitigation Incorporated. The EDB would be located in areas primarily zoned for agricultural use. Lands under active Williamson Act contracts are located on both sides of the Sutter Slough and east of Steamboat Slough (DOC 2012b, 2013a). No parcels held under Williamson Act contracts are located in the immediate vicinity of the proposed West False River barrier location (DOC 2013b). As described in Question a) above, implementing the proposed project could affect the pumping ability at water intakes close to the downstream side of the barriers during low tide while the barriers are in place. DWR would implement Mitigation Measure HYDRO-1 to provide emergency temporary pumps for any siphon or pump diversion that is adversely affected by the barriers. The proposed project would not conflict with existing zoning for agricultural uses or a Williamson Act contract. Potential impacts on agricultural water diverters would be less than significant with mitigation incorporated.

Mitigation Measure HYDRO-1: Minimize Downstream Water Surface Elevation Impacts and Work with North Delta Water Agency to Minimize Salinity Changes for Water Users within the Agency's Boundaries

Timing: During barrier operation

Responsibility: DWR

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

No Impact. None of the project sites are zoned as forestland, timberland, or a Timberland Production Zone. Therefore, implementing the proposed project would not conflict with existing zoning for, or cause rezoning of, forestry resources. No impact would occur.

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

No Impact. Section 12220(g) of the California Public Resources Code defines forestland as land that can support 10 percent native tree cover and woodland vegetation of any species (including hardwoods) under natural conditions, and that allows for management of one or more forest resources (e.g., timber, aesthetics, fish and wildlife, biodiversity, water quality, recreation) and other public benefits. The project sites do not contain forestland as defined by Section 12220(g). Therefore, implementing the proposed project would not result in the loss of forestland or conversion of forestland to nonforest uses. No impact would occur.

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

Less than Significant with Mitigation Incorporated. The proposed project would reduce the intrusion of saltwater into the Delta and would reduce demand on reservoir releases to maintain salinity levels in the Delta, leaving more water upstream for both fishery and community needs, as well as for agricultural irrigation.

The proposed project could affect pumping ability at water intakes close to the downstream side of the barriers during low tide while the barriers are in place, thereby potentially affecting agricultural water diverters. However, as discussed in response to Questions a) and b) above, this impact would be less than significant with the incorporation of Mitigation Measure HYDRO-1. For the reasons described in response to Question d) above, implementing the proposed project would not result in other changes in the physical environment that could indirectly result in the conversion of forestland to non-forest uses. Therefore, this impact would be less than significant with mitigation incorporated.

Mitigation Measure HYDRO-1: Minimize Downstream Water Surface Elevation Impacts and Work with North Delta Water Agency to Minimize Salinity Changes for Water Users within the Agency's Boundaries

Timing: During barrier operation

Responsibility: DWR

3.3 AIR QUALITY

ENVIRONMENTAL ISSUES	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 air pollution control district may be relied on to make the following determinations.				
Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☒	☐	☐
c) 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)?	☐	☒	☐	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐

3.3.1 ENVIRONMENTAL SETTING

The project sites are located in Yolo, Sacramento, and Contra Costa counties, which are within the Sacramento Valley Air Basin (SVAB) and San Francisco Bay Area Air Basin (SFBAAB). The SFBAAB includes Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara counties; the southern portion of Sonoma County; and the southwestern portion of Solano County. The SVAB includes Butte, Colusa, Glenn, Sacramento, Shasta, Sutter, Tehama, Yolo, and Yuba counties, the western portion of Placer County, and the eastern portion of Solano County. The environmental setting for the SVAB and SFBAAB is described separately next, along with a general air quality background that applies to both air basins.

GENERAL AIR QUALITY ENVIRONMENTAL SETTING

The federal Clean Air Act and the California Clean Air Act required the U.S. Environmental Protection Agency (EPA) and California Air Resources Board (ARB) to establish health-based air quality standards at the federal and state levels. National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS) were established for the following criteria pollutants: carbon monoxide (CO), ozone, sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter less than 10 microns in diameter (PM_{10}), particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), and lead. These standards have been established with a margin of safety to protect the public's health. Both EPA and ARB designate areas of the state as attainment, nonattainment, maintenance, or unclassified for the various pollutant standards according to the federal Clean Air Act (CAA) and the California Clean Air Act (CCAA), respectively.

An “attainment” designation for an area signifies that pollutant concentrations did not violate the NAAQS or CAAQS for that pollutant in that area. A “nonattainment” designation indicates that a pollutant concentration violated the standard at least once, excluding those occasions when a violation was caused by an exceptional event, as identified in the criteria. A “maintenance” designation indicates that the area previously had nonattainment status and currently has attainment status for the applicable pollutant; the area must demonstrate continued attainment for a specified number of years before it can be redesignated as an attainment area. An “unclassified” designation signifies that data do not support either an attainment or a nonattainment status.

SACRAMENTO VALLEY AIR BASIN

The SVAB is relatively flat, bordered by mountains to the east, west, and north. Air flows into the SVAB through the Carquinez Strait, the only breach in the western mountain barrier, and moves across the Sacramento–San Joaquin Delta, bringing with it pollutants from the heavily populated San Francisco Bay Area. The climate is characterized by hot, dry summers and cool, rainy winters. Periods of dense and persistent low-level fog that are most prevalent between storms are characteristic of SVAB winter weather. From May to October, the region’s intense heat and sunlight lead to high ozone concentrations. Summer inversions are strong and frequent, but are less troublesome than those that occur in fall. Autumn inversions, formed by warm air subsiding in a region of high pressure, have accompanying light winds that do not provide adequate dispersion of air pollutants.

The SVAB is designated as a nonattainment area for the state and federal 8-hour ozone standards, the state PM_{10} standards, the state $PM_{2.5}$ annual arithmetic mean standard, and the federal $PM_{2.5}$ 24-hour standard. For all other pollutants, SVAB is designated as an attainment area or is unclassified (SMAQMD 2014).

Sacramento Metropolitan Air Quality Management District (SMAQMD) attains and maintains air quality conditions in Sacramento County through a comprehensive program of planning, regulation, enforcement, technical innovation, and promotion of the understanding of air quality issues. Its clean air strategy includes preparing plans to attain ambient air quality standards, adopting and enforcing rules and regulations concerning sources of air pollution, and issuing permits for stationary sources of air pollution. SMAQMD also inspects stationary sources of air pollution and responds to citizen complaints, monitors ambient air quality and meteorological conditions, and implements programs and regulations required by the CAA and Clean Air Act Amendments (CAAA), and the CCAA.

SMAQMD’s Guide to Air Quality Assessment in Sacramento County is an advisory document that provides lead agencies, consultants, and project proponents with uniform procedures for addressing air quality in environmental documents (SMAQMD 2009).

SAN FRANCISCO BAY AREA AIR BASIN

The SFBAAB is characterized by complex terrain, consisting of coastal mountain ranges, inland valleys, and bays that distort normal wind flow patterns. The Coast Ranges, which trend northwest along the western side of the SFBAAB, have two major open areas, at the Golden Gate Bridge and the Carquinez Strait, that allow air to flow into and out of the SFBAAB and the Central Valley. During summer, temperature inversions can cause pollutant concentrations to build to unhealthy levels because of the lack of dispersion. During summer, winds flowing from the northwest are drawn inland through the Bay at the Golden Gate Bridge and over the lower portions of the San Francisco Peninsula. In winter, the Pacific high-pressure cell weakens and shifts southward, resulting in wind flow offshore, the absence of upwelling, and the occurrence of storms. Weak inversions coupled with moderate winds result in a low air pollution potential. The Pacific high-pressure cell periodically becomes dominant, bringing strong inversions, light winds, and high pollution potential.

The SFBAAB is designated as a nonattainment area for the State and federal 8-hour ozone standards, the State PM_{10} standards, the State $PM_{2.5}$ annual arithmetic mean standard, and the national $PM_{2.5}$ 24-hour standard. It is considered an attainment area or unclassified for the other criteria pollutants (BAAQMD 2014).

Bay Area Air Quality Management District (BAAQMD) is the agency responsible for protecting public health and welfare through the administration of federal and State air quality laws and policies in the SFBAAB. In 2010, BAAQMD updated the CEQA Air Quality Guidelines that, compared to the 1999 version, include new and more stringent quantitative thresholds for operation and construction-related criteria air pollutants and precursors, TACs, odors, and GHG emissions (BAAQMD 2010a). The Guidelines are intended to provide lead agencies, consultants, and project applicants with uniform procedures for addressing air quality in environmental documents.

3.3.2 DISCUSSION

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

Less-than-Significant Impact. Air quality plans describe air pollution control strategies to be implemented by an air district, city, county, or region. The primary purpose of an air quality plan is to maintain and/or achieve attainment of a CAAQS or NAAQS.

SMAQMD and BAAQMD prepare plans to attain ambient air quality standards in the SVAB and SFBAAB, respectively. In 2013, the SMAQMD Board of Directors adopted its 2013 Update to the 8-Hour Ozone Attainment and Reasonable Further Progress Plan, which contains control measures to serve as the SMAQMD's plan to attain the federal ozone standard (ARB 2013a). On September 15, 2010, the BAAQMD Board of Directors adopted the final Bay Area 2010 Clean Air Plan, an update to the 2005 Bay Area Ozone Strategy. The 2010 plan reviews the SFBAAB's progress in reducing ozone levels to attain the state 1-hour and 8-hour ozone standards (BAAQMD 2010b). These two plans represent the applicable air quality plans for the SVAB and SFBAAB to attain and maintain ambient air quality standards.

Two criteria were used to determine whether implementing the proposed project would conflict with or obstruct implementation of the air quality plan. The first criterion was whether the project would exceed the estimated air basin emissions used as the basis of the air quality plans. The emission estimates are based, in part, on population and vehicle miles traveled (VMT) projections developed by the applicable metropolitan planning organization. The second criterion was whether implementing the project would increase the frequency or severity of existing air quality violations, contribute to new violations, or delay the attainment of air quality standards.

The proposed project primarily includes construction activities. Long-term operational and maintenance activities essentially would be limited to opening or closing the culvert slide gates at the Sutter and Steamboat Slough project sites as necessary for water quality or maintenance purposes. In addition, rock at the West False River sheet pile abutments would be inspected annually and repairs or replacement of the rock would occur as needed. Thus, long-term operational activities are anticipated to be infrequent and nominal. As discussed in more detail in Question b), construction and operational activities would not violate any air quality standard or contribute substantially to an existing or projected air quality violation with implementation of Mitigation Measures AQ-1 through 5. Following removal of the drought barrier structures, all construction activities and emissions would cease. No long-term operational activities would continue following removal of the drought barrier structures, with the exception of routine checking and potential minor maintenance of the sheet pile abutments at the West False River project site.

Because implementing the proposed project would not substantially increase VMT and would not exceed the thresholds of significance, it would not conflict with or obstruct the implementation of the applicable air quality plan. Therefore, the impact would be less than significant.

b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?

CONSTRUCTION EMISSIONS

Less than Significant with Mitigation Incorporated. Construction emissions are described as emissions that are short term or temporary in duration but have the potential to represent a significant impact with respect to air quality. Construction of the proposed project would result in the temporary generation of reactive organic gases (ROG), oxides of nitrogen (NO_X), PM_{10}, and $PM_{2.5}$ emissions from construction work associated with dredging and hauling of dredged material. Construction-related emissions of the ozone precursors ROG and NO_x are associated primarily with mobile vehicle and equipment exhaust. Fugitive dust emissions (PM_{10} and $PM_{2.5}$) are associated primarily with site preparation and vary as a function of such parameters as soil silt content, soil moisture, wind speed, acreage of disturbance area, and VMT by construction vehicles on- and off-site.

Construction of the proposed project would include installation of the EDB and potentially removal of the barriers in the same year. Construction-related emissions for the proposed project were estimated using emission factors from ARB's on-road emissions inventory model, EMFAC 2011 (ARB 2013b) and the California Emissions Estimator Model (CalEEMod) Version 2012.2.2 (CAPCOA 2012). Modeling of emissions related to construction worker commutes, haul truck trips, and the use of off-road equipment were based on project-specific data provided by DWR. The proposed project's construction emissions were modeled based on a worst-case scenario, representing an intensive day of construction to conservatively estimate the maximum daily emissions.

Table 3.3-1 presents the construction emissions associated with off-road equipment and on-road motor vehicle use for the proposed project (see also Appendix A, "Air Quality and Greenhouse Gas Emission Calculations").

As shown in Table 3.3-1, the proposed project's components would exceed the applicable thresholds of significance in the SMAQMD or BAAQMD. Geologic exploration potentially would occur in any year from 2015 to 2025 that EDB would not be installed. Construction activities associated with the geological exploration would be substantially less than those associated with the EDB, and therefore the emissions shown in Table 3.3-1 represent the worst-case construction emissions that could occur with implementation of the proposed project. However, emissions associated with the geological exploration also could exceed the SMAQMD and BAAQMD thresholds of significance. In addition to the SMAQMD and BAAQMD thresholds of significance, the SMAQMD and BAAQMD require all projects, regardless of significance, to implement their Basic Construction Emission Control Practices and Basic Construction Mitigation Measures, respectively. Nevertheless, the proposed project's construction-related emissions in the SMAQMD and BAAQMD would be considered significant without mitigation.

Table 3.3-1 Estimated Unmitigated Construction Emissions				
Construction Activity	Estimated Emissions (pounds per day) [1]			
	ROG	NO_x	PM_{10}	$PM_{2.5}$
SMAQMD Emergency Drought Barriers				
Sutter Slough Emergency Drought Barrier [2]	53	786	39	39
Steamboat Slough Emergency Drought Barrier	110	1,627	80	80
SMAQMD Threshold of Significance [3]	—	85	—	—
Exceeds SMAQMD Threshold?	—	Yes	—	—
YSAQMD Emergency Drought Barriers				
Sutter Slough Emergency Drought Barrier (tons/yr) [2]	<1	12	<1	<1
YSAQMD Threshold of Significance (tons/yr) [4]	10	10	—	—
Exceeds YSAQMD Threshold?	No	Yes	—	—
BAAQMD Emergency Drought Barrier				
West False River Emergency Drought Barrier	166	2,473	122	122
BAAQMD Threshold of Significance [5]	54	54	82	54
Exceeds BAAQMD Thresholds?	Yes	Yes	Yes	Yes

Notes: ROG = reactive organic gases; NO_x = oxides of nitrogen; PM_{10} = particulate matter less than 2.5 microns in diameter; $PM_{2.5}$ = particulate matter less than 10 microns in diameter; SMAQMD = Sacramento Metropolitan Air Quality Management District; YSAQMD = Yolo-Solano Air Quality Management District; tons/yr = tons per year; BAAQMD = Bay Area Air Quality Management District;

1 Emissions are shown in units of pounds per day unless noted otherwise.

2 The Sutter Slough emergency drought barrier is located on the boundary of the Yolo and Sacramento County border. Per discussion with SMAQMD and YSAQMD, construction emissions for the Sutter Slough site have been split between SMAQMD and YSAQMD. YSAQMD allows projects to pay into SMAQMD's offset mitigation fee program to reduce emissions occurring in YSAQMD to a less-than-significant level.

3 SMAQMD's threshold of significance is in units of maximum daily pounds.

4 YSAQMD's threshold of significance is in units of tons per year.

5 BAAQMD's thresholds of significance are in units of average daily pounds.

Source: Modeled by AECOM in 2015

Implementation of Mitigation Measure AQ-1 would reduce construction-related emissions associated with off-road equipment and heavy-duty vehicles to a less-than-significant level.

Mitigation Measure AQ-1: Implement Bay Area Air Quality Management District and Sacramento Metropolitan Air Quality Management District Basic and Enhanced Construction Emission Control Practices to Reduce Fugitive Dust.

The construction contractor will implement the following applicable basic and enhanced control measures recommended by the Bay Area Air Quality Management District to reduce construction-related fugitive dust during site grading at the West False River project site (BAAQMD 2010a):

- All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) will be watered two times per day, as necessary to control fugitive dust.

- All haul trucks transporting soil, sand, or other loose material off-site will be covered.

- All visible mud or dirt track-out onto adjacent public roads will be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping will be prohibited.

- All vehicle speeds on unpaved roads will be limited to 15 miles per hour.

- All construction equipment will be maintained and properly tuned in accordance with manufacturer's specifications. All equipment will be checked by a certified mechanic and will be determined to be running in proper condition before operation.

- A publicly visible sign with the telephone number and person to contact at the lead agency (i.e., DWR) regarding dust complaints will be posted at the construction sites. The person identified as the contact will respond and take corrective action within 48 hours. The air district's phone number also will be visible, to ensure compliance with applicable regulations.

- Idling time of diesel-powered construction equipment will be no more than 5 minutes.

- All contractors will be required to use equipment that meets the California Air Resources Board's most recent certification standard for off-road heavy-duty diesel engines.

The construction contractor will implement the following applicable basic and enhanced control measures, recommended by the Sacramento Metropolitan Air Quality Management District to reduce construction-related fugitive dust during site grading the Sutter Slough and Steamboat Slough project sites (SMAQMD 2010):

- All exposed surfaces will be watered two times daily. Exposed surfaces include, but are not limited to soil piles, graded areas, unpaved parking areas, staging areas, and access roads.

- Haul trucks transporting soil, sand, or other loose material on the site will be covered or will maintain at least 2 feet of free board space on. Any haul trucks that will be traveling along freeways or major roadways will be covered.

- Wet power vacuum street sweepers will be used to remove any visible trackout mud or dirt onto adjacent public roads at least once per day. Use of dry power sweeping will be prohibited.

- Vehicle speeds will be limited on unpaved roads to 15 miles per hour.

- Idling time will be minimized either by shutting equipment off when not in use or by reducing the idling time to 5 minutes (as required by California Code of Regulations, Title 13, Sections 2449[d][3] and 2485). Clear signage that posts this requirement for construction workers will be provided at the entrances to the sites.

- All construction equipment will be maintained in proper working condition according to manufacturer's specifications. The equipment will be checked by a certified mechanic and will be determined to be running in proper condition before it is operated.

In addition, the construction contractor will implement the following applicable enhanced measures to reduce operation-related diesel particulate matter:

- Acceptable options for reducing emissions may include use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, and other options as they become available.

Timing: Before and during construction and removal as appropriate

Responsibility: DWR

In addition, because the proposed project would exceed the NO_X threshold of significance, additional mitigation measures (in Mitigation Measure AQ-2) are prescribed to further reduce emissions. BAAQMD has developed "Additional Construction Mitigation Measures" for those projects that would exceed the thresholds of significance.

Mitigation Measure AQ-2: Reduce Construction-Related Emissions from Off-Road Equipment and Heavy-Duty Vehicles.

The following measure from the BAAQMD's Additional Construction Mitigation Measures will be implemented during construction at the West False River project site (BAAQMD 2010a):

- All contractors will be required to use equipment that meet California Air Resources Board's most recent certification standard for off-road heavy duty diesel engines.

Timing: Before and during construction and removal as appropriate

Responsibility: DWR

In order to reduce ROG, NO_X, PM, and GHG emissions, the following measure will be implemented during construction of all three emergency drought barriers:

Mitigation Measure AQ-3: Fuel Tugboats/Barges with Renewable Diesel Fuel.

- All tugboats/barges will be fueled using renewable diesel fuel. The fuel provider could include, but is not limited to Golden Gate Petroleum. However, all renewable diesel fuel used from other providers will achieve a similar emissions reduction potential to Golden Gate Petroleum renewable diesel. In the case that renewable diesel cannot be used for tugboats/barges for logistic reasons, this will be recorded in the bi-weekly construction reports as part of Mitigation Measure AQ-5, and incorporated into the final emissions and mitigation fee calculations.

Timing: During construction and removal as possible

Responsibility: DWR and its contractor

Even with implementation of Mitigation Measure AQ-3, construction-related emissions occurring in SMAQMD, Yolo-Solano Air Quality Management District (YSAQMD), and BAAQMD would continue to exceed applicable thresholds of significance. Mitigation Measures AQ-4 and AQ-5 will be implemented to reduce this impact to a less-than-significant level. At the time of this analysis, the precise construction activities associated with development of the three emergency drought barriers (i.e., West False River, Sutter Slough, Steamboat Slough) cannot be determined. The analysis described above provides a conservative estimate of construction activities to avoid underestimating emissions. Even with implementation of Mitigation Measure AQ-1 to AQ-3, using the conservative estimates presented in this document, construction emissions would exceed BAAQMD's threshold of significance and the project applicant (i.e., DWR) would have to pay into BAAQMD's mitigation fee program in order to reduce short-term construction emissions to below the BAAQMD construction thresholds of significance. The following mitigation measure is intended to allow an estimate of the actual construction-related emissions associated with the project and a more accurate determination of the level of contribution to the mitigation fee program.

Mitigation Measure AQ-4: Use Construction Monitoring and BAAQMD CMP or Another Verifiable Offset Program to Offset Regional Off-Site Emissions

DWR and/or its contractor will monitor construction activities throughout development of all three emergency drought barriers. Construction activities data will be collected, emissions associated with construction activities will be calculated, and these data will be reported to BAAQMD. The specifics of construction monitoring and reporting will be determined in consultation with BAAQMD. Construction activities data will include, but are not limited to the following items:

1. Tugboats/Barges
    a. Distance traveled by tugboats/barges separated by "loaded" travel and "unloaded" travel.
    b. Horsepower of tugboats and auxiliary engines
    c. Idling time of tugboats/barges
    d. Fuel use and fuel type (collection of this data will also ensure Mitigation Measure AQ-3 [Renewable Diesel] is implemented)
2. Construction Equipment
    a. Equipment type and number of pieces
    b. Horsepower
    c. Hours of actual operation
3. Haul Trucks (heavy-duty trucks)
    a. Number of heavy-duty haul truck trips
    b. Total trip distance for haul truck trips
4. Construction Workers
    a. Number of construction workers per day

BAAQMD will collect the construction activity and emissions reports for record keeping and monitoring purposes. Following completion (i.e., removal of emergency drought barriers) of the proposed project, the final construction emissions will be evaluated to calculate the total offset mitigation fee based on actual construction activities. DWR will work in coordination with BAAQMD to assess the specific mechanisms associated with construction monitoring, emission calculations, and payment logistics.

DWR will use BAAQMD's Carl Moyer Program (CMP) or another verifiable program to offset the proposed project's reactive organic gases (ROG), oxides of nitrogen (NO_X), and particulate matter emissions that exceed the BAAQMD 2010 threshold as determined through the construction monitoring program described above. DWR may achieve the required offset through any combination of the following:

- Reduce on-site emission sources and implement offset actions (i.e., construction or operational changes to site-specific emissions).
- Implement offset emissions and programs available within Contra Costa County and the San Francisco Bay Area Air Basin.
- Submit payment to BAAQMD on a per ton of NO_X amount (i.e., dollars per ton of NO_X to offset) for emission reduction projects that will be funded by BAAQMD. The price of NO_X emission offsets will be determined by BAAQMD on an annual basis. The types of projects that will be funded by BAAQMD can include:
  - Projects within the Contra Costa County and/or the San Francisco Bay Area Air Basin (SFBAAB) that are eligible for funding under the CMP guidelines, which are real, surplus, quantifiable, and enforceable.
  - Projects to replace older, high-emitting construction equipment operating in Contra Costa County and/or the SFBAAB with newer, cleaner, retrofitted, or more efficient equipment.

Timing: Before and during construction and removal

Responsibility: DWR and the selected project contractor

Similar to the description above for Mitigation Measures AQ-4, at the time of this analysis, the precise construction activities associated with development of the three emergency drought barriers (i.e., West False River, Sutter Slough, Steamboat Slough) cannot be determined. Even with implementation of Mitigation Measure AQ-1 to AQ-3, using the conservative estimates presented in this document, construction emissions would exceed SMAQMD's threshold of significance and the project applicant (i.e., DWR) would have to pay into SMAQMD's mitigation fee program in order to reduce short-term construction emissions to below the SMAQMD threshold of significance. The following mitigation measure is intended to allow an estimate of the actual construction-related emissions associated with the project and a more accurate determination of the level of contribution to the mitigation fee program.

Mitigation Measure AQ-5: Use Construction Monitoring and SMAQMD's Mitigation Fee to Offset Regional Off-Site Emissions

DWR and/or its contractor will monitor construction activities throughout development of all three emergency drought barriers. Construction activities data will be collected, emissions associated with construction activities will be calculated, and these data will be reported to SMAQMD. The specifics of construction monitoring and reporting will be determined in consultation with SMAQMD. Construction activities data will include, but are not limited to the following items:

1. Tugboats/Barges
    a. Distance traveled by tugboats/barges separated by "loaded" travel and "unloaded" travel.
    b. Horsepower of tugboats and auxiliary engines
    c. Idling time of tugboats/barges
    d. Fuel use and fuel type (collection of this data will also ensure Mitigation Measure AQ-3 [Renewable Diesel] is implemented)
2. Construction Equipment
    a. Equipment type and number of pieces
    b. Horsepower
    c. Hours of actual operation
3. Haul Trucks (heavy-duty trucks)
    a. Number of heavy-duty haul truck trips
    b. Total trip distance for haul truck trips
4. Construction Workers
    a. Number of construction workers per day

SMAQMD will collect the construction activity and emissions reports for record keeping and monitoring purposes. Following completion (i.e., removal of emergency drought barriers) of the proposed project, the final construction emissions will be evaluated to calculate the total offset mitigation fee based on actual construction activities. DWR will work in coordination with SMAQMD to assess the specific mechanisms associated with construction monitoring, emission calculations, and payment logistics.

Timing: Before and during construction and removal

Responsibility: DWR and the selected project contractor

Following implementation of the SMAQMD- and BAAQMD-required construction mitigation measures and payment into SMAQMD and BAAQMD offset mitigation fee programs, the proposed project would offset its construction-related emissions below the applicable thresholds of significance. As noted above, the geological exploration activities are anticipated to be less intensive than the construction activities for the EDB, and therefore the offset mitigation measures for geological exploration would be different from those of the EDB. Nevertheless, with implementation of Mitigation Measures AQ-1 through AQ-5, the proposed project would reduce regional construction-related emission to a less-than-significant level. This impact would be less than significant with mitigation incorporated.

OPERATIONAL EMISSIONS

Less-than-Significant Impact. The proposed project would not include any long-term maintenance or operational activities following removal of the drought barriers, with the exception of routine checking and potential minor maintenance of the sheet pile abutments at the West False River project site. Therefore, the proposed project is not anticipated to result in substantial maintenance or operational activities that would generate regional air quality emissions exceeding the BAAQMD or SMAQMD's thresholds of significance. This impact would be less than significant.

c) 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 with Mitigation Incorporated. The analysis of cumulative effects focuses on whether implementing a specific project would result in cumulatively considerable emissions to a significant cumulative impact. By its very nature, air pollution mainly is a cumulative impact. The nonattainment status of regional pollutants is a result of past and present development within the SVAB and SFBAAB, and this regional impact is cumulative rather than attributable to any one source. A project's emissions may be individually limited but cumulatively considerable when taken in combination with past, present, and probable future projects. The thresholds of significance are relevant to determining whether the contribution of a project's individual emissions would result in a considerable incremental contribution to the existing cumulative air quality conditions. If a project's emissions would be less than these threshold levels, implementing the project would not be expected to result in a considerable incremental contribution to the significant cumulative impact.

As discussed earlier, implementation of Mitigation Measures AQ-1 to AQ-5 would reduce all construction-related emissions to a less-than-significant level with respect to the SMAQMD and BAAQMD's thresholds of significance. Therefore, emissions associated with the proposed project would not result in a cumulatively considerable incremental contribution to a significant cumulative impact. This impact would be less than significant with mitigation.

Mitigation Measure AQ-1: Implement Bay Area Air Quality Management District and Sacramento Metropolitan Air Quality Management District Basic and Enhanced Construction Emission Control Practices to Reduce Fugitive Dust.

Timing: Before and during construction and removal as appropriate

Responsibility: DWR

Mitigation Measure AQ-2: Reduce Construction-Related Emissions from Off-Road Equipment and Heavy-Duty Vehicles.

Timing: Before and during construction and removal as appropriate

Responsibility: DWR

Mitigation Measure AQ-3: Fuel Tugboats/Barges with Renewable Diesel Fuel.

Timing: During construction and removal as possible

Responsibility: DWR

Mitigation Measure AQ-4: Use Construction Monitoring and BAAQMD CMP or Another Verifiable Offset Program to Offset Regional Off-Site Emissions

Timing: Before and during construction and removal

Responsibility: DWR and the selected project contractor

Mitigation Measure AQ-5: Use Construction Monitoring and SMAQMD's Mitigation Fee to Offset Regional Off-Site Emissions

Timing: Before and during construction and removal

Responsibility: DWR and the selected project contractor

d) Expose sensitive receptors to substantial pollutant concentrations?

Less-than-Significant Impact. Some people are especially sensitive to air pollutant emissions and need to be given special consideration when evaluating air quality impacts from projects. These people include children, older adults, persons with preexisting respiratory or cardiovascular illness, and athletes and others who engage in frequent exercise. Sensitive receptors include residences, schools, playgrounds, child care centers, athletic facilities, long-term health-care facilities, rehabilitation centers, convalescent centers, and retirement homes.

The West False River project site does not have any sensitive receptors within 1,000 feet. The Steamboat Slough and Sutter Slough project sites have single-family units located within 150 to 900 feet. Pollutants that could be generated by the proposed project and result in adverse health impacts on sensitive receptors would include diesel exhaust particulate matter (i.e., PM_{10} and $PM_{2.5}$), which is classified as a toxic air contaminant (TAC). The greatest potential for TAC emissions would be related to diesel particulate matter (diesel PM) emissions associated with heavy construction equipment activity. Health effects from carcinogenic TACs usually are described in terms of individual cancer risk, which is based on a 70-year lifetime exposure to TACs.

Off-road equipment for barrier construction and removal would not operate in the immediate proximity of any sensitive receptor for an extended period of time (i.e., approximately 30 to 60 days during construction and approximately 30 to 60 days during removal). The maximum possible sensitive receptor exposure period from the proposed project's construction activities would be relatively short (i.e., approximately 60 days) and would be approximately 0.3 percent of the minimum exposure period for a health risk assessment. Thus, because the use of off-road, heavy-duty equipment would occur for a relatively short period (up to three times in 10 years, although possibly in consecutive years) and would not be in the immediate proximity of sensitive receptors, construction-related activities would not be anticipated to expose sensitive receptors to substantial concentrations of TACs. This impact with respect to construction emissions would be less than significant.

All construction emissions would cease following completion of the proposed project. As mentioned previously, following removal of the barriers, no long-term maintenance or operational activities would occur, with the exception of routine checking and potential minor maintenance of the sheet pile abutments at the West False River project site. Thus, implementing the proposed project would not expose sensitive receptors to substantial operational TAC concentrations. Therefore, this impact would be less than significant.

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

Less-than-Significant Impact. Human response to odors is subjective, and sensitivity to odors varies greatly. Typically, odors are regarded as an annoyance rather than a health hazard. However, manifestations of a person's reaction to foul odors can range from psychological (e.g., irritation, anger, anxiety) to physiological (e.g., circulatory and respiratory reactions, nausea, vomiting, headaches). A potential source of odor during construction activities is equipment exhaust. However, construction equipment exhaust would be localized and generally would be confined to the immediate area surrounding the project sites. Typical construction techniques would be used for the proposed project, and the odors would be temporary and typical of most construction sites. In addition, following construction and removal of the barriers, the proposed project would not include long-term maintenance or operational activities that could generate substantial odor sources. Implementing the proposed project would not create objectionable odors that would affect a substantial number of people; therefore, the impact would be less than significant.

3.4 BIOLOGICAL RESOURCES

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife, the U.S. Fish and Wildlife Service, or the National Marine Fisheries Service	☐	☒	☐	☐
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 Wildlife or the U.S. Fish and Wildlife Service?	☐	☒	☐	☐
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?	☐	☒	☐	☐
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?	☐	☒	☐	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
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?	☐	☐	☐	☒

3.4.1 ENVIRONMENTAL SETTING

INTRODUCTION AND METHODS

This section addresses biological resources known or with potential to occur at each of the three project sites that may be affected by the emergency drought barrier construction, operation, and removal (up to three times in 10 years), and potential geologic exploration between 2015 and 2025 at each of the three sites. AECOM biologists conducted a reconnaissance-level field survey of each project site. The field survey of the Sutter Slough and Steamboat Slough project sites was conducted on March 13, 2014, and the survey of the West False River project site was conducted on March 14, 2014. The surveys were conducted by boat and focused on evaluating the potential for the emergency drought barrier sites to support sensitive habitats and species. Plant communities and land cover features were noted and photographed with a digital camera.

Several biological resource databases were queried to identify sensitive plant, fish, and wildlife species that could be affected by the proposed project, including the CDFW's California Natural Diversity Database (CNDDB), the database of endangered species under the jurisdiction of the USFWS' Sacramento Fish and Wildlife Office, and the California Native Plant Society's (CNPS) online Inventory of Rare and Endangered Vascular Plants of California. Additional sources of information on biological resources of Delta also were reviewed in support of this analysis, including the Bay Delta Conservation Plan (DWR 2013) and results of focused surveys conducted by DWR throughout the Delta in recent years.

VEGETATION COMMUNITIES AND LAND COVER TYPES

Vegetation communities and land cover types present in the project sites include aquatic habitat in which the EDB would be placed and terrestrial cover associated with the adjacent channel slopes and banks.

Aquatic Habitat

As described in Chapter 2, "Project Description," the emergency drought barrier sites primarily are open water in Sutter Slough, Steamboat Slough, and West False River. Open water habitat at the project sites provides cover and foraging habitat for a variety of aquatic and water-dependent wildlife and native and nonnative fish. Construction also would occur on the channel banks, which support some natural vegetation but are at least partially covered with rock armoring.

Terrestrial Cover

The Sutter Slough project site supports the greatest amount of natural cover. The shoreline of the east levee is rock-lined but supports annual grasses and forbs, small riparian shrubs, and mature trees on the levee slope. The west levee is not rock-lined and contains a narrow, dense band of riparian shrubs and small trees. Tree species observed during the site visit include valley oak (*Quercus lobata*), white alder (*Alnus rhombifolia*), and box elder (*Acer negundo*). Ground cover and understory vegetation is dominated by annual grasses and forbs and also supports California rose (*Rosa californica*), poison oak (*Toxicodendron diversilobum*), and common horsetail rush (*Equisetum arvense*).

The banks of Steamboat Slough where one of the EDB would be placed are extensively rock-lined on both sides of the slough. The upper banks of the levees support annual grass and forbs, with a few scattered mature trees, including Fremont cottonwood (*Populus fremontii*), white alder, and valley oak. The lower bank, particularly on the west levee, supports some riparian shrubs, including arroyo willow (*Salix lasiolepis*), sandbar willow (*Salix exigua*), California rose, black elderberry (*Sambucus nigra*), poison oak, and sedge (*Carex* sp.).

The banks of the West False River project site are completely rock-lined, and vegetation cover is primarily limited to hardstem bulrush (*Schoenoplectus acutus*) along the shoreline and small areas of blackberry (*Rubus* sp.) on the levees.

SENSITIVE BIOLOGICAL RESOURCES

Waters of the United States

Sutter Slough, Steamboat Slough, and West False River are all navigable waters of the United States, under the jurisdiction of USACE.

Special-Status Species

Special-status species include plants and animals in the following categories:

- species officially listed by the State of California or the federal government as endangered, threatened, or rare;
- candidates for State or federal listing as endangered or threatened;
- taxa (i.e., taxonomic categories or groups) that meet the criteria for listing, even if not currently included on any list, as described in Section 15380 of the State CEQA Guidelines;
- species identified by CDFW as species of special concern;
- species listed as Fully Protected under the California Fish and Game Code;
- species afforded protection under local or regional planning documents; and
- taxa considered by CDFW to be "rare, threatened, or endangered in California" and assigned a California Rare Plant Rank (CRPR).

AECOM biologists developed an initial list of special-status species to be evaluated for potential to occur in the project sites (see Table 3.4-1). This was based on a review of the CNDDB (CDFW 2014) for occurrences of sensitive species within a 5-mile radius of each project site and USFWS (2014) and CNPS (2014) species lists generated for the U.S. Geological Survey (USGS) quadrangle in which each emergency drought barrier would be located, as well as the surrounding eight quadrangles (Appendix B, "Special-Status Species Database Searches"). The Sutter Slough and Steamboat Slough project sites are in the Courtland quadrangle, and the West False River project site is in the Jersey Island quadrangle. Additional quadrangles covered by the species lists include: Antioch North, Antioch South, Birds landing, Bouldin Island, Brentwood, Bruceville, Clarksburg, Florin, Isleton, Liberty Island, Rio Vista, Thornton, Saxon, and Woodward Island. The majority of species were eliminated from consideration in this document because the project sites are outside the current range of the species or because field observations and review of aerial photography indicated that no suitable habitat exists for the species on, or adjacent to, any of the project sites. The remaining species that were not eliminated from consideration are discussed next.

Table 3.4-1
Special-Status Species with Potential to Occur at One or More Project Site

Species	Status[1]			Habitat Requirements
	Federal	State	CRPR	
Plants				
Delta tule pea *Lathyrus jepsonii* var. *jepsonii*	–	–	1B.2	Freshwater and brackish marshes; generally restricted to the Delta, also recorded in riprap on levee slopes, from 0 to 13 feet in elevation
Mason's lilaeopsis *Lilaeopsis masonii*	–	R	1B.1	Freshwater and brackish marshes, riparian scrub; generally found in tidal zones, on bare depositional soils in the Delta, from 0 to 33 feet in elevation

Table 3.4-1 Special-Status Species with Potential to Occur at One or More Project Site				
Species	Status[1]			Habitat Requirements
	Federal	State	CRPR	
Delta mudwort *Limosella australis*	–	–	2B.1	Riparian scrub, freshwater marsh, brackish marsh; generally occurs on intertidal mud banks of the Delta in marshy or scrubby riparian associations, from 0 to 10 feet in elevation
Sanford's arrowhead *Sagittaria sanfordii*	–	–	1B.2	Shallow freshwater marshes and swamps
Woolly rose-mallow *Hibiscus lasiocarpos* var. *occidentalis*	–	–	1B.2	Freshwater marshes and swamps, generally found on wetted river banks and low peat islands in sloughs; known from the Delta watershed, also recorded in riprap on levee slopes, from 0 to 390 feet in elevation
Fish				
Chinook salmon, Central Valley fall/late fall–run ESU *Oncorhynchus tshawytscha*	SC	SSC	–	Spawns in cold, freshwater streams with suitable gravel; rears in seasonally inundated floodplains, rivers, and tributaries, and in the Bay-Delta
Chinook salmon, Sacramento River winter-run *Oncorhynchus tshawytscha*	E	E		Spawns in cold, upper reaches of the Sacramento River with suitable gravel; rears in seasonally inundated floodplains of the Sacramento River and in the Bay-Delta
Chinook salmon, Central Valley spring-run ESU *Oncorhynchus tshawytscha*	T	T	–	Spawns in cold, freshwater streams with suitable gravel; rears in seasonally inundated floodplains, rivers, and tributaries, and in the Bay-Delta
Central Valley steelhead DPS *Oncorhynchus mykiss*	T	–	–	Spawns in cold, freshwater streams with suitable gravel; rears in seasonally inundated floodplains, rivers, and tributaries, and in the Bay-Delta
Green sturgeon, southern DPS *Acipenser medirostris*	T	–	–	Spawns in cold, freshwater streams with suitable gravel; rears in seasonally inundated floodplains, rivers, and tributaries, and in the Bay-Delta
Delta smelt *Hypomesus transpacificus*	T	E	–	Shallow open waters of the Bay-Delta. Likely to spawn on hard substrates such as sand, gravel, or other submerged material.
Longfin smelt *Spirinchus thaleichthys*	–	T	–	Estuarine open waters, mid to lower water column. Prefer relatively high salinity waters, except for spawning and early life stages when freshwater or low salinity is preferred. Spawn over sandy or gravel substrate, rocks, and aquatic plants.
Sacramento Splittail *Pogonichthys macrolepidotus*	–	SSC	–	Primarily low to moderate current in bays, sloughs, and rivers of the Delta, Suisun Bay, Suisun Marsh, and Napa Marsh. Spawns in inundated vegetation as far upstream as the Yolo and Sutter bypasses and lower Cosumnes River in years of high runoff.
Pacific Lamprey *Entosphenus tridentata*	SC	–	–	Streams, mainstem rivers, estuaries, and nearshore ocean
River Lamprey *Lampetra ayresi*	–	SSC	–	Streams, mainstem rivers, estuaries, and nearshore ocean
Invertebrates				
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	T	–	–	Closely associated with blue elderberry, which is an obligate host for the beetle larvae

Table 3.4-1 Special-Status Species with Potential to Occur at One or More Project Site				
Species	Status[1]			Habitat Requirements
	Federal	State	CRPR	
Reptiles				
Giant garter snake *Thamnophis gigas*	T	T	–	Marshes, sloughs, ponds, small lakes, low gradient streams and other waterways, and agricultural wetlands during the active season; aestivates in adjacent uplands
Pacific pond turtle *Actinemys marmorata*	–	SSC	–	Permanent or nearly permanent water bodies in a variety of habitat types, including ponds, marshes, rivers, streams, and irrigation ditches
Birds				
Burrowing owl *Athene cunicularia*	–	SSC	–	Nests and forages in grasslands, agricultural lands, open shrublands, and open woodlands with natural or artificial burrows or friable soils
Swainson's hawk *Buteo swainsoni*	–	T	–	Nests in riparian forest and scattered trees; forages in grasslands and agricultural fields
Cooper's Hawk *Accipiter*	–	WL	–	Primarily forages and nests in woodland habitats; also occurs in urban and suburban areas where mature trees are present
White-tailed kite *Elanus leucurus*	–	FP	–	Nests in riparian zones, oak woodlands, and isolated trees; forages in grasslands and agricultural fields
Song sparrow ("Modesto" population) *Melospiza melodia*	–	SSC	–	Nests and forages in dense vegetation in marsh, riparian forest and scrub, and along irrigation and drainage canals
Mammals				
Western red bat *Lasiurus blossevillii*	–	SSC	–	Roosts solitarily in foliage of mature trees associated with woodland borders, rivers, and walnut orchards, especially in riparian corridors greater than 50 meters wide and dominated by mature trees

Notes: Bay-Delta = San Francisco Bay/Sacramento–San Joaquin Delta; CDFW = California Department of Fish and Wildlife; DPS = distinct population segment; ESU = evolutionarily significant unit; NMFS = National Marine Fisheries Service; USFWS = U.S. Fish and Wildlife Service

[1] Status Definitions:

Federal Listing Categories (NMFS/USFWS)

E = Endangered
T = Threatened

SC = Species of concern
– = No status

State Listing Categories (CDFW)

T = Threatened
E = Endangered
R = Rare
FP = Fully Protected
WL = Watch List
SSC = Species of special concern
– = No status

CDFW California Rare Plant Ranks

1B = Plants rare, threatened, or endangered in California and elsewhere
2B = Plants rare, threatened, or endangered in California, but more common elsewhere

Extensions:
.1 = Seriously endangered in California (>80% of occurrences are threatened and/or high degree and immediacy of threat)
.2 = Fairly endangered in California (20–80% of occurrences are threatened)

Sources: CDFW 2014; CNPS 2014; USFWS 2011; based on data collected and compiled by AECOM in 2014

Special-Status Fish

A number of special-status fish species occur in the Delta at some stage of their lives, including several that are federally and/or State-listed as threatened or endangered. The waterways in which the EDB would be placed function primarily as migration or dispersal corridors for these species. The following sections provide a summary of the life history characteristics of special-status fish species that would be likely to occur in the project sites. A more detailed discussion of those species that are federally and/or State-listed as threatened or endangered is presented in the Biological Assessment and Section 2081 Incidental Take Permit Application that have been prepared for the proposed project (ICF International 2015; ICF International and AECOM 2015).

Central Valley Fall-/Late Fall-Run Chinook Salmon

The Central Valley fall-/late fall-run Chinook salmon (*Onchorhynchus tshawytscha*) Evolutionarily Significant Unit (ESU) is a federal species of concern and a California species of special concern. Adult Central Valley fall-/ late fall–run Chinook salmon enter the Sacramento River system from mid-September through January, with peak numbers in mid-October through December. Spawning occurs from mid-October through early February, with peak spawning activity also in mid-October through December. During spawning, female salmon dig a redd (gravel nest) in which eggs are deposited and then fertilized by the male. Newly emerged fry remain in shallow, lower-velocity edgewaters, particularly where debris congregates and provides cover from predators. Juvenile fall-/late fall-run Chinook salmon typically rear in freshwater in their natal streams, the Sacramento River system, and the Delta for 3 to 6 months (fall-run) or up to 12 months (late fall-run) before entering the ocean. Juveniles migrate downstream from January through June. Important habitat during this period includes flooded bars, side channels, and overbank areas with relatively low water velocities, cover structures, space, and food. Suitable habitat includes areas with instream and overhead cover in the form of undercut banks, downed trees, and large, overhanging tree branches. As juveniles grow, they typically move into deeper water with higher current velocities, but still use velocity refugia to minimize energy expenditures. Migrational cues, including increasing flows and turbidity from runoff, changes in photoperiod, or intraspecific competition from other fish in their natal streams stimulate outmigration of juveniles that have reached the appropriate stage of maturation (Kjelson et al. 1982; Brandes and McLain 2001). In larger rivers, juveniles tend to migrate along the channel margins, avoiding the higher water velocities in the thalweg of the channel. When the river channel is relatively deep, juvenile salmon tend to utilize surface waters (Healey 1982).

Sacramento River Winter-Run Chinook Salmon

The Sacramento River winter-run Chinook salmon ESU is federally and state-listed as endangered. Adult Sacramento River winter-run Chinook salmon leave the ocean and migrate through the Delta and into the Sacramento River system, the only system in which they spawn, beginning in November. They migrate upstream past the Red Bluff Diversion Dam (RBDD) from mid-December through July, and most of the spawning population has passed RBDD by late June. They spawn from mid-April through August. Juveniles rear and emigrate in the Sacramento River from July through March (Hallock and Fisher 1985). Juveniles descending the Sacramento River above RBDD from August through October, and possibly November, are primarily pre-smolts (not yet physiologically ready to enter seawater) that likely rear in the Sacramento River below RBDD. Juveniles have been observed in the Delta between October and December, especially during high Sacramento River discharge caused by fall and early-winter storms. Triggers for downstream movement are similar to those described above for fall-run Chinook salmon. Winter-run salmon smolts may migrate through the Delta and San Francisco Bay to the ocean from December through May.

Central Valley Spring-Run Chinook Salmon

The Central Valley spring-run Chinook salmon ESU is federally and state-listed as threatened. Historically, this ESU was the most abundant run of Central Valley Chinook salmon (Fisher 1994) and occupied the headwaters of all major river systems in the Central Valley where there were no natural barriers. Current surveys indicate that remnant, nonsustaining spring-run Chinook salmon populations may be found in Butte Creek, Cottonwood, Battle, Antelope, and Big Chico Creeks. More sizable, consistent runs of naturally produced fish are found only in Mill and Deer Creeks. Historical records indicate that adult spring-run Chinook salmon enter the mainstem Sacramento River in February and March and continue to their spawning streams. Spring-run Chinook salmon are sexually immature during their spawning migration, and they hold in deep, cold pools until spawning occurs from late August through October. Emergence takes place in March and April. As is typical with juvenile Chinook salmon, spring-run Chinook salmon move into deeper water with higher current velocities as they grow, but they continue to use velocity refugia, such as complex channel margin habitat and backwater channels. Spring-run Chinook salmon appear to emigrate at two different life stages: fry and yearlings. Fry emigrate between February and June, while yearlings emigrate October to March, peaking in November. Juveniles may leave their natal streams as fry soon after emergence or rear for several months to a year before migrating as smolts or yearlings (Yoshiyama, Fisher, and Moyle 1998).

Central Valley Steelhead

The Central Valley steelhead (*Oncorhynchus mykiss*) distinct population segment (DPS) is federally listed as threatened. Central Valley steelhead typically leaves the ocean and begins its migration to spawning areas in Central Valley rivers and streams in August through April. They spawn in winter and spring (January through April) in waterways where cool, well-oxygenated water is available year round. Initially, juvenile steelhead are found in or near their natal spawning streams, but as they grow and mature, juveniles may move downstream into larger stream segments. Most juvenile steelhead spend 2 years in freshwater (Busby et al. 1996) and generally emigrate from March to June (Barnhart 1986; Reynolds et al. 1993); however, many juveniles may emigrate as young-of-the-year.

Green Sturgeon

The southern DPS of North American green sturgeon (*Acipenser medirostris*) is federally listed as threatened. Specific spawning behaviors, sites, and habitat requirements of this species remain unknown, though preferred habitats are thought to include deep, fast water. Adults sexually mature after 13–20 years and then spawn every 2–5 years (Adams et al. 2007). Most spawning is thought to occur in the Sacramento River, apparently from April through July (Brown 2007). Juveniles spend 1–4 years in freshwater and estuarine waters before dispersing into salt water (NMFS 2012). Post-spawn fish appear to typically hold for several months in the Sacramento River and out-migrate in fall, although they may move into and out of the river quickly during summer (Heublein et al. 2008).

Delta Smelt

Delta smelt (*Hypomesus transpacificus*) is federally listed as threatened and state-listed as endangered. Past sampling of larval delta smelt in the Bay-Delta has suggested that spawning occurs in the Sacramento River; in Georgiana, Prospect, Beaver, Hog, and Sycamore sloughs; in the San Joaquin River adjacent to Bradford Island and Fisherman's Cut; as well as in other potential areas (Wang 1991). However, in more recent years, the densest concentrations of both spawners and larvae have been recorded in the Cache Slough/Sacramento Deepwater Ship Channel complex in the North Delta. Some delta smelt spawning also occurs in the Napa River, Suisun Bay, and Suisun Marsh during wetter years (Sweetnam 1999; Wang 1991; Hobbs et al. 2007). Spawning occurs during late winter and spring, primarily in April through mid-May (Moyle 2002). At all life stages, delta smelt are found in greatest abundance in the water column and usually not in close association with the shoreline. They inhabit open, surface waters where they presumably aggregate in loose schools where conditions are favorable (Moyle 2002). The triggers for and duration of delta smelt larval movement from spawning areas to rearing areas is not known. Most young-of-the-year rear in the low salinity zone from late spring through fall and early winter, but some remain upstream from this zone, in particular in the Cache Slough complex, including Liberty Island and the Sacramento Deepwater Ship Channel (Sommer et al. 2011; Sommer and Mejia 2013).

Longfin Smelt

Longfin smelt (*Spirinchus thaleichthys*) is state-listed as threatened. Except when spawning, the species' center of abundance typically is near the confluence of the Sacramento and San Joaquin rivers (Baxter et al. 2010). Longfin smelt are most abundant in Suisun and San Pablo bays (Natural Heritage Institute 1992). Adults generally migrate upstream to the Delta and spawn in freshwater areas as temperatures drop in fall, from November onward. Larvae and early juveniles are subsequently found in upstream areas from January until early spring, when they migrate downstream (Moyle 2002; Baxter et al. 1999). Larval abundance in the Bay–Delta estuary peaks in January–March (CDFG 2009). Larvae are swept downstream into nursery areas in the western Delta and Suisun and San Pablo bays (Baxter et al. 1999).

Sacramento Splittail

Sacramento splittail (*Pogonichthys macrolepidotus*) is a state species of special concern that is confined largely to the Delta, Suisun Bay, Suisun Marsh, and Napa Marsh. Outside of the spawning season, the species is rarely found more than 5–10 miles above the upstream boundaries of the Delta (Moyle et al. 1989; Natural Heritage Institute 1992). Spawning runs, however, are more extensive, with major spawning and nursery areas in the Yolo and Sutter Bypasses and riparian areas on the lower Cosumnes River during years of high runoff when floodplains are inundated (Sommer et al. 1997, 2011; Crain et al. 2004). Splittail spawn adhesive eggs over flooded streambanks or aquatic vegetation. Spawning has been observed to occur as early as January and to continue through July (Wang 1986), but peak spawning occurs March through May. Larval splittail are commonly found in shallow, weedy areas where spawning occurs and eventually move into deeper, open water habitats as they grow and become juveniles (Wang 1986).

Pacific Lamprey

Pacific lamprey (*Entosphenus tridentata*) is a federal species of concern. It is a semelparous (i.e., individuals spawn once and then die) anadromous fish with a very long freshwater rearing period. Adult Pacific lampreys spend 6 months to 3.5 years in the marine environment and typically return to freshwater in spring and summer. They usually hold in low-velocity areas under large boulders and bedrock crevices until spawning the following spring. Pacific lamprey generally spawns between March and July in gravel bottom streams, usually at the upstream end of riffle habitat and near suitable habitat for their ammocoetes larvae. Ammocoetes drift downstream to areas of low stream velocity and burrow into sand or silt substrate, typically in depositional areas with soft substrate near stream margins associated with pools, alcoves, and glides. They are mostly sedentary and remain burrowed in the stream substrate for 3 to 7 years, filter feeding on algae, diatoms, and detritus.

Ammocoetes move downstream during high flow events, or if disturbed, and metamorphose into the sub-adult form (macropthalmia), generally from July through November. Outmigration to the ocean occurs during or shortly after transformation and generally peaks with rising stream and river flows in late winter or early spring. (Brostrom et al. 2010)

River Lamprey

River lamprey (*Lampetra ayresi*) is a state species of special concern thought to occur throughout Pacific coast streams. In California, the species occurs in tributaries of San Francisco Bay, such as the Napa River, Sonoma Creek, and Alameda Creek, as well as the Sacramento, San Joaquin, and Russian Rivers (Moyle et al. 1995; Moyle 2002). Limited information is available regarding the life history of this species in California. Current accounts are based mainly on information from Canadian populations (Moyle 2002). Like Pacific lamprey, river lamprey is semelparous and has a long freshwater rearing period. Adults return to fresh water in fall and winter, and spawning usually occurs in gravely riffles in small tributary streams from February through March (Moyle 2002). Ammocoetes remain in silty backwater habitats, where they filter feed on various microorganisms for approximately 3 to 5 years before migrating to the ocean in late spring (Moyle et al. 1995; Moyle 2002).

Special-Status Plants

Delta Tule Pea

Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*) has a CRPR of 1B.2. It is a robust perennial vine in the pea family. It has winged stems that reach 8 feet in length and climbs by tendrils located at the tips of the leaves. The leaves are 1 to 2 inches long and have 10 to 16 leaflets. Flowers are bright pink to purple, to 1-inch long, and are produced May through June. The nearest documented occurrences of Delta tule pea are approximately 0.7 mile northwest of the Sutter Slough project site, approximately 0.7 mile north of the Steamboat Slough project site, and approximately 3.7 miles southwest of the West False River project site (CDFW 2014).

Mason's Lilaeopsis

Mason's lilaeopsis (*Lilaeopsis masonii*) has a CRPR of 1B.1. This species occurs along the edge of rivers and sloughs throughout the Delta, particularly the central and west Delta. The nearest documented occurrences of Mason's lilaeopsis are approximately 0.5 mile east and west of the West False River project site and approximately 4 miles west of the Sutter and Steamboat Slough project sites (along the Sacramento Deepwater Ship Channel) (DWR 2013).

Suisun Marsh Aster

The Suisun marsh aster (*Symphyotrichum lentum*) has a CRPR of 1B.2. It is one of the few purple-headed members of the sunflower family that occurs as a rhizome-forming perennial in brackish water and wetlands, with stems often more than approximately 3 feet (1 meter) tall (CNPS 2014). Suisun marsh asters are found throughout the Delta, often on the banks of sloughs. The species is known to occur along the levee rip-rap and on submerged pilings along the northern shore of Jersey Island at the West False River project site (CDFW 2014). Other documented occurrences are approximately 3 miles west of the Sutter Slough project site and approximately 4 miles west of the Steamboat Slough project site (CDFW 2014).

Delta Mudwort

Delta mudwort (*Limosella australis*) has a CRPR of 2B.1. It is a tufted annual in the figwort family and produces green, linear awl-like to cylindrical leaves one half to one and one half inches long. Flowers are white to lavender-blue and develop May through August (CNPS 2014). It occurs on muddy to sandy intertidal flats, marshes, and swamps in the Sacramento and San Joaquin river deltas. The nearest documented occurrences are approximately 2 miles east of West False River project site and approximately 5 miles southeast of the Steamboat Slough project site (CDFW 2014).

Sanford's Arrowhead

Sanford's arrowhead (*Sagittaria sanfordii*) has a CRPR of 1B.2 and is endemic to California. It is found throughout the Sacramento and San Joaquin Valleys, on the North Coast, in the Cascade Range foothills, and on the northern portion of California's south coast (Ventura County) (CNPS 2014). Sanford's arrowhead is a perennial, rhizomatous herb in the water-plantain family. It has emergent, lance-shaped leaves and blooms from May to October (CNPS 2014). This species is found in shallow freshwater marsh, sloughs, ponds, ditches, and other channels with slow-moving or standing water. The nearest documented occurrences are approximately 2.5 miles west of the Steamboat Slough project site, and approximately 3 miles southwest of the Sutter Slough project site (CDFW 2014).

Woolly Rose-Mallow

Woolly Rose-Mallow (*Hibiscus lasiocarpos* var. *occidentalis*) has a CRPR of 1B.2 and is endemic to California. It is found almost exclusively in the Sacramento Valley and the Delta. Woolly rose-mallow is a perennial herb to subshrub in the mallow family that blooms with large, showy flowers from June to September (CNPS 2014). It grows in freshwater marshes and along banks of rivers and sloughs, including within riprap along levee slopes (CDFW 2014; CNPS 2014). The nearest documented occurrences are 0.7 mile east of the Sutter Slough project site and approximately 2 miles north of the Steamboat Slough project site (CDFW 2014).

Special-Status Wildlife

Valley Elderberry Longhorn Beetle

The valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) is federally listed as threatened. In 2012, USFWS issued a proposed rule to remove the beetle from the federal list of threatened and endangered species (Volume 77, page 60238 of the Federal Register [77 Federal Register 60238], October 2, 2012), but the proposal was later withdrawn (79 Federal Register 55874, September 17, 2014). Valley elderberry longhorn beetle is endemic to the Central Valley and is found only in association with its host plant, elderberry (*Sambucus* species). This beetle has four life stages: egg, larva, pupa, and adult. Females lay their eggs on the bark of elderberry shrubs, and larvae hatch and burrow into the stems. The larval stage can last 2 years, after which the larvae enter the pupal stage and transform into adults. Adults are active (feeding and mating) from March to June (USFWS 2006). It appears that to function as habitat for the valley elderberry longhorn beetle, host elderberry shrubs must have stems that are 1 inch or greater in diameter at ground level. Use of the plants by the beetle is rarely apparent; frequently, the only exterior evidence of the shrub's use by the beetle is an oval exit hole created by the larva just before the pupal stage (USFWS 1996). No documented occurrences of valley elderberry longhorn beetle are found in the vicinity of any of the emergency drought barrier sites, but several elderberry shrubs exist near the proposed Steamboat Slough temporary barrier site.

Giant Garter Snake

Giant garter snake (*Thamnophis gigas*) is federally and state listed as threatened. The species inhabits marshes, sloughs, ponds, small lakes, low gradient streams and other waterways, and agricultural wetlands in the Central Valley. Giant garter snakes are inactive or greatly reduce their activities during late fall and winter, typically emerging from winter retreats in late March to early April and often remaining active through October. The timing of their annual activities is subject to varying seasonal weather conditions. Giant garter snakes feed on small fishes, tadpoles, and frogs (Hansen 1988). They breed in March and April, with females giving birth to live young from late July though early September (Hansen and Hansen 1990).

A large portion of the Delta has not been comprehensively surveyed for giant garter snake, primarily because the majority of land is privately owned. Historical and recent surveys have failed to identify any extant population clusters in the region (Hansen 1986; Patterson 2004; Patterson and Hansen 2004), including during DWR surveys of various Delta sites in 2009. However, several individuals were trapped at White Slough Wildlife Area and several photographed near Little Connection Slough (USFWS 2012). These sites are considered the farthest west into the Delta where giant garter snakes are known to currently exist; they are more than 9 miles east of the West False River project site. The CNDDB includes two relatively recent observations of giant garter snakes closer to the West False River project site, a 2002 observation approximately 1.5 miles east of the site, and a 2010 observation approximately 5 miles southwest of the site. Two older occurrences are also documented in the CNDDB, a 1998 observation approximately 3.5 miles northwest of the site and a pre-1986 specimen collected in the vicinity of the 2002 observation. Speculation has occurred that recent observations in the Central Delta were snakes that occasionally move into the region by “washing-down” from known populations and that these occurrences do not represent local breeding populations (Hansen pers. comm. in DWR 2013). CNDDB occurrences nearest to the Sutter Slough and Steamboat Slough project sites are from approximately 4 miles east and include an unknown number of snakes observed in 1992 and pre-1986 at and near Snodgrass Slough.

The potential for giant garter snakes to occur in the vicinity of the proposed barrier sites is low. All three of the sites are many miles from any known populations of the species and none of the sites provide high-quality habitat for the species. Although the sloughs provide marginally suitable aquatic habitat, suitability of bankside habitat at all sites is limited. The Sutter Slough and Steamboat Slough project sites have a nearly continuous canopy of riparian shrubs and trees along the banks, and land uses adjacent to these sites are dominated by orchards and other unsuitable agricultural crops. Uplands adjacent to the West False River project site are more suitable for giant garter snake, but, as described above, occurrence of giant garter snake in this part of the Delta is likely accidental and uncommon.

Pacific Pond Turtle

Pacific pond turtle (*Actinemys marmorata*), a California species of special concern, inhabits still and slow-moving aquatic habitats. This species occurs throughout western California, including the Coast Ranges and Central Valley. It is found in ponds, lakes, rivers, streams, creeks, marshes, and irrigation ditches, with abundant vegetation and rocky or muddy bottoms. Pond turtles also require basking sites such as logs, rocks, cattail mats, and exposed banks. Female turtles nest in April through August in loose soils near aquatic habitat, usually along stream or pond margins (CaliforniaHerps.com 2014). The CNDDB includes one pond turtle occurrence within 5 miles of the Steamboat Slough project site and several within 5 miles of the West False River project site. Pond turtles have moderate potential to occur in aquatic habitat at all three of the proposed barrier sites. However, habitat quality is limited by the relatively steep banks, extent of rock armoring, and lack of in-water basking habitat. In addition, adjacent uplands are unlikely to provide suitable nesting habitat.

Western Burrowing Owl

Burrowing owl (*Athene cunicularia*) is a California species of special concern that prefers open, dry habitats. In California, the species occurs throughout the Central Valley, southwestern deserts, and northeastern basin, as well as the Carrizo Plain and other western valleys. The burrowing owl is primarily a grassland species, but it can thrive in some landscapes that are highly altered by human activity if suitable burrows for roosting and nesting and short vegetation are present. Primary prey consists of insects, but these owls also consume small mammals, reptiles, birds, and carrion. Burrowing owls typically nest and roost in burrow systems created by medium-sized mammals such as ground squirrels, artificial sites (e.g., drain pipes and culverts), or self-excavated burrows, where soil conditions are appropriate (Gervais et al. 2008:218–221). Breeding occurs from February through August, peaking in April and May. Burrowing owls have not been documented in the vicinity of the Sutter or Steamboat slough barrier sites and habitat conditions at and adjacent to these locations are not suitable for the species. However, habitat on the landside of the levees adjacent to the West False River project site could support burrowing owls, and occurrences have been documented at a number of locations south of this site.

Swainson's Hawk

Swainson's hawk (*Buteo swainsoni*) is state-listed as threatened. Swainson's hawks are primarily summer residents in the Delta, arriving as early as March and typically departing by October, but small numbers are also known to overwinter. Pairs typically begin to establish nesting territories in March, and egg-laying generally occurs in early April to early May (CDFG 1994). In the Central Valley, Swainson's hawks nest in riparian areas or isolated trees, typically adjacent to or within close proximity of suitable foraging habitat. They prefer relatively tall trees (mean height of approximately 50 feet), and the species most commonly used are valley oak, cottonwood, and willows (CDFG 2007). Suitable foraging habitat includes agricultural crops (alfalfa, row crops, and hay crops), pasturelands, and annual grasslands. All three proposed barrier sites are within the portion of the Swainson's hawk breeding range that supports the highest density of active nests in the Central Valley (CDFG 2007). Swainson's hawk nests have been documented in the vicinity of all three sites, including three nest locations within 0.5 mile of the Steamboat Slough project site and one location within 0.5 mile of both the Sutter Slough and West False River project sites (DWR 2013). Suitable nest trees are present along both sides of Sutter and Steamboat sloughs adjacent to the emergency drought barrier sites. Few suitable nesting trees are in the vicinity of the West False River project site.

Cooper's Hawk

Cooper's hawk (*Accipiter cooperii*) is on the CDFW Watch List for birds formerly considered California species of concern. It is resident throughout most of the United States, with a wintering range that extends south to Central America and a breeding range that extends north to southern Canada. Cooper's hawks forage primarily on medium-sized birds but is also known to eat small mammals (Curtis et al. 2006). They typically occur in a variety of woodland habitats, including riparian and oak woodlands but also nest and forage in urban and suburban areas where mature trees are present. Cooper's hawks are likely to occur at the emergency drought barrier sites and trees adjacent to the sites provide suitable nesting habitat.

White-Tailed Kite

White-tailed kite (*Elanus leucurus*) is fully protected under Section 3511 of the California Fish and Game Code. This species occurs in virtually all lowlands of California, west of the Sierra Nevada, and in the southeast desert; it is common in the Central Valley and along the entire California coast. White-tailed kites breed in lowland grasslands, agricultural areas, wetlands, oak woodland and savanna, and riparian areas with nearby open habitats (Moore 2000). They forage in grasslands, pasture, and some agricultural crops. White-tailed kites are likely to occur at the proposed barrier sites and trees adjacent to the sites provide suitable nesting habitat.

Song Sparrow ("Modesto" population)

The Modesto population of song sparrow (*Melospiza melodia*) is a California species of special concern. Song sparrows range widely throughout North America, but the Modesto population is endemic to California and restricted to the north-central portion of the Central Valley. The Delta and the Butte Sink are the currently known areas of highest abundance. Historically, these sparrows were described as having an affinity for emergent freshwater marsh dominated by tules and cattails, as well as riparian willow thickets (Gardali 2008). Recent occurrences of song sparrow have been documented in the vicinity of all three proposed barrier sites (CDFW 2014), in habitats described as marsh and riparian. Although the Sutter and Steamboat Slough project sites support some riparian vegetation, the extent of suitable habitat for this subspecies is very limited and of marginal quality. However, a moderate potential would exist for song sparrows to occur at these sites.

Western Red Bat

Western red bat (*Lasiurus blossevillii*) is a California species of special concern. In California, this species occurs throughout the Central Valley and the western portion of the state from Shasta County southward. Western red bats typically roost in the foliage of mature trees associated with woodland borders, rivers, and agricultural areas. Roost trees are typically large cottonwoods, sycamores, walnuts, and willows. Activity levels in the Central Valley, as measured by acoustic surveys, have been shown to be highest in riparian habitat corridors greater than 164 feet wide and dominated by mature trees (Pierson et al. 2006). Although potential roost trees are present adjacent to the proposed barrier sites, very few trees occur near the West False River project site and the riparian corridor at the other sites is very narrow. Therefore, this habitat is unlikely to support large numbers of roosting individuals.

3.4.2 DISCUSSION

a and d) 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 Wildlife, the U.S. Fish and Wildlife Service, or the National Marine Fisheries Service? Or,
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?

Less than Significant with Mitigation Incorporated. Construction, operation, and removal of the EDB could result in adverse effects on a variety of fish, plant, and wildlife species without the incorporation of mitigation measures. These effects and the responses to Questions a) and d) are discussed below.

FISH

Historic data on occurrence of resident and migratory special-status fish species in Central Valley rivers and tributaries indicate adult and juvenile individuals of a variety of species could be present in the vicinity of the proposed barrier sites during barrier construction, operation, and/or removal. However, in many cases typical peak occurrence occurs outside the period in which the project activities would occur. Detailed analyses of potential effects on federally and state-listed fish are presented in the Biological Assessment and Section 2081 Incidental Take Permit Application prepared for the proposed project (ICF 2015, ICF and AECOM 2015). A summary of these analyses is presented below, along with an evaluation of potential impacts on non-listed fish species.

Temporary Barrier Construction and Removal

As noted in Chapter 2, "Project Description," most materials needed for the temporary barrier construction would be transported to the project sites by barge; exceptions would include construction of the gravel roads used to access the boat ramps at Steamboat Slough, transport of road materials and boat ramps to this site, and installation of portions of the king piles and sheet piles at the West False River project site. In addition, minimal vegetation and clearing would be required on the levees prior to placement of rock or the installation of sheet piles. The more substantial of these land-based activities may generate noise that potentially could disturb fish in the immediate area.

Geologic exploration is expected to result in minor impacts on juvenile and adult Chinook salmon and Central Valley steelhead, because of the procedures that would be implemented (see Section 2.5, "Geologic Exploration"). These procedures should ensure that there would be no discharge of bentonite or drilling muds to the channels, and implementation of a spill prevention and control plan (see Section 2.9.1, "Environmental Commitments") would minimize potential for an accidental spill or release and would ensure proper clean-up of an accidental discharge. Noise associated with geologic exploration is anticipated to be well below levels that could cause injury or behavioral modification in exposed fish during 2-3 days of exploration at each site.

The placement of rock below the waterline would generate noise and create a physical disturbance that may adversely affect fish present in the area and interfere with migratory movements. Displaced fish may become more prone to predation in areas away from the zone of disturbance, with this effect being more pronounced near the upper barriers (at the Sutter and Steamboat sloughs) if water levels are relatively low because of drought conditions. Rock placement would increase turbulence and turbidity in the water column more so than under existing conditions, which could adversely affect fish temporarily through reduced availability of food, reduced feeding efficiency, and exposure to potentially toxic sediment released into the water column. These potential effects would be temporary and relatively small areas of the three subject channels would be affected. Therefore, most fish would be likely to move away from the area of disturbance.

The use of construction equipment near the waterways potentially could impair water quality if hazardous chemicals (e.g., fuels and petroleum-based lubricants) are spilled or enter the river. These potential effects would be temporary. In addition, DWR would implement a spill prevention and control plan and HMMP to minimize potential for an accidental spill or release (see Section 2.9.1, "Environmental Commitments"). These plans also would describe procedures for minimizing effects from vessel traffic with the EDB once installed. DWR also will adhere to standard construction best management practices, described in the California Department of Transportation's Construction Site Best Management Practices Manual (California Department of Transportation 2003).

High levels of underwater noise from pile driving could have temporary adverse effects on some fish species, as described by NMFS and others (Hastings and Popper 2005; Popper et al. 2006; Carlson et al. 2007; NMFS 2006). Pile driving would occur at the West False River project site and could affect fish in the vicinity of this site. Vibratory driving, which is quieter than impact driving (ICF Jones & Stokes and Illingworth & Rodkin 2009), likely would be feasible at the West False River project site. Therefore, an impact hammer is anticipated to be required only if the vibratory hammer could not reach the design tip elevation of the pilings. In 2008, NMFS, USFWS, and California Department of Fish and Game (CDFG; now CDFW) adopted interim criteria of a peak sound pressure level for fish (Fisheries Hydroacoustic Working Group 2008; ICF Jones & Stokes and Illingworth & Rodkin 2009). These criteria are specific to impact or percussive pile driving. Vibratory hammers generally are much quieter than impact hammers, and recently proposed criteria suggest higher threshold levels for this method of pile driving (Hastings 2010).

The Biological Assessment prepared for the proposed project (ICF 2015) includes a detailed analysis of potential pile driving effects for the emergency drought barrier piles (i.e., king piles and sheet piles) at the West False River project site, water quality equipment monitoring piles, and float line piles upstream and downstream from the West False River project site. The analysis examined various potential scenarios for the duration of pile driving, because of the lack of exact knowledge about the number of piles to be driven per day. Results suggested the potential zone of effect (i.e., the zone within which potential displacement or physical injury exists) for vibratory pile driving could extend almost 1,600 feet upstream and downstream; the zone of effect for impact driving varied broadly, depending on the number of strikes necessary. However, sound data taken during the 2012 installation of rock barriers as part of DWR’s Temporary Barrier Project showed that noise levels at 328 feet from construction were below the NMFS criteria for adverse behavioral effects (Shields 2012), suggesting that the area of construction effects from rock placement may be less than 328 feet for vibratory pile driving. The effects of noise on fish would likely be limited to avoidance behavior in response to movements, noises, and shadows caused by construction workers and equipment operation in or adjacent to the river, although avoidance of the disturbed areas could make fish more susceptible to predation.

Overall, the potential adverse effects of barrier construction and removal on special-status fish would occur in each year that the barriers were installed, over a total construction period of approximately 30 to 60 days at all sites, and a total removal period of approximately 45 to 60 days at the West False River project site and approximately 30 to 60 days at the Sutter and Steamboat Slough project sites. Construction and removal would take place when relatively few individuals of juvenile salmonids and adult green sturgeon are expected to occur at the project sites. In addition, construction and removal activities would be spatially limited relative to the potential areas in which delta smelt occurs, and removal would take place when relatively few individuals are expected to occur in the vicinity of the project sites.

Abutments (sheet piles and king piles) at the West False River barrier would be left in place and would result in a permanent alteration of the habitat at this location. The sheet piles would extend approximately 75 feet from the levee into the river channel. Installation of rock transitions would limit the potential for creation of hydrodynamic eddies that could form ambush habitat for predatory fishes, although some increase in predation on more susceptible species could occur.

Temporary Barrier Operations

Operation of the EDB, including the presence of rocks on the channel bottom, would be temporary. Disturbance of the channel substrate resulting from construction and removal of the EDB, and, to a lesser extent, any incidental sediment removal activities, would affect the benthic community within the emergency drought barrier footprints. Construction and removal would disturb a total of less than 4 acres occupied by the EDB. This is a very small area in relation to the total amount of similar benthic habitat available in the Delta. Despite providing fish passage at the Steamboat and Sutter Slough barriers, the EDB would create physical blockages in the waterways in which they are placed. This would create impediments to free movement of fish within the Delta channels, as well as potentially attract predatory fish and create areas that enhance the foraging success of predatory fishes on susceptible species and life stages. This and other potential indirect effects of barrier operation are described further below.

Hydrodynamic Effects

The greatest potential for hydrodynamic effects would be delays in upstream migration of adult salmonids and green sturgeon. Relatively few juvenile salmonids are expected to occur in the vicinity of the EDB during operation, but those present could be affected by altered flow routing in the lower Sacramento River and changes in seaward migration pathways. The probability that a migrating salmonid juvenile would take a particular pathway (i.e., because of changing flow splits) could be altered. There may also be changes to juvenile salmonid entrainment susceptibility at the South Delta export facilities because of changes in tidal hydraulics in the lower San Joaquin River caused by the West False River barrier acting in concert with more flow entering the interior Delta through Georgiana Slough and the DCC. Changes in flow could also affect survival probability within individual reaches, e.g., by changing residence time and velocity, which could affect probability of predation. For any juvenile salmonids entering Sutter and Steamboat sloughs that pass through the emergency drought barrier culverts, less river flow in the channels downstream from the EDB may increase travel time and therefore increase energy expenditure and predation risk. Overall, operation of the Sutter and Steamboat Slough barriers at the same time could result in somewhat lower relative survival of Chinook salmon juveniles. However, the EDB may provide a slight benefit to any fish in the lower San Joaquin River near False River and Old River, by increasing net flow towards Antioch, which would reduce the risk of entrainment into the South Delta.

Adult salmonids may experience migratory delays resulting from barrier operation, particularly because of the Sutter and Steamboat Slough barriers. Although it is unclear to what extent migratory movements in these waterways could be influenced by changes in river flow moving downstream (e.g., less movement into the sloughs when the EDB are operating, perhaps because of reduced attraction flows or olfactory stimulus from upstream), the potential would exist for migratory delay. The barrier operation period would avoid much of the spring upstream migration period of adult green sturgeon but could affect juvenile green sturgeon, which spend several years in the Delta and therefore could encounter the barriers during operations.

Data for pre-spawning adult sturgeon (primarily white sturgeon) in the Sacramento River suggest that upstream migration ceases or fish move back downstream if flows are not adequate. If green sturgeon exhibit similar behavior to white sturgeon, reductions in river flow down Sutter Slough and Steamboat Slough could affect stimuli for any upstream migrating green sturgeon present during barrier operation. Successful passage through the culverts would be a function of swimming ability. Investigations of adult white sturgeon swimming performance in a laboratory flume (Webber et al. 2007) indicated their swimming velocity should be sufficient to pass through the culverts of the rock barriers under anticipated flow velocity conditions. However, migratory delay may be more likely for juvenile and sub-adult green sturgeon, which are smaller than adult white sturgeon and therefore would have weaker swimming ability. Delta smelt occurrence in the vicinity of the Sutter Slough and Steamboat Slough project sites during the operation period is anticipated to be minimal based on historical sampling. Therefore, potential impacts of flow changes are likely to be minimal at the Sutter Slough and Steamboat Slough barriers. However, flows in the central and South Delta would be affected by the West False River barrier, potentially trapping any delta smelt that are present upstream from this barrier (e.g., in the Franks Tract area). Analyses conducted to assess the potential for seepage flow through the EDB suggested such flow through the West False River barrier would be very low compared to nearby tidal flow at Jersey Point. Therefore, risk to delta smelt from impingement in the emergency drought barrier would be very low. The fate of delta smelt found southeast of the West False River barrier may well be entrainment at the South Delta export facilities regardless of the presence of the emergency drought barrier, based on simulated fates of neutrally buoyant particles (Kimmerer and Nobriga 2008). In addition, barrier operations have potential to reduce entrainment of delta smelt in the lower San Joaquin River into Franks Tract and Old River (and ultimately the CVP/SWP South Delta export facilities) by blocking off one of the main points of entry into the South Delta.

Water Quality Effects

Adverse effects on water quality could result from a reduction in the proportion of Sacramento River flow entering Sutter Slough and Steamboat Slough, coupled with reduced tidal action upstream from the EDB in these sloughs. This could lead to degraded water quality in portions of these sloughs.

Some species and/or life stages could be affected by changes in salinity (measured in terms of EC) resulting from barrier operations. Although the emergency drought barrier at West False River would prevent most tidal flow from entering False River, and therefore tidal flow would tend to move farther upstream on the lower San Joaquin River, modeling suggests that the greater flow coming down the Mokelumne River as a result of the Sutter and Steamboat Slough barriers would counteract this effect. Modeling also indicates there would be reduced salinity in the central/South Delta. However, the proposed project would result in slightly higher EC farther upstream on the lower Sacramento River because of less freshwater moving down Sutter Slough and Steamboat Slough. Greater EC farther upstream could result in fish that typically reside in low salinity zones (i.e., delta smelt) moving farther upstream than would be the case without the proposed project. The most pronounced relative differences in EC are anticipated to be in the lower reaches of the tributaries downstream from the Sutter Slough and Steamboat Slough barriers.

Predation

Increased predation of juvenile salmonids in areas with artificial structures has been observed throughout the Delta (Sabal 2014). More lentic conditions created by the presence of the EDB may increase the potential for predation by predatory fishes on juvenile salmonids entering Sutter Slough and Steamboat Slough (both upstream and downstream from the EDB); however, most of the flow would remain in the Sacramento River and therefore a relatively low proportion of downstream migrating juvenile salmonids may enter these sloughs. Increased predation on other species could result, though the relative susceptibility of these species to increased predation is not known. For, example, juvenile and sub-adult green sturgeon are relatively large and bottom-dwelling, and are therefore likely less susceptible to predation than juvenile salmonids.

Predatory fish may congregate below manmade barriers in rivers to feed on prey passing through the EDB. Because evidence exists that barriers attract predatory fish and may result in elevated rates of predation, fish present in the project area during the period that barriers are operating may be more vulnerable to predation. This concern would be greatest for salmonids emigrating down the Sacramento River that may enter Sutter Slough and Steamboat Slough and encounter the EDB in those locations; the West False River barrier location is less likely to be encountered by Chinook salmon and may be more likely to result in predation effects for some Central Valley steelhead emigrating from the San Joaquin River watershed. For juvenile salmonids encountering the Steamboat Slough barrier, the boat ramps at that site may pose an elevated predation risk if they harbor greater densities of predatory fishes than would otherwise occur at that location. Placement of the emergency drought barrier culverts at an elevation of -4 feet would limit the potential for wading birds to stand on barrier culverts and prey upon juvenile fish coming through the culverts; however, the EDB and associated structures may provide perching habitat for predatory diving birds such as cormorants.

Effects of Implementation in Consecutive Years

As noted in Chapter 2, "Project Description," the proposed project could be implemented in up to 3 consecutive years if drought conditions persist for this duration. From a population dynamics perspective, the worst-case scenario for salmonids may be proposed project implementation in 3 consecutive years. This is because a large portion of Central Valley spring-run Chinook salmon, Sacramento River winter-run Chinook salmon, and Central Valley steelhead spawn at age 3. Therefore, implementation of the proposed project in 3 consecutive years could overlap with the Delta occurrence of the majority of individuals from a single generation. This could result in greater effects on salmonid populations than may arise from having three proposed project implementation years separated by several years, during the 10-year period; implementation in three non-consecutive years presumably would result in a lesser effect to several generations. However, not all individuals would encounter the barriers during construction, operation, and removal, whether implementation occurs in consecutive or non-consecutive years.

As with salmonids, the worst-case scenario of the proposed project for delta smelt and longfin smelt may be implementation in 3 consecutive years. For these species, evidence exists that abundance in 1 year affects abundance in the subsequent year. At relatively low abundance, a greater number of smelt tends to give greater numbers during the subsequent life stage, regardless of which life stage is considered. The current relatively low abundance of both these smelt species, therefore, suggests that negative effects of the proposed project in 1 year could be compounded by subsequent negative effects in 1 or more consecutive years. In contrast, implementation of the proposed project in 3 non-consecutive years out of 10 years may avoid such compounding effects as there presumably would be more opportunity for the delta smelt population to compensate for any negative effects in a given year.

The different life history of longer-lived species, such as green sturgeon, makes it unlikely for the majority of individuals within a generation to pass through the Delta during proposed project implementation in 3 consecutive years. In addition, the breeding population size shows some evidence of being positively related to river flow (Israel and May 2010), and upstream migration of adult green sturgeon may be less likely in the types of drought years in which the proposed project would be implemented, whether in 3 consecutive years or in non-consecutive years. Because the green sturgeon population has very low abundance (e.g., 10-28 fish breeding per year in the upper Sacramento River [Israel and May 2010]), adverse effects of the proposed project on even a few individuals in 1 or consecutive years could have some consequences for population dynamics. However, because the proposed project is unlikely to result in adult green sturgeon mortality, adverse effects are expected to be minor from a population perspective, whether the proposed project is implemented in consecutive or non-consecutive years.

Conclusion

Several temporary adverse effects on special-status fish could result from construction, operation, and removal of the EDB up to three times in 10 years, including potentially in consecutive years, as well as minor permanent effects associated with the West False River abutments. The type and severity of impacts would vary depending on the species and the timing of barrier installation and removal, and whether the proposed project is implemented in consecutive years. Although adverse effects would be minimized by implementation of Environmental Commitments 1, 2, and 3 (see Chapter 2, "Project Description"), which include preparation and implementation of an erosion control plan; spill prevention and control plan; and HMMP, adverse effects on water quality could result from barrier operation. Impacts could range from relatively minor disruption of movement patterns to disruption of migratory routes and migration timing, as well as injury or death of individuals. The mitigation measures presented below have been designed, in close coordination with NMFS, USFWS, and CDFW, to minimize adverse effects on special-status fish and disruption of their movements. As a result, potential fish impacts would be less than significant with mitigation incorporated.

Mitigation Measure BIO-1: Conduct Real-Time Monitoring and Adjust Construction Activities Accordingly.

- DWR will monitor weather patterns and river forecasts for the period preceding the start of construction. If precipitation events or increases in river levels and flows are predicted to occur immediately prior to the start of construction, DWR will notify NMFS, USFWS, and CDFW before the start of construction and informally will confer with them to determine whether construction actions are still feasible as previously considered. Sudden increases in river flows, imminent precipitation events that create changes in river stage in the Sacramento and San Joaquin valleys, or observed sudden increases in turbidity in the Sacramento or San Joaquin rivers upstream of the Delta may initiate pulses of fish migration into the project channels (e.g., juvenile salmonids moving downstream, pre-spawning delta smelt moving upstream).

- DWR also will monitor the capture of listed fishes in the fish monitoring programs currently being employed in and close to the barrier sites, i.e., Sacramento area beach seines and trawling (Sherwood Harbor and Jersey Point) by USFWS; and Knights Landing and Tisdale Weir rotary screw traps (RSTs), 20-millimeter (mm) survey, Spring Kodiak Trawl, and fish salvage monitoring by CDFW. If increasing presence of listed fishes (principally juvenile salmonids and smelts) is detected in these monitoring efforts during project implementation, DWR will immediately contact the NMFS, USFWS, and CDFW to allow informal consultation to determine whether construction actions will place fish at substantial additional risk near the barrier sites.

Timing: Before and during barrier construction and removal

Responsibility: DWR and its contractors

Mitigation Measure BIO-2: Phase Barrier Construction, Operation, and Removal in Collaboration with Permitting Fish Agencies and in Consideration of Real-Time Monitoring Data.

- DWR will collaborate with NMFS, USFWS, and CDFW to develop and implement if necessary a phased construction and operation plan intended to fulfill the main purpose of the proposed project (i.e., to prevent excessive salinity intrusion into the Delta and conserve water in reservoirs) while minimizing adverse potential effects on listed fishes. The plan would be developed in consideration of the latest real-time monitoring data to assess the temporal and spatial distribution of listed fishes that could be affected by project operations.

Timing: Before and during barrier construction, operation, and removal

Responsibility: DWR and its contractors

Mitigation Measure BIO-3: Facilitate Upstream Barrier Passage for Adult Anadromous Fishes (Culvert Opening and Slopes Leading to Culverts) and Monitor Effectiveness.

- DWR will facilitate upstream passage of adult anadromous fishes (Chinook salmon, steelhead, and sturgeon) at the Sutter and Steamboat Slough barriers by keeping a single culvert at each barrier fully open at all times. To increase the probability of sturgeon locating the culvert openings, DWR will provide a 4-foot pad in front of the downstream culvert mouths and a 2:1 slope from the pad to the channel bed. These slopes would be provided on the downstream sides of both barriers to facilitate passage.

- Passage success of adult anadromous fishes approaching the barriers will be assessed with DIDSON monitoring. Additional culverts will be opened as necessary should special-status fish congregate below the barriers as identified from monitoring observations. Additional culverts will be opened only when existing open culverts are fully open, and the minimum opening for any culvert will be 50 percent.

Timing: During barrier operation

Responsibility: DWR and its contractors

Mitigation Measure BIO-4: Conduct Pile Driving With a Vibratory Driver To The Extent Possible; Minimize Effects of Impact Driving.

- DWR will conduct pile driving using a vibratory hammer to minimize to the extent possible the noise generated from pile-driving activities. Compared to the standard impact driving method, vibratory driving substantially reduces the distance that noise exceeds NMFS thresholds, thereby substantially reducing or avoiding the potential to cause take of listed species. However, in certain circumstances (e.g., vibratory driving is not capable of reaching required embedment), impact pile driving may be necessary. Monitoring of underwater sound generated by the vibratory hammer during pile driving in the vicinity of the West False River barrier will be conducted to verify that sound level criteria are not being exceeded as calculated in the effects analysis (i.e., 214 decibels [dB] cumulative sound exposure level [SEL] at approximately 33 feet [10 meters], for each day of pile driving). If levels are exceeded, the permitting fish agencies will be notified and work halted until corrective actions are instituted to achieve sound level criteria.

- If impact driving is necessary, bubble curtains will be employed to attenuate noise. As noted above for vibratory driving, monitoring of underwater sound generated by impact driving will be conducted to verify that sound level criteria are not being exceeded as calculated in the effects analysis (i.e., 218 dB cumulative SEL at approximately 33 feet [10 meters], for each day of pile driving). If levels are exceeded, the permitting fish agencies will be notified and work halted until corrective actions are instituted to achieve sound level criteria.

- Should emergency drought barrier installation occur in summer (e.g., July), DWR will confer with NMFS, USFWS, and CDFW regarding the need for sound monitoring and restrictions on pile driving during a period in which few listed fishes would be likely to be exposed to excessive sound levels.

Timing: During barrier construction

Responsibility: DWR and its contractors

Mitigation Measure BIO-5: Implement Turbidity Monitoring during Construction.

- DWR will monitor turbidity levels in Sutter and Steamboat sloughs and West False River during ground-disturbing activities, including placement of rock fill material and any major maintenance. Monitoring will be conducted by measuring upstream and downstream of the disturbance area to ensure compliance with the Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins (Central Valley Regional Water Quality Control Board 2011). For Delta waters, the general objectives for turbidity apply except during periods of stormwater runoff; the turbidity of Delta waters shall not exceed 50 Nephelometric Turbidity Units (NTUs) in the waters of the Central Delta and 150 NTUs in other Delta waters. Exceptions to the Delta specific objectives are considered when a dredging operation can cause an increase in turbidity. In this case, an allowable zone of dilution within which turbidity in excess of limits can be tolerated will be defined for the operation and prescribed in a discharge permit.

- DWR contractors will slow or adjust work to ensure that turbidity levels do not exceed the Basin Plan thresholds. If slowing or adjusting work to lower turbidity levels is not practical or if thresholds cannot be met, DWR will stop work and consult with the State Water Resources Control Board and permitting fish agencies to determine the most appropriate BMPs to minimize turbidity impacts to the maximum extent feasible.

Timing: During barrier construction and removal

Responsibility: DWR and its contractors

Mitigation Measure BIO-6: Develop a Water Quality Plan to Monitor Water Quality and Operate Barrier Culverts to Improve Water Quality.

- DWR will develop and implement a water quality plan to assess the effects of the proposed project on flow and water quality in the Central and North Delta. DWR will monitor water quality with solar-powered monitoring instruments upstream and downstream of the Sutter and Steamboat Slough barriers, in addition to assessing monitoring data from existing and recently upgraded stations in the Delta. DWR will open the slide gates of additional culverts to allow greater water flow into Sutter and Steamboat sloughs, should water quality issues arise. NMFS, USFWS, and CDFW will be provided regular updates on culvert operations.

- The water quality plan will document the procedures for producing the following elements:
    - Water quality data from new monitoring sites and augmentation of existing sites;
    - Monthly water quality summaries;
    - Monthly water quality maps for Franks Tract (discrete data);
    - Final report on project effects on water quality.

Timing: Before and during barrier construction, operation, and removal

Responsibility: DWR and its contractors

Mitigation Measure BIO-7: Return Disturbed Areas to Pre-Project Conditions And Conserve Habitat.

- DWR and its construction contractors will strive to limit riparian habitat removal during project-related construction activities, such as site access to Sutter and Steamboat sloughs. Following barrier removal, DWR will restore riparian habitat removal to approximate pre-project conditions using native vegetation only. DWR will develop and implement a conceptual mitigation and monitoring plan outlining restoration details. DWR will mitigate for impacts on shallow water habitat at a 3:1 ratio for permanent impacts and a 1:1 ratio for temporary impacts.

Timing: Before and during barrier construction and after barrier removal

Responsibility: DWR and its contractors

Mitigation Measure BIO-8: Implement Adaptive Management Program.

- DWR will adaptively manage the EDB in coordination with USFWS, NMFS, and CDFW on a weekly call during the construction, operation and removal of the barriers. Adaptive management will include reviewing first-year project monitoring reports with USFWS, NMFS, and CDFW identifying apparent problem areas; formulating potential solutions, and refining project elements for future-year implementation based on the best available solutions to address any identified problems. The success of these solutions would be monitored in the subsequent year of implementation, with the adaptive management cycle beginning again to allow correction of any further problems that were identified. Specific adaptive management measures would be identified during the process described above.

Timing: During barrier construction, operation, and removal

Responsibility: DWR and its contractors

PLANTS

Extensive Delta-wide surveys for special-status plant species, including those evaluated in this section, were conducted by DWR in 2009. The study area included the Sutter Slough and West False River barrier sites and the northern portion of Steamboat Slough, to within approximately 100 feet of the emergency drought barrier and boat ramp footprint. Based on CNDDB occurrences, 2009 DWR survey results, and observations made by AECOM biologists during the March 13 and 14, 2014 field surveys, only three special-status plant species have been documented at or nearby a proposed barrier site: Suisun marsh aster, delta tule pea, and Mason's lilaeopsis. Marsh aster has been documented on the south levee at the West False River project site and lilaeopsis has been documented to the east, also on the south levee; delta tule pea has been documented near the Sutter and Steamboat Slough barrier sites. During the field surveys, potentially suitable habitat for lilaeopsis was observed on the west bank of Sutter Slough, adjacent to the emergency drought barrier site, and suitable habitat for marsh aster was present at the West False River site.

Based on results of the 2009 DWR surveys and habitat conditions observed during the 2014 AECOM field surveys, implementation of the proposed project is unlikely to directly affect delta tule pea, Mason's lilaeopsis, delta mudwort, Sanford's arrowhead, or woolly rose mallow. None of these species is anticipated to occur within the project footprints, and none has been documented within approximately 0.5 mile of any project site. It is possible, however, that conditions could change in future years when barrier installation could occur and suitable habitat could become established at the barrier sites. In addition, plants located near the barriers could be indirectly affected by changes in tidal fluctuations resulting from EDB operation if the plants are dependent upon particular tidal conditions and changes in tidal fluctuations affect habitat suitability. Suisun marsh aster has been documented at the West False River project site and could be adversely affected. The barrier footprint at this site is not anticipated to extend onto the terrestrial part of the levee, but individual aster plants and suitable habitat could be disturbed and/or destroyed by placement of the south levee abutment and/or rock fill at the south end of the emergency drought barrier. However, the potential area of disturbance would be very small and only a small number of individuals would likely be directly affected, if present.

Effects on special-status plants from implementing the EBD in consecutive years are unlikely to be greater than implementing in non-consecutive years. There may actually be greater impact if the proposed project is implemented in non-consecutive years that are well-spaced, because if special-status plants are present at a project site and cannot be avoided, individuals of the species could be removed multiple times if they recolonize the area between project implementation years.

Loss of special-status plant populations at the project sites could result in adverse effects on the local and regional populations of the affected species. The mitigation measure presented below would avoid and minimize adverse effects on special-status plants. As a result, this impact would be less than significant with mitigation incorporated.

Mitigation Measure BIO-9: Conduct Pre-construction Surveys for Special-status Plants and Implement Impact Avoidance and Minimization Measures.

- Implement Mitigation Measure BIO-3 to keep a single culvert in the Sutter Slough and Steamboat Slough barriers fully open at all times to reduce disruption of tidal fluctuations.

- Each year in which barrier installation may be required, a focused survey for delta tule pea, Mason's lilaeopsis, delta mudwort, Sanford's arrowhead, Suisun Marsh aster, woolly rose-mallow, and any other special-status plant that may occur at a project site will be conducted by a qualified botanist in areas of suitable habitat in the ground disturbance footprints and within 25 feet of the footprint boundaries. To the extent feasible depending on timing of barrier installation, surveys will be conducted at an appropriate time of year during which the species are likely to be detected, generally during the blooming period.
- If Mason's lilaeopsis is detected, a qualified botanist will ensure the area occupied by this species is fenced for complete avoidance during barrier installation, operation, and removal. Habitat occupied by other special-status species will also be fenced and avoided, to the extent feasible.
- If special-status plants (other than Mason's lilaeopsis) cannot be avoided, a qualified botanist will assess the feasibility of salvaging and transplanting individual plants to be removed, collecting and planting seeds of plants to be removed, and/or collecting and translocating seed- and rhizome-containing mud to nearby areas of suitable habitat. If such actions are deemed feasible, they will be implemented under the direction of the botanist, and in coordination with CDFW.

Timing: Before barrier construction

Responsibility: DWR

INVERTEBRATES

Several elderberry shrubs are present in the vicinity of the Sutter Slough project site, but no removal of elderberry shrubs would be required. In addition, no indirect effects are anticipated to occur during barrier installation or removal, because the nearest known shrubs are located approximately 500 feet from the project footprint, beyond the likely influence of such effects. If land-based access is required at this site, the likely route would be at least 250 feet from the nearest of these shrubs at its closest point. Potential adverse effects from dust or other effects associated with potential use of this access route are anticipated to be minor, if any. Additional elderberry shrubs possibly exist, adjacent to the proposed barrier sites and the potential material storage sites near Hood and Rio Vista. Such shrubs could be adversely affected by barrier construction and removal, including material storage. The potential for adverse effects on valley elderberry longhorn beetle is not anticipated to increase if the proposed project is implemented in consecutive years.

Adverse effects on elderberry shrubs adjacent to project sites could result in adverse effects on valley elderberry longhorn beetle, if present during project activities. Implementation of the mitigation measure presented below would avoid adverse effects on these shrubs. As a result, this impact would be less than significant with mitigation incorporated.

Mitigation Measure BIO-10: Implement Measures to Avoid Impacts on Elderberry Shrubs.

- DWR will implement protective buffers around known and previously unidentified elderberry shrubs adjacent to project sites or potential material storage sites before the start of construction. A minimum 100-foot buffer will be established and maintained around elderberry plants containing stems measuring 1.0 inch or greater in diameter at ground level.

- A fenced avoidance area will be established before the start of construction to protect all elderberry shrubs located adjacent to construction or storage areas. High-visibility fencing will be placed at least 100 feet from the dripline of the shrubs to prevent encroachment of construction workers and vehicles.
- If maintaining 100-foot protective buffers around all elderberry shrubs with a stem greater than 1 inch in diameter at ground level is not feasible, DWR will coordinate with USFWS to determine if the specific site conditions allow implementation of reduced buffers to adequately minimize impacts on and avoid take of valley elderberry longhorn beetle.

Timing: Before and during barrier construction, operation, and removal

Responsibility: DWR

REPTILES

The proposed barrier sites provide marginal-quality habitat for pacific pond turtle. This species has potential to occur at the emergency drought barrier sites but is unlikely to occur in large numbers. If present, individuals are likely to flee from the area of disturbance, and potential for death or injury of any pond turtles as a result of project activities is small. In the unlikely event project implementation results in loss of pond turtles, the number of individuals would be very low. Effects on pond turtles are not anticipated to differ between proposed project implementation in consecutive years versus non-consecutive years. Because potential adverse effects would be limited to a small number of individuals, this impact would be less than significant.

Based on the locations and circumstances of documented occurrences of giant garter snake in the Delta and observations made during the 2014 field surveys, this species would be highly unlikely to occur at any proposed barrier site. Therefore, the impact on giant garter snake would be less than significant and would not differ between project implementation in consecutive years versus non-consecutive years.

BIRDS

Grassland habitat adjacent to the West False River barrier site and the Rio Vista stockpile sites is suitable for burrowing owl. Although the species has not been documented in the immediate vicinity of these sites, it is known to occur several miles south of West False River and could be present near these sites. If burrowing owls are present in uplands adjacent to the emergency drought barrier or stockpile site, they could be adversely affected by disturbance associated with project activities. Although no direct disturbance of occupied habitat is anticipated to occur, loss of individuals could result from disturbance and subsequent abandonment of active nests during project activities.

Suitable nesting and foraging habitat for Swainson’s hawk, Cooper’s hawk, white-tailed kite, and common raptor species such as great horned owl and red-tailed hawk, is present at all three of the proposed barrier sites. Potential for adverse effects on foraging habitat would be very minimal and limited to minor disturbance of riparian vegetation in which Cooper’s hawks may forage. However, noise and visual disturbances associated with barrier construction and removal and potential geologic exploration could adversely affect active raptor nests, if present in the vicinity when these construction activities occur. Species that could be affected are considered sensitive because they are either listed as threatened under the California Endangered Species Act, designated as California species of special concern, and/or protected under the California Fish and Game Code and federal Migratory Bird Treaty Act. Adverse effects of sufficient magnitude could result in nest abandonment, a reduction in the level of care provided by adults (e.g., duration of brooding, frequency of feeding), or forced fledging. Disturbance associated with operation of the Steamboat Slough barrier could be sufficient to result in nest loss if an active nest is located very near to either boat ramp. However, disturbance levels associated with barrier construction would be greater in magnitude, and if nearby nests are not substantially disturbed at this stage, they are unlikely to be disturbed by operations.

A limited potential would exist for migratory birds, including Modesto song sparrow, to nest in vegetation within or adjacent to the proposed barrier footprints. Very little, if any, suitable nesting habitat would be removed to accommodate barrier construction and operation because affected areas would largely be limited to rock-lined areas and low-quality ruderal vegetation. Therefore, the potential for active migratory bird nests to be lost as a result of project activities is low and would not result in a substantial adverse effect to any migratory bird species. In addition, implementation of Environmental Commitment 8 would minimize disturbance to and avoid direct loss of any active migratory bird nests that may be present during barrier construction, so that the proposed project does not violate the MBTA or California Fish and Game Code. Therefore, the impact would be less than significant.

It is difficult to predict whether implementation of the proposed project in consecutive years could have a more detrimental effect on burrowing owl, Swainson's hawk, other raptors, or migratory birds than implementation in 3 years spread more evenly through the 10-year period. Pairs that nest near enough to any of the proposed emergency drought barrier sites to experience, but tolerate, disturbance during barrier installation in one year may be less likely to persist with nesting at or near the site if the barrier is installed in the following year. However, it is also possible that if the initial nesting attempt was not substantially disrupted, the pair would be likely to accept the disturbance in subsequent years, particularly if the initial nesting attempt was successful. Similar behavior has been observed on DWR's Temporary Barriers Project where a pair of Swainson's hawks has repeatedly nested successfully in very close proximity to a barrier site (Tsao, pers. comm., 2014).

Loss of active nests of Swainson's hawk, burrowing owl, or other special-status and common raptors could adversely affect local populations of the affected species. Destruction of burrows occupied by burrowing owls in the non-breeding season could also result in loss of individuals. The mitigation measures presented below would avoid and minimize adverse effects on special-status and common raptors. As a result, this impact would be less than significant with mitigation incorporated.

Mitigation Measure BIO-11: Conduct Pre-construction Nest Surveys, Implement Impact Avoidance and Minimization Measures, and Provide Compensatory Mitigation for Swainson's Hawk.

- A biological monitor will survey all potential Swainson's hawk nesting trees within 0.5 mile of each of the project sites no more than 5 days before the start of barrier installation activities at each site. The biologist will conduct a second survey of potential nesting trees and Swainson's hawk nests no more than 3 days before beginning emergency drought barrier installation at each site. Surveys will also be conducted before geologic exploration that would occur during the Swainson's hawk nesting season (March 1 – September 15). Results will be reported to CDFW within 24 hours of each survey.
- During preconstruction surveys (described immediately above), a biological monitor will observe any nest(s) within 0.5 mile of the project sites for at least 1 hour. Nest status will be determined and

normal nesting behaviors observed to provide a baseline against which to compare behaviors after construction begins. Results of preconstruction monitoring will be reported to CDFW within 24 hours of each survey.

- All active Swainson's hawk nests within 0.25 mile of the project sites (the area in which adverse effects are anticipated to occur) will be monitored during construction activities. Monitoring requirements will generally be based on proximity of construction activities to the nest site, as described below. These requirements may be adjusted, based on observed behavior patterns and response to construction activities by the nesting pair and/or their young. Potential adjustments will be evaluated on a case-by-case basis and in consultation with CDFW.

  - 25-Meter Construction Monitoring: Where a Swainson's hawk nest occurs within 25 meters (approximately 80 feet) of construction, a biological monitor will monitor the nesting pair during all construction hours to ensure the hawks are exhibiting normal nesting behavior. Construction activity will be limited to daylight hours.

  - 26–100-Meter Construction Monitoring: Where a Swainson's hawk nest occurs between 26 and 100 meters (approximately 80 to 330 feet) of construction, a biological monitor will observe the nest for at least 3 hours per construction day to ensure the hawks are exhibiting normal nesting behavior. Construction activity will be limited to daylight hours.

  - 101–200-Meter Construction Monitoring: Where a Swainson's hawk nest occurs between 101 and 200 meters (approximately 330 to 655 feet) of construction, a biological monitor will observe the nest for at least 1.5 hours per construction day to ensure the hawks are exhibiting normal nesting behavior.

  - 201–400-Meter Construction Monitoring: Where a Swainson's hawk nest occurs between 201 and 400 meters (approximately 655 to 1,310 feet) of construction, a biological monitor will observe the nest for at least 2 to 3 hours on each of 3 days per construction week to ensure the hawks are exhibiting normal nesting behavior and to check the status of the nest.

  - 401–800-Meter Construction Monitoring: Where a Swainson's hawk nest occurs between 401 and 800 meters (approximately 1,310 to 2,635 feet) of construction, a biological monitor will observe the nest for at least 2 to 3 hours on 1 day per construction week to ensure the hawks are exhibiting normal nesting behavior and to check the status of the nest.

- If personnel must approach closer than 25 meters (approximately 80 feet) to an active nest tree for more than 15 minutes while adults are brooding, the nesting adults will be monitored for signs of stressed behavior. If stressed behavior is observed, personnel will leave until the behavior normalizes. If personnel must approach closer than 50 meters (approximately 165 feet) for greater than 1 hour, the same applies. All personnel outside vehicles will be restricted to greater than 100 meters (approximately 330 feet) from the nest tree unless construction activities require them to be closer, and the personnel will remain out of the line of sight of the nest during work breaks.

- If a biological monitor determines that a nesting Swainson's hawk is significantly disturbed by project activities, to the point where nest abandonment is likely, the biological monitor will have the authority to immediately stop project activity and work will cease until the threat has subsided. The biological monitor will notify CDFW if nests or nestlings are abandoned, and if the nestlings are still alive, to determine appropriate actions.

- If an abandonment of a nest with eggs or nestlings occurs during construction, DWR will initiate action to retrieve any abandoned eggs or nestlings and deliver them to a CDFW-approved wildlife care facility for rearing and later return to the wild using methods acceptable to CDFW. DWR will fund the recovery, rearing, and controlled release of the young. Persons handling eggs and/or young birds will be qualified and approved by CDFW to conduct retrieval of abandoned eggs or nestlings.

- Removal of live trees with trunks in excess of 4 inches in diameter at breast height (dbh) will be avoided to the greatest extent practicable. To protect trees that can be preserved in the construction area, all trees 4 inches or greater in dbh located from the water edge to the levee crown will be flagged for avoidance prior to any work.

- DWR will provide compensatory mitigation for any loss of trees in excess of 4 inches dbh. Before the start of construction, DWR will conduct a survey of all trees that require removal and record characteristics of those greater than 4 inches dbh, including species, dbh, and height. Appropriate replacement ratios (minimum of 1:1), location of tree replacement plantings, and success criteria will be determined in consultation with and approved by CDFW.

  DWR will also provide mitigation to compensate for the potential impacts of reduced nest productivity or nest failure as a result of construction activities. If an active nest is present within 0.5 mile of a project site during barrier construction and project activities could result in reduced nest productivity, DWR will provide compensation for this potential impact. The circumstances under which compensation will be provided will depend on local conditions, such as distance from the nest to the project site, baseline human activity levels in the vicinity of the nest, and observed behavior of the nesting pair and will be determined in consultation with CDFW. If a monitored nest is abandoned and nestlings are still alive, DWR will fund the recovery and hacking (controlled release) of the nestlings. If a nest is abandoned and the nestlings do not survive, DWR will provide compensation for this loss. The appropriate amount and nature of the compensation will be determined in consultation with and approved by CDFW, based on the specific circumstances of the impact, and all mitigation will be implemented in accordance with the ITP issued for the project. Potential compensation mechanisms may include permanent protection and management of habitat for Swainson's hawk at a mitigation bank, contribution to a Swainson's hawk conservation fund, or other feasible means of promoting the long-term conservation of the species.

Timing: Before and during barrier construction and after barrier removal

Responsibility: DWR and its contractors

Mitigation Measure BIO -12: Conduct Pre-Construction Habitat Assessment and Burrow Survey and Implement Impact Avoidance and Minimization Measures for Burrowing Owl.

- A qualified biologist will conduct an assessment of burrowing owl habitat suitability at the West False River barrier site and the Rio Vista stockpile site (if applicable). The assessment will evaluate the area subject to direct impact, as well as adjacent areas within 150 to 500 meters (approximately 490 to 1,640 feet), depending on the potential extent of indirect impact.

- If suitable habitat or sign of burrowing owl presence is observed, surveys and reporting will be conducted in accordance with Appendix D of CDFW's Staff Report on Burrowing Owl Mitigation (CDFW 2012). At a minimum, an initial take avoidance survey will be conducted no less than 14 days before stockpiling activities begin and a second survey will be conducted within 24 hours before activities begin. If sign of burrowing owl presence is observed during the habitat assessment, the full survey protocol (four surveys during the breeding season and four surveys during the non-breeding season) will be implemented, to the extent feasible, depending on timing of project implementation and stockpiling activities.

- If any occupied burrows are observed, DWR will develop and implement avoidance and minimization measures, such as protective buffers, in consultation with CDFW. A qualified biologist will monitor the occupied burrows before and during stockpiling activities to inform development of and confirm effectiveness of these measures. If it is determined, in consultation with CDFW, that passive exclusion of owls from the stockpile area is an appropriate means of minimizing direct impacts, such exclusion will be conducted in accordance with an exclusion and relocation plan developed by DWR in coordination with and approved by CDFW.

- Burrows occupied during the breeding season (February 1 through August 31) will be provided a protective buffer until a qualified biologist verifies through noninvasive means that either (1) the birds have not begun egg laying or (2) juveniles from the occupied burrows are foraging independently and are capable of independent survival. The size of the buffer will depend on distance from the nest to the project footprint, type and intensity of disturbance, presence of visual buffers, and other variables that could affect susceptibility of the owls to disturbance.

Timing: Before and during barrier construction

Responsibility: DWR and its contractors

Mitigation Measure BIO-13: Conduct Pre-Construction Nest Surveys and Implement Impact Avoidance and Minimization Measures for Nesting Raptors Other than Swainson's Hawk and Burrowing Owl.

- If removal of suitable nest trees is required for barrier installation, such removal will be conducted between September 16 and January 31 (outside of the raptor nesting season), to the extent feasible.

- Focused surveys for active nests of Cooper's hawk, white-tailed kite, and other common raptors will be conducted by a qualified biologist in areas of suitable nesting habitat within 500 feet of project activity areas at each barrier site. Surveys will be conducted within 10 days before the start of project activities (including geologic exploration) that would occur during the raptor nesting season (February 1 – September 15).

- If an active nest is identified, an appropriate protective buffer will be determined by the biologist, in coordination with CDFW. The size of the buffer will depend on site-specific conditions and potential disturbance levels. Construction-related activities within the buffer will be avoided to the extent feasible until the nest is no longer active. If construction activity is necessary within the buffer, a qualified biologist will monitor the nesting adults and/or young for signs of stressed behavior. If behavior suggesting potential for nest failure is observed, project activity within the buffer will be reduced until behavior normalizes. Frequency and duration of monitoring will depend on the location and intensity of construction activity within the buffer and will be determined by the biologist, in coordination with CDFW.

Timing: Before and during barrier construction

Responsibility: DWR and its contractors

MAMMALS

The proposed barrier sites provide marginal-quality habitat for western red bat, but potential roost sites are absent from the West False River project site. Riparian trees at the Sutter and Steamboat Slough project sites provide marginal-quality roosting habitat, although preferred habitat for this species occurs in riparian corridors greater than 164 feet wide and dominated by mature trees. Western red bats could roost in trees at the Sutter and Steamboat Slough project sites, but the number of individuals is likely to be small. Potential adverse effects could include disruption of roost sites, but such impacts would affect a small number of individuals that could relocate to nearby undisturbed habitat of similar quality. Because the EBD sites are unlikely to support important roost sites, effects are not anticipated to differ between project implementation in consecutive years versus non-consecutive years. The impact would be less than significant.

Although not considered a special-status species, California sea lions (*Zalophus californicus*) and other marine mammals are protected under the federal Marine Mammal Protection Act. Sea lions are primarily restricted to marine waters, but they can tolerate brackish and fresh water and are known to regularly follow food supplies into the Delta. However, the likelihood would be low that a sea lion, or other protected marine mammal, would be present and susceptible to harm or disturbance during installation, operation, or removal of the EDB. In addition, sea lions are expected to avoid the emergency drought barrier sites if activity levels are high enough to result in disturbance. Effects are not anticipated to differ between project implementation in consecutive years versus non-consecutive years. Therefore, the impact would be less than significant.

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

Less than Significant with Mitigation Incorporated. Barrier construction activities would be primarily water-based, and potential for adverse effects on riparian habitat would be minimal. Such impacts would be limited primarily to the terrestrial footprint for construction of the boat ramp access roads at the proposed Steamboat Slough barrier site. Small areas that support riparian habitat could also be affected by land-based equipment staging. Up to 0.2 acre of riparian vegetation could be affected. DWR would avoid and minimize impacts to the extent feasible, but some pruning or clearing of riparian vegetation may be required. Effects would not differ between project implementation in consecutive years versus non-consecutive years. Substantial adverse effects on riparian habitat at the proposed emergency drought barrier sites could result if vegetation removal is necessary. Implementation of the mitigation measures below would compensate for removal of riparian vegetation. As a result, this impact would be less than significant with mitigation incorporated.

Implement Mitigation Measure BIO-7: Return Disturbed Areas to Pre-Project Conditions And Conserve Habitat.

Timing: Before and during barrier construction and after barrier removal

Responsibility: DWR

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?

Less than Significant with Mitigation Incorporated. Barrier construction would result in fill of a total of approximately 4 acres in the three affected waterways. The majority of fill would be removed at the end of each temporary installation, but abutments installed at the West False River project site would remain in place, resulting in permanent loss of 0.75 acre of waters of the United States. Fill would occur across the entire width of the affected waterways and would result in flow alteration and potential adverse effects on water quality. Effects are not anticipated to differ between project implementation in consecutive years versus non-consecutive years over the 10-year project period. Although adverse water quality effects would be reduced with implementation of Environmental Commitments 1, 2, and 3 (see Chapter 2, "Project Description"), which require preparation and implementation of an erosion control plan, spill prevention and control plan, and HMMP, adverse effects on water quality could result from barrier operation. Implementation of the mitigation measures below would minimize adverse effects on water quality and compensate for temporary and permanent fill. As a result, this impact would be less than significant with mitigation incorporated.

Implement Mitigation Measure BIO-5: Implement Turbidity Monitoring during Construction.

Timing: During barrier construction and removal

Responsibility: DWR

Implement Mitigation Measure BIO-6: Develop a Water Quality Plan to Monitor Water Quality and Operate Barrier Culverts to Improve Water Quality.

Timing: Before and during barrier construction, operation, and removal

Responsibility: DWR

Implement Mitigation Measure BIO-7: Return Disturbed Areas to Pre-Project Conditions And Conserve Habitat.

Timing: Before and during barrier construction and after barrier removal

Responsibility: DWR

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

No Impact. The proposed project would not conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance. No impact would occur.

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

No Impact. The proposed project would not conflict with the provisions of any adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan. No impact would occur.

3.5 CULTURAL RESOURCES

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?	☐	☒	☐	☐
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	☐	☒	☐	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☒	☐	☐

3.5.1 ENVIRONMENTAL SETTING

Native American and Euro-American peoples have inhabited or at least traveled through present-day Yolo, Contra Costa, and Sacramento counties for thousands of years. Their long record of occupation and activities in the area has left numerous prehistoric and historic-era remains on the landscape, including scattered artifacts, the remains of seasonal and long-term occupation, human interments, buildings, structures, and in some cases heavily altered landscapes. The following archaeological and historical review is presented to place this occupation and the associated sites, features, and artifacts within a broader cultural setting.

PREHISTORIC CONTEXT

Archaeological data that have been gathered over the past century has shown humans have inhabited California for at least the past 10,000 to 12,000 years. In part because of the varied topography and climate of the state, technological adaptations to these disparate conditions vary greatly from region to region and over long periods of time. To a certain degree, however, Native American technological, subsistence systems, and land use patterns appear to have possessed similar general elements during various periods of prehistory. Although evolving environmental conditions can account for many technological changes over time, the effects of the inter-group exchange of material and non-material cultural elements was almost certainly an important factor affecting cultural development and variability throughout California.

Early work conducted by Sacramento Junior College and the University of California, Berkeley, resulted in the development of the Central California Taxonomic System and a tripartite classification scheme (i.e., Early, Middle, and Late Periods). These broad temporal periods have been further sub-divided (Bennyhoff and Hughes 1987:149). The following overview of these temporal periods is based on a more detailed discussion of the broad cultural patterns proposed for Central California, found in Bennyhoff and Fredrickson (1969), and supplemented with information, outlined in Moratto (1984:167–216).

The Paleo-Indian Period (10,000 Before Present [B.P.] to 8,000 years B.P.) saw the first clearly demonstrated entry and spread of humans into California. Known sites are situated along shores of pluvial lakes and typically exhibit implements likely used in hunting. Traditionally, Paleo-Indian subsistence and land-use have been tied to the hunting of Pleistocene mega-fauna. However, little archaeological evidence exists to support the notion that Paleo-Indian lifeways were tied consistently to the pursuit of large mega-fauna. A developed milling tool technology also may have existed during this period and has been noted at some sites. The social units are thought to have been small, highly mobile, and not heavily dependent on exchange of resources with exchange activities occurring on an ad-hoc, individual basis. Artifacts characteristic of this period include distinctive fluted projectile points (which likely served as all-purpose tools) and flaked crescent-shaped implements. These and other stone tools frequently were produced from lithic materials, exotic to the areas in which they are found archaeologically, indicating that their makers may have traveled great distances.

The beginning of the Lower Archaic Period (8,000 B.P. to 5,000 B.P.) coincides with a middle Holocene climatic change. Generally drier conditions prevailed and this brought about a reduction in the size and number of pluvial lakes that appear to have been so important in earlier land use patterns. Subsistence appears to have focused on the consumption of plant foods over faunal resources and settlement appears to have been semi-sedentary. Such changes in settlement and subsistence patterns may be related, at least in part, to the ongoing climatic changes during this time. Most stone tools were manufactured of local materials, and patterns of material exchange remained on an ad hoc basis. Distinctive artifact types include large projectile points of varying morphology, and milling slabs and grinding stones frequently are encountered on sites.

The Middle Archaic Period (5,000 B.P. to 3,000 B.P.) begins at the end of mid-Holocene, when climatic conditions were similar to those of the present day. The material cultural changes noted in the archaeological record likely occurred at least in part as a response to shifting environmental factors. The economic base became more diversified, and acorn-processing technology first appeared. Hunting remained an important source of food, although a clear shift occurred towards floral resources. Sedentism appears to have been more fully developed, a general population growth and expansion occurred into more varied parts of the region. Little evidence has been found for development of regularized exchange relations. Characteristic artifacts for this period include the bowl mortar and pestle (which first appears in the archaeological record during this time), continued use of the milling stone and hand-stone, and the continued use of large projectile points.

The growth of sociopolitical complexity marks the Upper Archaic Period (3,000 B.P. to 1,500 B.P.), and the development of status distinctions based on material wealth is well documented. Group-oriented religions emerged and may represent the origins of the Kuksu religious system at the end of the period. Greater complexity of exchange systems occurred, with evidence of regular, sustained exchanges between groups. Shell beads gained in significance as possible indicators of personal status and as important trade items. This period retains the large projectile points found in earlier periods but in different styles. In addition, the bowl mortar and pestle replaced the milling stone and hand-stone throughout most regions in California.

Several technological and social changes distinguish the Emergent Period (1,500 B.P. to 150 B.P.). The bow and arrow were introduced, ultimately replacing the dart and atlatl that were employed at least as early as the Lower Archaic Period. Territorial boundaries between groups became well established and settlement patterns were highly sedentary. The ability to distinguish an individual's social status based on acquired wealth became more common. Exchange of goods between groups became more regularized with more resources, including raw materials, entering into the exchange networks. During the latter portion of this period (500 B.P. to 150 B.P.), exchange relations became highly regularized and sophisticated. The clamshell disk bead developed into a monetary unit for exchange, and increasing quantities of goods moved greater distances. Specialists within groups retained an ability to govern various aspects of the production and exchange of these shell beads. During the latter years of this period, large scale European settlement began to greatly affect traditional Native lifeways.

The project sites for the EDB are situated between two distinct regions, each having unique environmental and cultural contexts. Both the San Francisco Bay and the Central Valley have similar chronologies, despite the differences in cultural traditions and environments. The cultural changes for each of the regions are briefly discussed next.

ETHNOGRAPHIC CONTEXT

With the exception of the area west of Sutter Slough, which is located on the eastern fringe of territory ascribed to the lower Patwin (Johnson 1978; Kroeber 1932), the area of potential effects (APE) for this cultural resources evaluation is located in the territory ascribed to the ethnographic Plains and Bay Area Miwok, as defined by Krober (1925) and Levy (1978). The ethnographic context for each group is as follows.

Patwin

Liberty Island is within the ethnographic territory of the River Patwin, a southern division of the Wintun people, who belonged to the Penutian language family. Use of the Patwin language extended southward to the Delta, and included numerous dialects (i.e., Hill, River, Cache Creek, Lake, Tebti, Dahcini and Suisun) (Shipley 1978). Kroeber (1932) arranged the groups along three linguistic-political lines, Hill (southwest) and River (southeast and southern). The word “Patwin” translates as “man” or “people” in the native tongue. Although native people did not identify themselves as Patwin, this name is used to describe the linguistically and culturally related groups who occupied their traditional tribal territory. The southern group or Pooewin claimed the Yolo Basin; however, no known ethnographic village locales are within this area. The nearest documented ethnographic village site is Tolenas, located near Suisun Bay (Johnson 1978:350).

The Patwin were politically organized into tribelets that consisted of a primary village with several outlying settlements. Each tribelet maintained its own autonomy and sense of territoriality. Structures within these villages usually were earthen-covered, semi-subterranean elliptical (River Patwin) or circular (Hill Patwin) in form (Kroeber 1932). All except the individual family dwellings were built with the assistance of everyone in the village. Ethnographic accounts indicate that one’s paternal relatives built single-family homes within the settlements (Johnson 1978).

The Patwin made use of a wide variety of resources, using the natural materials available within their range as well as trading with other tribes for obsidian and other non-local material. Netting and cordage made from wild hemp (*Apocynum cannabinum*), and milkweed (*Asclepias* sp.) provided fibers for the production of fishing nets and lines. Anadromous fish, such as sturgeon (*Acipenser* spp.) and chinook salmon, were part of the staple Patwin diet (Johnson 1978:355) and typically were caught in large numbers, using stone and wood weirs and cordage nets. Smaller fish also were caught with nets, and mussels were collected from the river bottom. Fishing spots were considered “owned” and permission was required before fishing at a particular location (Johnson 1978:355).

The Patwin territory supported a wide variety of animal life, including tule elk, deer, antelope, bear, and various species of duck, geese, turtles, and other small animals (Johnson 1978:355). Although hunting and fishing were important subsistence activities among the Patwin, as with many Native American groups throughout the region, their primary staple food was the valley oak (*Quercus lobata*) acorn. Oak groves were considered as "owned" communally by individual tribelets. Various seeds, such as sunflower (*Helianthus* spp.), clover (*Melilotus* spp.), bunchgrass (*Festuca* spp.), and wild oat (*Avena fatua*), also were gathered and were ground into course flours. As with the oak groves, particularly fruitful tracts of seed-bearing land were controlled by individual families or tribelets (Powers 1877; Kroeber 1932).

Plains and Bay Miwok

The Plains and Bay Miwok groups are two of five Miwok groups (i.e., Coast, Lake, Bay, Plains, and Sierra) that formed a subgroup of the Utial language family. The Plains Miwok historically occupied the lower Sacramento River Valley from just north of the Cosumnes River south, including the lower San Joaquin River drainage, consisting of the western ends of the Mokelumne River and Jackson Creek. This area is roughly bounded by Sacramento on the north and Stockton to the south. The northern boundary may not have been as firm as indicated in the ethnographic literature because archaeological evidence along the Cosumnes River suggests that the Nisenan may have displaced the Miwok in this region during Phase II of the Late Horizon (Grantham 1993; Deis 1996). Bay Area Miwok inhabited a core area extending from Suisun Bay to south of the present-day location of Walnut Creek, including Mount Diablo.

Although the Miwok shared a common language and cultural background, they consisted of a number of separate and politically independent nations or tribelets. Each tribelet lived in a number of permanently inhabited or seasonally occupied locales, with control of the natural resources contained within a bounded area (Levy 1978:398).

Subsistence targeted a broad spectrum of flora and faunal resources. Of the plant species, the valley oak acorn was the most valued, with buckeye, laurel, and hazelnut also used. Other plant resources used by the Miwok included wild oats, balsam root and other species of edible roots, greens such as wild pea and miner's lettuce, berries, and a number of different mushroom varieties. Tule elk and pronghorn antelope were the most important faunal species. Various species of rabbit were hunted in summer. Waterfowl and fish, especially salmon, were extremely important food sources for the Miwok. Several animal species were avoided, including grizzly and black bear, fox, wildcat, dog, coyote, skunk, eagle, great-horned owl, roadrunner, and all snakes and frogs (Aginsky 1943:397–398; Levy 1978:403).

Levy (1978) refers to Plains Miwok tribelets located in the vicinity of the proposed project and identifies the village of Ochejamne as being located south of the town of Cortland on the east side of the Sacramento River near the location of the Paintersville Bridge, and the approximate location of the village Siusumne on the west side of Sutter Slough, north of the Sutter Slough project site. No locations of Bay Miwok village sites are known to exist in the vicinity of the West False River APE. Kroeber (1925:447–449) and Levy (1978:408–409) indicate that a typical Miwok settlement would have been located on natural rises along major rivers and streams, and could have included brush shelters, sweat houses, acorn granaries, a dance house, and earth-covered living structures.

Permanent villages usually were surrounded by a number of temporary and seasonal camps. Politically autonomous, groups of 50 to 500 individuals followed an annual round of subsistence activities, focused on gathering botanical, riparian, and aquatic resources. Trade was common with other groups in the region, including those located in the North Coast Ranges, Central Valley, and Sierra Nevada.

HISTORIC CONTEXT

Early Exploration and Settlement

While searching for sites for inland missions, various Spanish explorers (i.e., Pedro Fages in 1772, and Jose Canizares in 1776) visited the central valley in the 1700s. Francisco Eliza sailed on the unexplored Sacramento River in 1793. Expeditions also were conducted in the early 1800s and included those of Gabriel Moraga, Jose Antonio Sanchez, and Father Narciso Duran. These explorers were followed by trappers of the Hudson Bay Company, beginning with Jedidiah Strong Smith in the late 1820s, and Joseph Walker and Ewing Young in the 1830s (Hoover et al. 1990:285–286).

Settlement along the lower Sacramento was marked by the establishment of small speculative towns that would suddenly shift because of severe flooding, the moving or establishment of a post office, the construction of a landing, or railroad construction.

DEVELOPMENT OF THE DELTA

The Delta covers more than 425,000 acres. The Sacramento, San Joaquin, North and South Mokelumne rivers mingle with smaller watercourses to form a 700-mile maze of rivers and sloughs, surrounding approximately 57 islands, most of which now are used for agricultural (Hoover et al. 1990:314; Argent 1989:2). Before humans changed the Delta's environment, ocean water from the San Francisco Bay meandered up Delta channels during the summers, when mountain runoff ebbed. During the winter, heavy runoff from the mountains kept the ocean water at bay. Initially settled in 1850 by disillusioned miners, the Delta soon became an area known for its fertile soil. Over time, through settlement, reclamation, and the development of agriculture, the Delta became a cornerstone of California's agricultural foundation (Argent 1989:2–3).

Regional Developments: Flood Control and Land Reclamation

Early settlements in the Delta initially were situated on naturally formed levees, created by the merging of floodplains and tidal environments. However, in the Central Delta, sediments primarily consisted of peat, resulting in poorly developed natural levees. Over a century ago, farmers began building a network of levees to drain and reclaim the Delta's fertile land. Initial efforts at flood control, however, usually were uncoordinated and consisted of small "shoestring" levees, constructed by individual landowners. Most of these early levees offered little protection from anything beyond periodic high tides. The early shoestring levees as well as the earthen structures built in the 1860s and 1870s rarely remained intact for more than 1 or 2 years and required frequent repairs and upgrades (Argent 1989:2; Thompson 1957:33). The ad-hoc construction of levees that took place during the latter part of the nineteenth century increasingly proved to be inadequate, and the idea of a coordinated, Valley-wide reclamation program gained popularity (McGowan 1961:170–171). In 1861, the California Legislature passed the Reclamation District Act, which aided the establishment of reclamation districts, drainage of Delta lands, and construction of studier levees to protect the area from flooding (Argent 1989:3; Thompson 1957:261).

With the start of these early reclamation efforts, what originally was uncontrolled marshland was transformed into productive farmland. By 1930, more than 1,000 miles of levees surrounded approximately 500,000 acres of farmland. The increased demands for water, for agricultural use and urban growth, prompted California's largest water projects, the SWP and the federal CVP (Argent 1989:2). In essence, these projects provided water for irrigation and urban use through a system of canals and aqueducts originating in the Delta, which intercepted water and transported/exported water to the north and south Bay areas, Contra Costa County, and San Joaquin Valley, as well as to over 16 million urban Californians, mostly in southern California (Seckler 1965:1; Argent 1989:2; El-Ashry 1986:23–24).

Delta Canals and Islands

As a result of more coordinated and concentrated flood control efforts, numerous "islands" were formed in the Delta, and the region grew to bear little resemblance to the landscape that existed before the Gold Rush period and the massive reclamation efforts of the late 1800s. Each island was reclaimed by the early 1900s and was soon producing bountiful crops because of the fertile soil. The remainder of the twentieth century saw even more ambitious projects, related to the use and development of water in the Delta (McGowan 1961:173–174).

During the building of essentially artificial islands in the Delta and levees to preserve them, canals as well as straightened and widened river channels were necessary and subsequently vital byproducts of this development. These canals served, and continue to serve, as an important water source for irrigation, provide a recreational boating waterway, and allow dredge access for levee construction and maintenance. However, regardless of their uses, these canals exist as a result of levee construction.

Delta Agriculture

Rich, fertile soils coupled with a marine influence historically have resulted in high productivity in the lower Delta regions. In addition, the land is basically flat and easy to grade, excavate, and irrigate with mechanized equipment, because of the lack of hardpan, gravel, and rock. Furthermore, the original soils were rich in nitrogen, so initially the application of fertilizer was not required (Thompson 1957:309–310).

Early farming, which consisted primarily of subsistence gardening during and following the Gold Rush, was fostered by the proximity of the region to the markets located in San Francisco and the goldfields of the Sierra Nevada foothills. At first, the primary crops were tended by farmers on higher lands (i.e., natural levees and rises) and consisted primarily of potatoes, onions, and beans, among other perishable crops. Beef cattle were grazed during summer in the tule swamps. Later, in the 1870s, fruits, grains, and dairy products also became profitable commodities, originating in the Delta (Thompson 1957:310; McGowan 1961:1–7).

During the early twentieth century, the Delta transitioned from garden to field agriculture, primarily because of the introduction of electric pumps. These pumps were in wide use by 1905, replacing less efficient and less powerful steam- and horse-powered devices. Electricity was provided by a network of transmission and distribution lines, the construction of which peaked between 1911 and 1915. These improvements allowed farmers to produce larger crops of potatoes, beans, and barley (Thompson 1957:312–313). Farming practices changed again after World War I, when small family operations gave way to heavily industrialized farms. Industrial farming came about with an increase in mechanization, the use of contract day labor rather than sharecropping, increased use of fertilizer, and a move away from a traditional potato-barley-beans rotation. Gains in planted acreage were associated with field corn, sugar beets, celery, and onions in the San Joaquin region, and asparagus and sugar beets became more prevalent in the Sacramento River districts (McGowan 1961:232).

During the post-World War I period, winter grain and asparagus ranked first and second among Delta crops in terms of acreage, followed by corn and alfalfa. By 1945, 62,300 acres of asparagus were planted in older organic soil districts of the San Joaquin Delta, which became the major producing area for this crop. By 1952, the acreage had increased to 75,800 acres, 95 percent of which was located in San Joaquin River districts, compared to 1916, when only 16 percent of the San Joaquin Delta was planted in asparagus (Thompson 1957:315). By 1957, asparagus had a value of $11 million, with the Delta crop representing approximately one-half of the nation's production (Thompson 1957:315–316).

Mechanization continued to increase in popularity and, coupled with the use of fertilizer, led to higher agricultural production. Although markets have expanded in volume, the same basic crops have grown in the Delta over the past 150 years.

TRANSPORTATION

The region's agriculture vastly expanded by increasing means of transportation, which resulted in the expansion of markets. Early on, steamers transported the majority of the agricultural products to Sacramento, Stockton, or San Francisco, where they would be transferred to rail cars of the Southern Pacific Railroad.

Shallow draft steamboats began to be used in December 1849, and their number greatly increased during 1850. Because debris and snags were located in the main stream of the Sacramento River, most of the river traffic went through Steamboat Slough. With increased demand, steamships became larger, and during the 1860s, the largest ships were the *Yosemite* (1,032 tons), the *Capital* (1,625 tons), and the *Chrysopolis* (1,086 tons), which was the holder of the Sacramento to San Francisco speed record of 5 hours and 10 minutes (California State Lands Commission 1988).

However, in the late 1860s and early 1870s, the build-up of hydraulic mining debris effectively closed the river to larger traffic. For example, Steamboat Slough, which was 12 feet deep in 1853, was only 5 feet deep in 1879, and it was abandoned as a customary waterway for steamboats; those craft that continued to operate in the main channel were much smaller. In 1873, the largest steamboats on the lower Sacramento were the *Amador* (864 tons), the *Sacramento* (700 tons), the Julia (520 tons), and the *S. M. Whipple (*350 tons, less than one-third the size of the boats of the 1860s). Although dredging was employed to deepen the channels, not until the twentieth century did the river begin to scour itself of accumulated debris (California State Lands Commission 1988).

By 1900, the Atchison, Topeka, and Santa Fe Railway had constructed railroad track from Stockton to Point Richmond and had introduced its own steamer, the Frances, for river transport. In response, Southern Pacific built a rail line from N Street in downtown Sacramento to the City of Stockton. This route originally was intended to be both a mainline replacing the route through Suisun that was rapidly sinking into marshlands, and a feeder line supporting the agricultural industry. However, in reality, the route was never more than a branch line, carrying freight via steam locomotive and passengers using McKeen Motor Car railcars. Although entirely built and funded by the Southern Pacific, the line was known as the Sacramento Southern, or by its more popular designation, the Walnut Grove Branch Line. Operations began in 1912, with an extension completed to Isleton in 1929. In 1977, the line south of Hood was abandoned, and the entire route was abandoned formally in 1978, except for 3 miles in Sacramento that are still operated by the California Railroad Museum (California State Railroad Museum Foundation 2001; Witthaus 2004). This route bisects the towns of Courtland and Walnut Grove, located northeast and southeast of the Steamboat and Sutter Slough APEs.

3.5.2 REGULATORY SETTING

CEQA provides a broad definition of what constitutes a cultural or historical resource. Cultural resources can include traces of prehistoric habitation and activities, historic-era sites and materials, and places used for traditional Native American observances or places with special cultural significance. In general, CEQA requires any trace of human activity more than 50 years in age to be treated as a potential cultural resource.

CEQA states that if a project would have significant impacts on important cultural resources, then alternative plans or mitigation measures must be considered. However, only significant cultural resources (termed "historical resources") need to be addressed. The State CEQA Guidelines define a historical resource as a resource listed or eligible for listing in the California Register of Historical Resources (CRHR) (Public Resources Code Section 5024.1). A resource may be eligible for inclusion in the CRHR if it:

1. is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
2. is associated with the lives of persons important in our past;
3. 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
4. has yielded, or may be likely to yield, information important in prehistory or history.

The State CEQA Guidelines also require consideration of unique archaeological resources (Section 15064.5). As used in the Public Resources Code (Section 21083.2), the term "unique archaeological resource" means an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, a high probability exists that it meets any of the following criteria:

1. contains information needed to answer important scientific research questions and that a demonstrable public interest exists in that information,
2. has a special and particular quality such as being the oldest of its type or the best available example of its type, or
3. is directly associated with a scientifically recognized important prehistoric or historic event or person.

In addition to meeting one or more of the above criteria, resources eligible for listing in the CRHR must retain enough of their historic character or appearance to be recognizable as historical resources and to convey the reasons for their significance. Integrity is evaluated with regard to the retention of location, design, setting, materials, workmanship, feeling, and association (OHP 1999:71).

3.5.3 METHODS

Cultural resource investigations for the project areas consisted of Native American consultation, pre-field research, field survey, and resource documentation. All aspects of the cultural resource study were conducted in accordance with guidelines outlined in the California Office of Historic Preservation's (OHP's) Instructions for

Recording Historical Resources (OHP 1995) and the federal Secretary of the Interior's Standards and Guidelines for the Identification of Cultural Resources (48 Federal Register 44720-23).

Technical studies conducted by AECOM for the proposed project began with a review of the existing documentation, provided by DWR, and a records search, conducted at the Northwest and North Central Information Centers of the California Historical Resources Information System, as well as a review of the California State Lands Commission's Shipwrecks Database (2010).

The record searches revealed that several investigations have been conducted in the project vicinity and directly adjacent to the Steamboat and Sutter Slough APEs, and that these studies have been associated with levee rehabilitation projects. Using magnetometer and sonar technology, Pan American Consultants, Inc. (2010) documented the remains of an abandoned landing (P-34-4454) within, and the remains of a 27-foot-long wooden-hulled vessel (P-34-4455) immediately north of the Steamboat Slough APE. Pan American determined that the landing was not eligible for inclusion in the National Register of Historic Places (NRHP), and stated that the vessel remains required further investigation to complete the Section 106 process.

A county-wide project within Yolo County resulted in the documentation of 48 groves of heritage oaks, one of which (P-57-00132H) is located north of the Sutter Slough project site, and thus would not be affected by the proposed project.

The only prior investigation conducted within the West False River project site was a records search by Pacific Legacy in 1995. No cultural resources were documented by Waugh (1986) as part of her inventory, conducted for State Parks at Franks Tract within 0.25 mile of the West False River APE. Although no cultural resources have been documented within the APE, Pacific Legacy's review indicated the presence of a ferry house (CA-CCO-583H [P-07-00349]), documented in 1989 by PAR & Associates, located east of the APE in the Webb Track, and a prehistoric site (CA-CCO-350 [P-07-000711]) located approximately 0.25 mile north of the APE on Bradford Island. Site documentation for this prehistoric resource is missing. As part of the Bethel Island Bridge Replacement Project, URS (2001) documented and evaluated the Bethel Island Levee (P-07-003098), south of the project area. Because of a lack of integrity and special engineering qualities, the levee was not eligible for inclusion in the NRHP.

NATIVE AMERICAN COORDINATION

An AECOM archaeologist contacted the Native American Heritage Commission (NAHC) to request a search of the Sacred Lands File and a list of Native American representatives that may have information or concerns regarding the proposed project. A response letter from the NAHC was received by AECOM on March 20, 2014, and indicated that its search failed to indicate the presence of Native American cultural resources within and in the immediate project APEs. AECOM initiated consultation with the NAHC-identified groups that may have knowledge of the project areas or concerns related to the proposed project. Contacts consisted of letters and follow-up e-mail messages and phone calls. As of October 2014, responses had been received from the Shingle Springs Band of Miwok Indians (SSBMI), the Yocha Dehe Wintun Nation, and the Ione Band of Miwok Indians. The SSBMI is not aware of any known cultural resources within the project APEs and has requested updates as the proposed project progresses. It also requested copies of all completed record searches and/or surveys that have been conducted, including environmental, archaeological, and cultural reports. The SSBMI will be provided a copy of the cultural technical report and this IS/MND document for review and comment. The Yocha Dehe Wintun Nation has expressed an interest in proposed project and has stated that it is not aware of any known cultural resources near the project, but it would like to be contacted with regard to new cultural issues or information. The Ione Band of Miwok Indians requested an environmental assessment, including a pedestrian survey, compliance with Section 7 of the Endangered Species Act, copies of background research, and continued consultation. AECOM advised the Ione group that it would be provided copies of the cultural technical report and environmental documents, and would continue to be consulted with by DWR.

FIELD SURVEYS

Field investigation included an inventory by boat and, where accessible, an investigation of the project APEs from the landside. The Sutter Slough east levee and the West False River levees were not accessible from the landside. Encountered cultural resources were recorded, using global positioning system (GPS) technology, and were documented on California Department of Parks and Recreation (DPR) Series 523 primary records forms.

ARCHAEOLOGY

Background research, field studies, and Native American consultation resulted in the documentation of six levee segments, located on Bradford, Jersey, Grand, and Sutter islands and along the east side of Sutter Slough, and a previously submerged landing (P-34-44-54) within the project APEs, and the remains of a previously identified submerged vessel (P-34-4455) directly north of the Steamboat Slough project site, on the west bank of the slough and in approximately 13 feet of water.

The remains of the sunken landing, P-34-44-54, although identified by its magnetic signature, did not yield sonar readings, indicating that the resource does not retain integrity. Therefore, Pan American concluded that P-34-4454 does not appear to be eligible for inclusion in the NRHP or CRHR. After reviewing the report and findings prepared by Pan American, AECOM agrees with its recommendations. Pan American estimated the size of the submerged craft (P-34-4455) to be 27 feet in length. Although its team members did not dive at this site, they concluded that the vessel likely is historic and that it should be avoided pending further investigation.

BUILT ENVIRONMENT

The project APEs were studied using a combination of background research, Native American consultation, and field surveys. These investigations resulted in the identification of seven resources (i.e., six levee segments, and the remains of a landing [P-34-44-54]) within the project APEs.

Using the general history and significance associations, none of the levee segments appear to meet significance criteria for associations with important events related to reclamation, or persons related to local, state, or national history (i.e., NRHP Criteria A and B; CRHR Criteria 1 and 2). Under Criterion C of the NRHP and Criterion 3 of the CRHR, the levees do not represent new or innovative designs nor were they the work of a notable engineer. Thus, they do not appear to meet Criterion C or 3, and they do not display archaeological deposits that would qualify them as eligible under Criterion D or 4. These structures also were evaluated in accordance with Section 15064.5(a) (2)–(3) of the State CEQA Guidelines, using criteria outlined in Section 5024.1 of the Public Resources Code, and they do not appear to be historical resources for the purposes of CEQA.

3.5.4 DISCUSSION

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

Less than Significant with Mitigation Incorporated. The six identified levee segments do not appear to meet the criteria for listing in the NRHP and the CRHR for their association with early levee construction and reclamation efforts; therefore, they are not considered historical resources for the purposes of CEQA. Furthermore, the sunken landing has lost integrity and also is not eligible for listing in either the NRHP or the CRHR, and it is not considered a historical resource under CEQA.

Although technically not within the Steamboat Slough project site, the potential would exist for barges that are heavily laden with rock material during construction to damage the unevaluated remains of the historic vessel (P-34-4455) north of the Steamboat Slough project site. This vessel is located in shallow water at the base of the Sutter Island east levee. The impact would be potentially significant without mitigation. However, with implementation of Mitigation Measure CUL-1, and because no historic resources are within the project sites and the unevaluated sunken vessel would be avoided, impacts on historical resources would be reduced to a less-than-significant level.

Mitigation Measure CUL-1: Avoid Historic Vessel P-34-4455.

To avoid inadvertently affecting the historic vessel P-34-4455 during construction, DWR, in consultation with a qualified professional archaeologist, will advise construction workers that the location of the vessel is an environmentally sensitive area that is to be avoided during construction and subsequent removal of the temporary Steamboat Slough barrier.

Timing: Before the start of construction

Responsibility: DWR

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

Less than Significant with Mitigation Incorporated. Archival and field research revealed no significant archaeological resources within the project sites, and it is extremely unlikely that buried archaeological resources are present. Further, only minimal ground-disturbing activities would occur. Nevertheless, previously undiscovered or unknown cultural remains possibly exist at the sites and could be encountered or uncovered during construction. Therefore, the impact would be potentially significant without mitigation. However, with implementation of Mitigation Measure CUL-2, in the unlikely event that archaeological resources are discovered during project-related construction activities, this potentially significant impact would be reduced to a less-than-significant level.

Mitigation Measure CUL-2: Halt Ground-Disturbing Construction Activities if Cultural Materials Are Discovered.

If cultural materials (e.g., unusual amounts of shell, animal bone, flaked stone, bottle glass, ceramics, or structure/building remains) are discovered during construction, ground disturbances in the immediate vicinity of the find will be halted immediately, and a qualified professional archaeologist will be notified regarding the discovery. The archaeologist will determine whether the resource is potentially significant as per the California Register of Historical Resources (CRHR) and will determine the appropriate management steps necessary to protect and secure the identified resources.

Timing: During construction

Responsibility: DWR

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

No Impact. As described in detail in Section 3.6, "Geology and Soils," project-related temporary barriers would be constructed in Holocene-age (11,700 years B.P. to present day) soft silts, clays, and peat deposits. By definition, to be considered a fossil, a resource must be more than 11,700 years old. Holocene deposits contain only the remains of extant, modern taxa (if any resources are present), which are not considered "unique" paleontological resources. Thus, this formation is not considered to be paleontologically sensitive, and project-related ground-disturbing activities would have no effects on unique paleontological resources. Therefore, no impact would occur.

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

Less than Significant with Mitigation Incorporated. No evidence of human remains at the project sites was found in documentary research, and buried human remains would be extremely unlikely to be present. Nevertheless, presently unknown prehistoric burials possibly could be uncovered during construction. California law recognizes the need to protect interred human remains, particularly Native American burials and associated items of patrimony, from vandalism and inadvertent destruction. In light of the potential to uncover unknown or undocumented Native American burials, the impact would be potentially significant without mitigation. However, with implementation of Mitigation Measure CUL-3, the impact would be reduced to a less-than-significant level.

Mitigation Measure CUL-3: Halt Construction Activities if Any Human Remains Are Discovered.

The procedures for the treatment of discovered human remains are described in Sections 7050.5 and 7052 of the California Health and Safety Code and Section 5097 of the California Public Resources Code. In accordance with the California Health and Safety Code, if human remains are uncovered during ground-disturbing activities, such activities that may affect the remains will be halted, and DWR or its designated representative will be notified. DWR immediately will notify the county coroner and a qualified professional archaeologist. If the coroner determines that the remains are those of a Native American, the coroner will contact the Native American Heritage Commission (NAHC) by telephone within 24 hours of making that determination (California Health and Safety Code, Section 7050.5[c]).

DWR's responsibilities for acting on notification of a discovery of Native American human remains are identified in Section 5097.9 of the California Public Resources Code. DWR or its appointed representative and the professional archaeologist will consult with a Most Likely Descendant (MLD), determined by the NAHC, regarding the removal or preservation and avoidance of the remains, and will determine whether additional burials could be present in the vicinity.

Timing: During construction

Responsibility: DWR

3.6 GEOLOGY AND SOILS

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) 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.)	☐	☐	☒	☐
ii) Strong seismic ground shaking?	☐	☐	☒	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c) 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?	☐	☐	☒	☐
d) 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?	☐	☐	☒	☐
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒

3.6.1 ENVIRONMENTAL SETTING

The three project sites are located in the Great Valley Geomorphic Province of California. The Great Valley is drained by the Sacramento and San Joaquin rivers, which join and flow out of the province through San Francisco Bay. This geomorphic province is an asymmetric trough approximately 400 miles long and 50 miles wide, filled with a thick sequence of sediments ranging from Jurassic (180 million years Before Present [B.P.]) to recent age. The sediments in the Great Valley vary from 3 to 6 miles in thickness and were derived primarily from erosion of the Sierra Nevada to the east, with lesser amounts of material from the Coast Ranges to the west.

All three project sites are located south of Sacramento, in the northern and central reaches of the Delta. Most of the sediments in the Delta were deposited between 175 million and 25 million years B.P., and were accumulated in marine environments. Younger deposits (25 million years B.P. to recent) generally are described as nonmarine;

however, some of the younger deposits may have formed as marine deposits in shallow seas and estuaries. The depositional history of the Delta during the late Quaternary period (the last 1 million years) probably was controlled by several cycles related to fluctuations in regional and global climate in which each cycle consisted of a period of deposition followed by a period of nondeposition and erosion. Thus, the Delta during the late Quaternary period had stages of wetlands and floodplain creation as tidewaters rose in the Central Valley from the west, areas of erosion when tidewaters receded, deposition of alluvial fans that were reworked by wind to create extensive sand dunes, and alluvial fan deposition from streams emanating from the adjacent mountain ranges.

From 70,000-11,700 years B.P., sea level may have been as much as 365 feet below the present-day level. During this time, the Delta was a fluvial and alluvial system, where fast-moving rivers deposited coarse-grained sediments in alluvial fans and channels. During the Holocene (11,700 years B.P. to present-day), sea levels rose, flooding San Francisco Bay and the Delta. In the initial flood stages, fine-grained silty sands and clayey silts were deposited in shallow bays. As conditions in the Delta became conducive to plant growth over time, organic sediments mainly made of peat began to accumulate above the silt that previously had been deposited. After the plants became established, their growth and decay led to repeated cycles of peat deposition. The thickest deposits likely occurred at the sites of major Pleistocene-age drainage ways. Over thousands of years, the process of peat deposition led to the formation of peat islands, with river channels and sloughs around the islands. During flood events, rivers would flow over their banks and form natural levees of sand and silt along the edges of the islands. Many of the existing levees in the Delta are located at the sites of these older, natural levees.

The Central Valley generally has not been seismically active. Known sources of seismic activity generally are located in the Coast Ranges, west of the project sites. Table 3.6-1 shows the closest seismic sources and their activity levels.

Table 3.6-1
Seismic Sources in the Vicinity of the Proposed Project

Fault Name	Approximate Distance from Sutter and Steamboat Slough Project Sites	Approximate Distance from West False River Project Site	Activity Level
Midland	8 miles west	0.5 mile east	No activity in the last 1.6 million years
Rio Vista	10 to 12 miles southwest	3.5 miles west	Activity in the last 1.6 million years, but not during the last 200 years
Vaca-Kirby Hills	17.5 miles west	10.3 miles west	Microearthquakes recorded over the last 32 years
Greenville-Clayton-Marsh Creek	36 miles southwest	18 miles west	Two magnitude 5.8 earthquakes in 1980

Sources: Jennings 1994; Myer et al. 2010

3.6.2 Discussion

a) 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 Impact. The damage from surface fault rupture generally is limited to a linear zone that is a few yards wide. No active faults have been mapped within or immediately adjacent to any of the three project sites (Table 3.6-1). The closest Alquist-Priolo earthquake fault zone—the Greenville Fault Zone—is approximately 18 miles southwest of the West False River and 36 miles southwest of the Sutter and Steamboat Slough project sites (California Geological Survey 2012). Therefore, surface fault rupture would be unlikely to occur, and the impact would be less than significant.

ii) Strong seismic ground shaking?

Less-than-Significant Impact. Two magnitude 5.8 earthquakes occurred along the Greenville segment of the Greenville Fault Zone in 1980. The Working Group on California Earthquake Probabilities (2008:74) estimates that a 3 percent probability exists for an earthquake with a magnitude greater than 6.7 to occur on this fault zone within the next 30 years. Although this fault is located approximately 18 miles southwest of the West False River project site and 36 miles southwest of the Sutter and Steamboat Slough project sites, strong seismic ground shaking could still occur at the project sites from seismic activity on the Greenville Fault Zone or on other faults in the Coast Ranges. However, as described in Chapter 2, "Project Description," the EDB would be placed in the middle of the river channels, with rock fill placed on top of the culverts and frames, and would range from 110 to 200 feet wide at the base, and 12 feet wide at the top, set at an elevation of 7 to 9.5 feet across the crest. In addition, each barrier would include an overflow weir at the top and channel culverts at the bottom that could be opened and closed to regulate the passage of water. Because the barriers have been approximately designed and engineered for stability in the event of strong seismic ground shaking, and because of the extremely low probability that a large magnitude earthquake would occur during the limited periods that the barriers could be in place, the impact would be less than significant.

iii) Seismic-related ground failure, including liquefaction?

Less-than-Significant Impact. Soil liquefaction occurs when ground shaking from an earthquake causes a sediment layer that is saturated with groundwater to lose strength and take on the characteristics of a fluid, thus becoming similar to quicksand. Saturated, Holocene-age, uncompacted fill material located close to an active fault has a higher potential to liquefy. Liquefaction poses a hazard to engineered structures. The loss of soil strength can result in bearing capacity insufficient to support foundation loads, increased lateral pressure on retaining walls, and slope instability.

The soils at all three project sites are composed of Holocene-age soft silts, clays, and peat deposits. Therefore, strong seismic ground shaking could result in liquefaction and lateral spreading. The EDB would be located within river channels and would be made of rock. As mentioned previously, rock would be placed over a partially submerged steel frame that holds culverts, slide gates, and cat walks at the Sutter and Steamboat Slough barrier sites. At the West False River project site, the barrier would include two sheet pile walls, supported by king piles extending out from each levee into the channel for a distance of 75 feet. Therefore, the barriers have been appropriately designed for stability in the event of liquefaction, and the barriers would be temporary in nature (i.e., installed no sooner than May and removed in November of the same year, up to three times in 10 years). Furthermore, the barriers themselves would not cause the area or surrounding areas to become unstable. Therefore, the impact would be less than significant.

iv) Landslides?

No Impact. The three project sites are not located in areas subject to landslides. The proposed construction activities associated with the EDB, sheet-pile walls, and boat transfer ramps would have no effect on the potential for landslides to occur. Thus, no impact would occur.

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

Less-than-Significant Impact. As discussed in Environmental Commitments 1 and 2 in Section 2.9.1, "Environmental Commitments," an Erosion Control Plan and a Spill Prevention and Control Program would be prepared before and would be implemented during all ground-disturbing construction activities. The plan would include site-specific best management practices to control erosion, sedimentation, runoff, and accidental spills from construction equipment. DWR also would limit the number of land-based access routes, and the size of each construction area would be limited to the minimum space necessary. Access routes would be restricted to established roadways. Furthermore, all disturbed areas would be restored after initial construction and after all EDB are removed. Therefore, the impact would be less than significant.

c) 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 Impact. As previously described, all of the EDB would be constructed within river channels; only the boat transfer ramps on either side of the Steamboat Slough project site would be on rock fill, and dock anchors would be used to stabilize the boat ramps. The EDB and sheet pile walls would be constructed on unstable riverbed soils, and therefore could be subject to liquefaction. However, as discussed in Question a) iii), the barriers and sheet pile walls have been appropriately designed to resist liquefaction in the event of strong seismic ground shaking, and the barriers would be temporary in nature (i.e., installed no sooner than May and removed in November of the same year, up to three times in 10 years). Therefore, the impact would be less than significant.

d) 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 Impact. Although the EDB may be located on expansive soils, the proposed project would not increase risks to life or property. The barriers would be located in the river channels and would be temporary in nature (i.e., installed no sooner than May and removed in November of the same year, up to three times in 10 years). Because of the temporary nature of the barriers, the shrink-swell potential would not represent a hazard. The boat ramps would be placed on rock fill and dock anchors would be used to stabilize the boat ramps. Therefore, the impact would be less than significant.

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

No Impact. Portable restroom facilities would be used as needed during construction activities. The proposed project (i.e., installation of temporary barriers, sheet pile walls, and boat transfer ramps) would not include wastewater treatment. Therefore, no impact would occur.

3.7 GREENHOUSE GAS EMISSIONS

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☒	☐	☐

3.7.1 ENVIRONMENTAL SETTING

Certain gases in the earth's atmosphere, classified as greenhouse gases (GHGs), play a critical role in determining the earth's surface temperature. A portion of the solar radiation that enters Earth's atmosphere is absorbed by the earth's surface, and a smaller portion of this radiation is reflected back toward space. Infrared radiation (i.e., thermal heat) is absorbed by GHGs; as a result, infrared radiation released from the earth that otherwise would have escaped back into space is instead "trapped," resulting in a warming of the atmosphere. This phenomenon, known as the "greenhouse effect," is responsible for maintaining a habitable climate on Earth.

Global warming is the name given to the increase in the average temperature of Earth's near-surface air and oceans since the mid-twentieth century. Increases in GHG concentrations in Earth's atmosphere are thought to be the main cause of human-induced climate change. As discussed above, some GHGs occur naturally and are necessary for keeping Earth's surface habitable. However, increases in the concentrations of these gases in the atmosphere during the last 100 years have decreased the amount of solar radiation that is reflected back into space, intensifying the natural greenhouse effect and resulting in the increase of global average temperature. GHG emissions associated with human activities are highly likely to be responsible for intensifying the greenhouse effect and have led to a trend of unnatural warming of the earth's atmosphere and oceans, with corresponding effects on global circulation patterns and climate (IPCC 2013).

The principal GHGs are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs). Each of the principal GHGs has a long atmospheric lifetime (1 year to several thousand years). In addition, the potential heat-trapping ability of each of these gases varies significantly from the others. For example, CH_4 is 23 times as potent as CO_2, whereas SF_6 is 22,200 times more potent than CO_2. Conventionally, GHGs have been reported as CO_2 equivalents (CO_2e). This approach takes into account the relative potency of non-CO_2 GHGs to convert their quantities to an equivalent amount of CO_2 so that all emissions can be reported as a single quantity.

The primary human-made processes that release these gases are the burning of fossil fuels for transportation, heating, and electricity generation; agricultural practices that release CH_4, such as livestock grazing and crop residue decomposition; and industrial processes that release smaller amounts of high global warming potential gases, such as SF_6, PFCs, and HFCs. Deforestation and land cover conversion also have been identified as contributing to global warming by reducing Earth's capacity to remove CO_2 from the air and altering Earth's albedo (or surface reflectance), allowing more solar radiation to be absorbed.

CRITERIA FOR DETERMINING SIGNIFICANCE OF EFFECTS

Any single project would be unlikely to create a significant GHG impact. However, the cumulative effect of human activities has been clearly linked to quantifiable changes in the composition of the atmosphere, which in turn have been shown to be the main cause of global climate change (IPCC 2013). Therefore, the environmental effects of GHG emissions from the proposed project are addressed cumulatively in this document.

In May 2012, DWR adopted the Climate Action Plan Phase 1: Greenhouse Gas Emissions Reduction Plan (GGERP), which details DWR's efforts to reduce its GHG emissions consistent with Executive Order S-3-05 and the Global Warming Solutions Act of 2006 (Assembly Bill [AB] 32). DWR also adopted the IS/negative declaration prepared for the GGERP in accordance with the State CEQA Guidelines review and public process. Both the GGERP and IS/negative declaration are incorporated herein by reference and are available online at http://www.water.ca.gov/climatechange/CAP.cfm. The GGERP provides estimates of historical (back to 1990), current, and future GHG emissions related to operations, construction, maintenance, and business practices (e.g. building-related energy use). The GGERP specifies aggressive 2020 and 2050 emission reduction goals and identifies a list of GHG emissions reduction measures to achieve these goals.

DWR developed construction emission thresholds to distinguish between typical construction projects that are analyzed and addressed under the GGERP and Extraordinary Construction Projects, whose construction emissions are not analyzed or addressed under the GGERP. A construction project is considered to be an Extraordinary Construction Project if:

- more than 25,000 metric tons (MT) CO_2e in total will be emitted during the construction phase of the project; or
- more than 12,500 MT CO_2e will be emitted by the project in any single year of construction.

These thresholds represent a level of GHG emissions that, by themselves, potentially could adversely affect DWR's ability to achieve its GHG emissions reduction goals. However, a project exceeding either of these thresholds would represent construction activities exceeding the typical level of construction activity performed by DWR, and therefore exceeding the level of cumulative effects analysis done for the GGERP. Therefore, construction emissions that exceed either of these thresholds are not analyzed or addressed under the GGERP, and projects that exceed these thresholds would not be eligible to rely on the analysis in the GGERP for project-specific cumulative impacts analyses under CEQA. For projects where construction emissions exceed this threshold, a project-specific impact analysis for construction GHG emissions following the State CEQA Guidelines and DWR policy may need to be conducted. Depending on the results of the impact analysis, mitigation may need to be implemented to address the proposed project's potential impacts related to GHG emissions.

DWR states that including thresholds in the GGERP does not constitute a determination that these generally are applicable as thresholds of significance for CEQA purposes. Each project is evaluated on a case-by-case basis using the most up-to-date calculation and analysis methods. However, because the proposed project essentially would include only construction-related emissions (i.e., virtually no change in operations-related emissions would occur), it is appropriate to use the GGERP thresholds to evaluate whether the proposed project's GHG emissions contribution to the global impact of climate change would reach the level of a cumulatively considerable incremental contribution to a significant cumulative impact.

3.7.2 DISCUSSION

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

Less-than-Significant Impact. Construction-related GHG exhaust emissions would be generated by sources such as heavy-duty off-road equipment, barges hauling materials to the project sites, and worker commute vehicles. GHG emissions generated by construction activities would be primarily in the form of CO_2. Although emissions of other GHGs, such as CH_4, are important with respect to global climate change, emission levels of other GHGs would be less dependent on the emissions-generating activities associated with the proposed project than would be the levels of CO_2. However, where appropriate emission factors were available, emissions of CH_4 and N_2O were included in the analysis of the proposed project.

Construction-related emissions for the proposed project were estimated using fuel consumption rates for off- and on-road vehicles and emission factors for diesel fuel. Estimated total GHG emissions from construction at the Sutter Slough, Steamboat Slough, and West False River project sites would be 1,579; 2,793; and 7,660 MT CO_2e, respectively (see Appendix A, "Air Quality and Greenhouse Gas Emission Calculations"). As discussed in Section 3.3, "Air Quality," following construction and removal of the barriers, the proposed project would not involve long-term maintenance or operational activities, with the exception of routine checking and potential minor maintenance of the sheet pile abutments at the West False River project site. Thus, the proposed project would not substantially increase the generation or use of electricity, water, wastewater, and solid waste. In addition, geologic exploration potentially would occur in any year from 2015 to 2025 that the EDB would not be installed. As discussed in Section 3.3, "Air Quality," geological explorations are anticipated to be less emissions-intensive than the barriers installation, and thus the emissions presented above represent the maximum annual emissions that would occur from implementation of the proposed project.

The estimated total construction-related and operational CO_2e emissions of 12,032 MT CO_2e per year associated with implementing the proposed project, assuming that all barriers are installed and removed in the same year, would be substantially less than any of the GHG thresholds discussed earlier in this section. In addition, in the case that geological explorations are conducted in a given year rather than installation of the barriers, construction emissions would remain less than the GHG thresholds of significance. Therefore, the proposed project, whether constructing barriers or conducting geological explorations in a given year, would not generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment. This impact would be less than significant.

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

Less than Significant with Mitigation Incorporated. AB 32 directed ARB to develop a scoping plan and identify a list of early action GHG reduction measures. ARB's Scoping Plan identifies measures to meet California's goal of reducing emissions to 1990 levels by 2020 and reiterates the State's role in the long-term goal established in Executive Order S-3-05, which is to reduce GHG emissions to 80 percent below 1990 levels by 2050 (ARB 2009). According to ARB, the 2020 goal was established as an achievable, mid-term target, and the 2050 GHG emissions reduction goal represents the level scientists believe is necessary to stabilize the climate (ARB 2009). However, the scoping plan does not recommend implementing additional measures for meeting specific GHG emissions limits beyond 2020. In general, the measures described in the scoping plan are designed to meet emissions goals in 2020 and do not become increasingly stringent after 2020.

ARB's current scoping plan identifies measures that would indirectly address GHG emissions levels associated with construction activity, including the phasing in of cleaner technology for diesel engine fleets (including construction equipment) and the development of a Low Carbon Fuel Standard. Policies formulated under the mandate of AB 32 that are applicable to construction-related activity, either directly or indirectly, are expected to be implemented during construction of the proposed project if those policies and laws are developed before construction begins. Therefore, construction presumably would not conflict with the scoping plan.

The scoping plan recognizes the long-term goal of Executive Order S-3-05; however, it also states that measures needed to achieve the 2050 goal are "too far in the future to define in detail." ARB is required to update the scoping plan at least once every 5 years, to evaluate progress and develop future inventories that may guide this process. ARB released *First Update to the Climate Change Scoping Plan: Building on the Framework* in May 2014 (ARB 2014).

DWR has developed the GGERP to guide its efforts in reducing GHG emissions (DWR 2012). The GHG emissions reduction measures proposed in the plan were developed to reduce emissions of GHGs in California as directed by Executive Order S-3-05 and AB 32. DWR has established the following GHG emissions reduction goals:

- Reduce GHG emissions from DWR activities by 50 percent below 1990 levels by 2020; and
- Reduce GHG emissions from DWR activities by 80 percent below 1990 levels by 2050.

DWR specifically prepared its GGERP as a Plan for the Reduction of Greenhouse Gas Emissions, to address Section 15183.5 of the State CEQA Guidelines. That section provides that such a document, which must meet certain specified requirements, "may be used in the cumulative impacts analysis of later projects." Because global climate change, by its nature, is a global cumulative impact, an individual project's compliance with a qualifying GHG reduction plan may suffice to mitigate the project's incremental contribution to that cumulative impact to a level that is not "cumulatively considerable." (See State CEQA Guidelines, Section 15064, Subdivision [h][3].)

More specifically, "[l]ater project-specific environmental documents may tier from and/or incorporate by reference" the "programmatic review" conducted for the GHG emissions reduction plan. "An environmental document that relies on a greenhouse gas reduction plan for a cumulative impacts analysis must identify those requirements specified in the plan that apply to the project, and, if those requirements are not otherwise binding and enforceable, incorporate those requirements as mitigation measures applicable to the project" (State CEQA Guidelines Section 15183.5, Subdivision [b][2]).

Section 12 of the GGERP outlines the steps that each DWR project will take to demonstrate consistency with the GGERP:

- analyze GHG emissions from construction of the proposed project;

- determine that the construction emissions from the proposed project would not exceed the levels of construction emissions analyzed in the GGERP;
- incorporate DWR's project-level GHG emissions reduction strategies into the design of the proposed project;
- determine that the proposed project would not conflict with DWR's ability to implement any of the "specific action" GHG emissions reduction measures, identified in the GGERP; and
- determine that the proposed project would not add electricity demands to the SWP system that could alter DWR's emissions reduction trajectory in such a way as to impede its ability to meet its emissions reduction goals.

General preconstruction and final design BMPs have been designed so that individual projects are evaluated and their unique characteristics are taken into consideration when determination is made regarding whether specific equipment, procedures, or material requirements are feasible and efficacious for reducing GHG emissions from any DWR project. The proposed project would implement preconstruction and final design BMPs as described in Mitigation Measure GHG-1.

Mitigation Measure GHG-1: Conform to Best Management Practices (BMPs) for Construction and Maintenance Activities to Reduce Greenhouse Gas Emissions that are Contained in the Climate Action Plan Phase I: Greenhouse Gas Emissions Reduction Plan Implementation Procedures (DWR 2012).

DWR will implement the following measures for the proposed project:

Pre-Construction and Final Design BMPs

- Evaluate project characteristics, including location, project work flow, site conditions, and equipment performance requirements, to determine whether specifications of the use of equipment with repowered engines, electric drive trains, or other high efficiency technologies are appropriate and feasible for the project or specific elements of the project.
- Evaluate the feasibility and efficacy of performing on-site material hauling with trucks equipped with on-road engines.
- Ensure that all feasible avenues have been explored for providing an electrical service drop to the construction site for temporary construction power. When generators must be used, use alternative fuels, such as propane or solar, to power generators to the maximum extent feasible.
- Limit deliveries of materials and equipment to construction sites to off-peak traffic congestion hours.

Construction BMPs

- Minimize idling time by requiring that construction equipment be shut down after 5 minutes when not in use, as required by the State airborne toxics control measure in Section 2485 of Title 13 in the California Code of Regulations. Provide clear signage that posts this requirement for construction workers at the entrances to construction sites and provide a plan for the enforcement of this requirement.

- Maintain all construction equipment in proper working condition and perform all preventative maintenance. Required maintenance will include compliance with all manufacturer's recommendations, proper upkeep and replacement of filters and mufflers, and maintenance of all engine and emissions systems in proper operating condition.

- Implement a tire inflation program at construction sites to ensure that equipment tires are correctly inflated. Check tire inflation when equipment arrives on-site and every 2 weeks for equipment that remains on-site. Check vehicles used for hauling materials off-site weekly for correct tire inflation.

- Develop a project-specific ride share program to encourage carpools, shuttle vans, transit passes, and/or secure bicycle parking for construction worker commutes.

- Reduce electricity use in temporary construction offices by using high efficiency lighting and requiring that heating and cooling units be Energy Star compliant. Require that all contractors develop and implement procedures for turning off computers, lights, air conditioners, heaters, and other equipment each day at close of business.

- For deliveries to construction sites where the haul distance exceeds 100 miles and a heavy-duty class 7 or class 8 semi-truck or 53-foot or longer box-type trailer is used for hauling, a SmartWay2 certified truck will be used to the maximum extent feasible.

- Develop a project-specific construction debris recycling and diversion program to achieve a documented 50 percent diversion of construction waste.

- Evaluate the feasibility of restricting all material hauling on public roadways to off-peak traffic congestion hours. During construction scheduling and execution, minimize, to the extent possible, uses of public roadways that will increase traffic congestion.

Timing: Before and during construction as appropriate

Responsibility: DWR

Thus, with implementation of Mitigation Measure GHG-1, the proposed project would include all applicable BMPs, would not conflict with implementation of DWR's Specific Action emission reduction projects, and would generate emissions well below typical DWR projects covered by the GGERP. The proposed project would not conflict with the AB 32 Scoping Plan, GGERP, or any other plans, policies, or regulations prepared or established to reduce GHG emissions. Based on the analysis provided in the GGERP and the demonstration that the proposed project would be consistent with the GGERP (as shown in Appendix A, "Air Quality and Greenhouse Gas Emission Calculations"), DWR has determined that the proposed project's incremental contribution to the cumulative impact of increasing atmospheric levels of GHGs would be less than cumulatively considerable; therefore, the impact would be less than significant with mitigation.

3.8 HAZARDS AND HAZARDOUS MATERIALS

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and/or accident conditions involving the release of hazardous materials into the environment?	☐	☐	☒	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be 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?	☐	☐	☐	☒
e) 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?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
h) Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☒	☐

3.8.1 ENVIRONMENTAL SETTING

Minor amounts of hazardous materials would be necessary for construction and maintenance at the three project sites. DWR would not store, transport, or use substantial amounts of hazardous materials to maintain the EDB.

Bates Elementary School is approximately 1.4 miles northeast of the Sutter Slough project site and approximately 2.7 miles north of the Steamboat Slough project site. Delta Vista Middle School is approximately 4.5 miles south of the West False River project site.

The nearest public airport, Rio Vista Muni Airport, is approximately 9.5 miles southwest of the Steamboat Slough project site, approximately 11 miles southwest of the Sutter Slough project site, and approximately 9.5 miles northwest of the West False River project site.

The nearest private airstrip, at Spezia Airport, is approximately 6 miles south of the Steamboat Slough project site, approximately 8 miles south of the Sutter Slough project site, and approximately 13 miles northeast of the West False River project site.

3.8.2 DISCUSSION

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

Less-than-Significant Impact. Proposed project activities would not require extensive or ongoing use of acutely hazardous materials or substances. Construction activities associated with the temporary rock barriers would be completed in approximately 30 to 60 days and removal of the barriers would be completed in approximately 30 to 60 days at the Steamboat and Sutter Slough sites and in approximately 45 to 60 days at the West False River site. Construction materials would include rock, steel frames, prefabricated concrete mats, gravel for access roads, sheet pile walls, and king piles. Project-related activities would require limited, short-term handling of hazardous materials, such as fueling and servicing construction equipment on-site with fuels, lubricating fluids, and solvents. These types of materials, however, are not acutely hazardous, and all storage, handling, and disposal of these materials are regulated by the California Department of Toxic Substances Control (DTSC), the EPA, the Occupational Safety and Health Administration, and California Occupational Safety and Health Administration. In addition, a Hazardous Materials Management Program would be implemented for the proposed project (Environmental Commitment 3 in Chapter 2, “Project Description”). No hazardous materials would be used after the barriers are removed. Because project implementation would include using only a limited amount of hazardous materials during construction and removal of the EDB, and route transport, use, or disposal of hazardous materials would not occur, the impact would be less than significant.

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

Less-than-Significant Impact. As noted under Question a) above, proposed project activities would require the use of minor amounts of hazardous materials during construction. However, as discussed in Chapter 2, “Project Description,” an Erosion Control Plan, a Spill Prevention and Control Program, and a Hazardous Materials Management Program would be prepared before and implemented during all ground-disturbing activities (Environmental Commitments 1, 2, and 3). The plan and program would include site-specific best management practices to minimize the potential for hazardous, toxic, or petroleum substances to be released into the project sites during construction and project operation. DWR also would limit the number of land-based access routes, and the size of each construction area would be limited to the minimum space necessary. Access routes would be restricted to established roadways (Environmental Commitment 7 in Chapter 2, “Project Description”). Therefore, the impact would be less than significant.

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

No Impact. No existing or proposed schools are located within 0.25 mile of the project sites. Bates Elementary School is approximately 1.4 miles northeast of the Sutter Slough project site and approximately 2.7 miles north of the Steamboat Slough project site. Delta Vista Middle School is approximately 4.5 miles south of the West False River project site. No potential exists for proposed project-related hazardous emissions or handling of hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school. Therefore, no impact would occur.

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

No Impact. The Hazardous Waste and Substances Sites List (Cortese List) is compiled by the DTSC in accordance with Section 65962.5 of the California Government Code. A search of the Cortese List and a search for sites with reported hazardous material spills, leaks, ongoing investigations, and/or remediation near the project sites were performed using the DTSC online EnviroStor database (DTSC 2014). In addition, a search was conducted using the State Water Resources Control Board's GeoTracker database (SWRCB 2014). These searches did not identify any potential hazardous contamination sites within approximately 0.5-mile of the project sites. Therefore, no impact would occur.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within 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. The project sites are not located within 2 miles of a public airport. The nearest public airport, Rio Vista Muni Airport, is approximately 9.5 miles southwest of the Steamboat Slough project site, approximately 11 miles southwest of the Sutter Slough project site, and approximately 9.5 miles northwest of the West False River project site. The proposed project would not create a hazard associated with airport operations for people residing or working in the area of the proposed project. Therefore, no impact would occur.

f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?

No Impact. The project sites are not located within 2 miles of a private airstrip. The nearest private airstrip, at Spezia Airport, is approximately 6 miles south of the Steamboat Slough project site, approximately 8 miles south of the Sutter Slough project site, and approximately 13 miles northeast of the West False River project site. The proposed project would not create a safety hazard associated with airport operations for people residing or working in the area of the proposed project. Therefore, no impact would occur.

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

Less-than-Significant Impact. Land-based emergency response routes and plans would not be affected by construction or operation of the proposed project. Nearby roadways that would be accessed for project-related construction and maintenance purposes would include Road 145 and Levee Road adjacent to the Sutter Slough project site; Sutter Island Road and Grand Island Road adjacent to the Steamboat Slough project site; and Jersey

Island Road adjacent to the West False River project site. These rural, local roads would be affected intermittently during construction and removal of the EDB by minimal truck traffic. The majority of construction activities would occur from the river; therefore, traffic flow would not be substantially interrupted on any roadway. In-water navigation would not be substantially interrupted because public notices would be posted about the barriers, temporary boat transfer ramps would be provided to facilitate navigation, alternate routes would be available, and the proposed project would be of limited size and short duration. Implementation of the proposed project would not significantly impair or interfere with emergency access to local roads and evacuation routes, or significantly reduce emergency response. Therefore, the impact would be less than significant.

h) Expose people or structures to a significant 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 Impact. The California Department of Forestry and Fire Protection (CAL FIRE) classifies an area over which it has responsibility as a very high fire hazard severity zone (VHFHSZ) or Non-VHFHSZ. CAL FIRE has designated the project sites as Non-VHFHSZ or unzoned (CAL FIRE 2007; CAL FIRE 2008; CALFIRE 2009). None of the communities near the three project sites are shown on the map of communities at risk from wildfire (CAL FIRE 2001). The proposed project would not add structures that could be exposed to fire risk. In the event of a fire at any of the project sites, access roads could be used to accommodate fire-fighting crews and equipment. No features of the proposed project would add to the existing moderate fire danger in the area of the proposed project. Therefore, the impact would be less than significant.

3.9 HYDROLOGY AND WATER QUALITY

ENVIRONMENTAL ISSUES	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 (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)?	☐	☐	☐	☒
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?	☐	☒	☐	☐
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?	☐	☐	☐	☒
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 flood hazard area 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 flood hazard area structures that 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) Result in inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒
k) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, such that surface water elevations are reduced and negatively affect diversions for beneficial uses?	☐	☒	☐	☐

3.9.1 ENVIRONMENTAL SETTING

HYDROLOGY

Tidal flows in the Delta are controlled by channel geometry, tidal elevations at the Golden Gate, inflows from the Sacramento and San Joaquin rivers, CVP and SWP export pumping in the South Delta, and Delta outflows. Appendix C, "DSM2 Modeling of Tidal Flows and Salinity," summarizes tidal elevations and tidal flows in several Delta channels that would be hydrologically affected by the EDB. Potential changes in tidal elevations and tidal flows from the EDB were evaluated with the Delta Simulation Model 2 (DSM2) based on simulated hydrology representative of Delta conditions during drought conditions. The month of July was chosen to illustrate representative drought conditions during the EDB operational period, and was used to illustrate the processes. Potential effects of the EDB on tidal elevations and tidal flows in the Delta channels were evaluated assuming the following average baseline conditions for July: 1) Sacramento River inflow of just over 6,900 cubic feet per second (cfs); 2) San Joaquin River inflow of just over 900 cfs; 3) CVP/SWP exports of nearly 1,700 cfs; and 4) Delta outflow of just under 2,700 cfs. See Table B2 in Appendix C, "DSM2 Modeling of Tidal Flows and Salinity" for more details. These conditions represent the type of drought operations scenario in which the proposed project could be implemented.

Groundwater

Shallow groundwater conditions adjacent to most Delta channels generally are a result of seepage flow towards the adjacent, lower elevation agricultural islands. Groundwater elevation (depth to water table) is controlled by the mean tide and adjacent land elevations, soil types and properties of the adjacent land, and the subsurface soils underlying the channels and levees.

WATER QUALITY

Surface Water

Salinity and other water quality parameters in the Delta are controlled mainly by freshwater inflows from the Sacramento and San Joaquin rivers and Delta outflow, which primarily determines seawater intrusion at Collinsville and other western Delta locations. Appendix C, "DSM2 Modeling of Tidal Flows and Salinity," provides a summary of tidal flows and tidal variations in salinity in several Delta channels that would be affected by the EDB. Water quality parameters, such as minerals, nutrients, metals, and contaminants, generally are higher during drought conditions because the river flows are low and provide less dilution of these substances. Few changes occur in the river water quality within the Delta channels; water quality in Sutter and Steamboat sloughs is controlled by Sacramento River inflow, and water quality in West False River is controlled by Sacramento River inflow mixed with salinity and other constituents in seawater. The San Joaquin River inflow generally is pumped at the CVP and SWP export facilities in the South Delta; therefore San Joaquin River water quality has very little effect on West False River water quality during drought conditions. Salinity is measured as EC, and all minerals or other substances from seawater (e.g., chloride, bromide) are proportional to the EC. Changes in EC that would be caused by the barriers were simulated using DSM2 for June through November. Modeled scenarios included no EDB, and EDB in place from June 1 through October 31 (with one or four culverts open in each of the Sutter Slough and Steamboat Slough barriers). See further description of these scenarios and the associated simulated hydrology in Appendix C, "DSM2 Modeling of Tidal Flows and Salinity."

Groundwater

Groundwater quality in the vicinity of the project sites is controlled by seepage water flowing from the channel to the adjacent agricultural islands.

FLOOD FLOWS AND FLOOD HAZARDS

Major flood events in the Central Valley are the result of high rainfall or snowmelt events, which have occurred only in mid-November through June in recorded history. Potential flood flows from the Sacramento River are diverted at Fremont Weir to Yolo Bypass; therefore, the flows in the Sacramento River at Freeport are limited to about 100,000 cfs. Farther downstream on the Sacramento River, some of the remaining high flows are diverted to Sutter and Steamboat sloughs, with remaining flows continuing to the Walnut Grove diversion into Georgiana Slough. The Sacramento River water surface elevation at Freeport increases to about 27.5 feet (North American Vertical Datum of 1988 [NAVD]) at the maximum flow of 100,000 cfs; whereas, the water surface elevation increases to approximately 17.5 feet in Walnut Grove, and approximately 12.5 feet at the mouth of Steamboat Slough and Cache Slough (DWR 1995). The levees along the Sacramento River, Sutter Slough, and Steamboat Slough are designed to convey this maximum flow without overtopping or failure (breaching). The 100-year flood flow elevation in West False River is about 10 feet, which is only 4 feet higher than the mean higher high water (MHHW) elevation of about 6 feet.

Since 1900, over 160 levee failures have occurred in the Delta, primarily resulting from overtopping or structural failure. Flood hazards for land adjacent to Delta channels can be caused by levee failures resulting from flood flows causing high water elevations, levee seepage (e.g., channeling), erosional events (e.g., wave overtopping), and/or seismic disturbance. However, significant improvements to the Delta levee system since 1982 have reduced the incidences of failure to just one major failure in 30 years. Most Delta levees have been strengthened in recent years with increased height, increased width from land-side buttressing, or both. Levee stability (strength) generally is greatest for wider levees composed of mineral soils (i.e., high sand, silt, and clay content, as compared with peat and other organic soils), with a lower slope and height above adjacent land. Levees on Sutter and Steamboat sloughs are Federal Flood Control Project Levees (DWR 1995:40). Levees on Bradford and Jersey Islands, adjacent to the proposed West False River barrier, have been strengthened in recent years and have sufficient freeboard for anticipated flood elevations.

3.9.2 DISCUSSION

a) Violate any water quality standards or waste discharge requirements?

Less than Significant with Mitigation Incorporated. During construction of the barriers, increased turbidity from sediment disturbance during pile driving and rock placement would occur. Barrier removal would result in similar turbidity increases. Implementation of turbidity monitoring during construction through Mitigation Measure BIO-5 (see Section 3.4.2, "Discussion") will eliminate any significant sustained increase in turbidity resulting from construction and removal or the barriers to a less-than-significant level. The applicable water quality criterion (i.e., performance standard) for Delta waters, except during periods of storm runoff, is that turbidity shall not exceed 50 NTUs in the waters of the Central Delta and 150 NTUs in other Delta waters; this criterion can generally be achieved by closely monitoring upstream and downstream turbidity and settable solids. If the turbidity increase is at or approaching the performance standard, DWR's contractor will be directed to slow or stop work until turbidity decreases. Careful placement of the barrier rock fill will also minimize disturbance of the channel sediment.

The installation and operation of the EDB would be done within the broader framework of drought contingency planning through multi-agency collaboration between DWR, Reclamation, SWRCB, NMFS, USFWS, and CDFW; this type of planning by its nature only occurs following periods of extremely low precipitation leading to drought conditions. As such, the EDB would be installed and operated in order to meet prevailing water quality and outflow objectives, which during critically dry drought conditions may be temporarily amended from those in the Bay-Delta Water Quality Control Plan listed in D-1641, as occurred in 2014. As noted in the 2014 Drought Operations Plan (p.23):

> [O]ne of the primary objectives of barrier operation (conservation of upstream storage), can only be achieved if barrier implementation is carried out in concert with modifications of various Delta salinity D-1641 requirements

Detailed installation and operations of the EDB would be planned several months in advance of EDB construction using the most up-to-date forecasts and modeling, in the context of overall drought operations of the SWP and CVP, and would be managed in real time in response to changes in Delta conditions, reservoir inflows, and other factors. The exact nature of any operations and water quality standard amendments, should they occur, is unknown at the present time, but as noted above, the EDB would be installed in the context of multi-agency collaboration in order to limit adverse effects to stakeholders.

In 2014, the EDB were part of the Drought Operations Plan, which allowed Delta outflow to be reduced from the D-1641 critical year outflow requirements (4,000 cfs in July; 3,000 cfs in August to October) to 2,000 cfs in June-October with the EDB, without violating the D-1641 salinity objectives at South Delta municipal and agricultural intakes. Seawater intrusion at Collinsville is controlled by Delta outflow and would not be affected by the proposed barriers (see Appendix C, "DSM2 Modeling of Tidal Flows and Salinity"). The West False River barrier would reduce seawater intrusion into Franks Tract and Old River, and it would shift some tidal flows (flood tide) from the San Joaquin River to the Sacramento River, which would slightly increase EC at Emmaton and Jersey Point. The Sutter Slough and Steamboat Slough barriers would block diversions from the Sacramento River, and increase the diversions from the Sacramento River to the San Joaquin River through the DCC when open and Georgiana Slough. This would shift flows from the Sacramento River toward the San Joaquin River, which would increase the EC at Emmaton and slightly reduce the Jersey Point EC. Changes in EC caused by the drought barriers would not exceed the prevailing D-1641 objectives for EC at Emmaton, Jersey Point, or San Andreas Landing when the barriers are implemented. There would be a small increase in the salinity (EC) downstream of Sutter Slough and Steamboat Slough barriers because more water would originate from Rio Vista (tidal flows), rather than from the Sacramento River. However, the increase in EC would be small (see in particular Figures C-19 and C-20 in Appendix C, "DSM2 Modeling of Tidal Flows and Salinity"), protecting beneficial uses, including agriculture, and would be less than significant. At no times would EC increases associated with the barriers create conditions where irrigation water has salinity levels that could damage irrigated crops. This is illustrated for the North Delta by the DSM2 modeling results summarized in Appendix C, "DSM2 Modeling of Tidal Flows and Salinity," which show that increases in EC in Cache Slough at Ryer Island (Figure C-17), Steamboat Slough (Figure C-19), and Miner Slough (Figure C-20) are well below the 700-microsiemens per centimeter (µS/cm) average EC described by Hoffman (2010:98) as suitable for all agricultural crops.

With implementation of Mitigation Measure HYDRO-1, downstream water surface elevation impacts and North Delta Water Agency impact will be reduced to a less-than-significant level.

Mitigation Measure HYDRO-1: Minimize Downstream Water Surface Elevation Impacts and Work with North Delta Water Agency to Minimize Salinity Changes for Water Users within the Agency's Boundaries

DWR will work with affected agricultural diverters and the North Delta Water Agency to agree upon acceptable measures to minimize potential water surface elevation decreases caused by the Sutter and Steamboat Slough barriers. In the event of a diversion deficiency downstream from the Sutter and Steamboat Slough barriers, and in coordination with affected landowners, DWR will:

- Respond with a site visit within 24 hours of phone notification of a diversion deficiency from an affected landowner,
- Determine if the diversion deficiency is due to reduced stage caused by the Sutter and Steamboat Slough barriers, and
- Identify and implement a preferred corrective action, such as changing the intake depth by attaching a length of pipe to extend an existing pipe or shorten a pipe if the pipe is buried in sediment. Corrective actions will be implemented in accordance with the following criteria:
    - The performance standard is to return affected diversions to their pre-project equipment capacities.
    - The type of diversion cannot be changed, e.g., siphons cannot be replaced with a permanent pump or vice versa. Temporary pumps may be installed to assist any type of diversion. Intake size cannot be increased, e.g., an 8-inch pipe replaced with a 12-inch pipe.
    - Intakes will not be relocated; maintenance dredging will not be conducted; and corrective actions cannot require additional U.S. Army Corps of Engineers (USACE) permit application and approval, which would require substantial delays in implementing the corrective action.

DWR will also reach agreement with North Delta Water Agency to ensure that any salinity increases remain below the State Water Resources Control Board limits set in Water Rights Decision 1641 as amended. DWR remains committed to fulfilling its commitments in the 1981 Contract between State of California Department of Water Resources and North Delta Water Agency for the Assurance of a Dependable Water Supply of Suitable Quality.

Timing: During barrier operation

Responsibility: DWR

The EDB would change the tidal flow patterns in many Delta channels and would increase or decrease the salinity (EC) in some Delta channels. Appendix C, "DSM2 Modeling of Tidal Flows and Salinity," describes the large changes in tidal flows that would be caused by the West False River barrier, and would be observed in the San Joaquin River channel from the confluence with the Sacramento River (near Antioch) to the mouth of Old River. The tidal flows entering Franks Tract through False River would be re-routed upstream to the mouth of Old River;

tidal flows upstream of Franks Tract in Old River and in Middle River would not change appreciably with the barriers. About 10 percent of the San Joaquin River tidal flows would be shifted to the Sacramento River channel, also increasing tidal flows in Cache Slough. The West False River barrier would reduce seawater intrusion into Franks Tract and Old River, thereby reducing salinity (EC) at the CVP and SWP export pumps and at the Contra Costa Water District intakes at Rock Slough, Old River at Highway 4, and Victoria Canal. Agricultural diversions from Franks Tract and Old River would also be reduced with the West False River barrier. However, the West False River barrier could slightly increase seawater intrusion in the San Joaquin River (e.g., San Andreas Landing) and adjacent channels located upstream of False River.

Appendix C, "DSM2 Modeling of Tidal Flows and Salinity," describes how the Sutter Slough and Steamboat Slough barriers would reduce the ebb-tide flows entering Sutter and Steamboat Sloughs from the Sacramento River, and increase the ebb-tide flows in the Sacramento River at Walnut Grove. This would increase diversions to the DCC and Georgiana Slough, and thereby slightly reduce the Sacramento River flow at Rio Vista, which could increase seawater intrusion in the mouth of the Sacramento River below Rio Vista (e.g., near Decker Island at Emmaton and Threemile Slough) where the River is already highly influenced by tidal fluctuation and tidal salinity. Because salinity at Emmaton and in the San Joaquin River at Jersey Point is generally controlled by Delta outflow, the changes in the ebb-tide flows caused by Sutter Slough and Steamboat Slough barriers would cause only a slight shifting of the measured EC at Emmaton (increase) and at Jersey Point (decrease).

Appendix C, "DSM2 Modeling of Tidal Flows and Salinity," describes the DSM2-simulated changes in tidal flows and EC in several Delta channels that would result from the proposed barriers. Although the barriers would affect tidal flows and EC in several Delta channels, the reductions in EC would largely improve water quality conditions in many South Delta locations. Although the Sutter Slough and Steamboat Slough barriers may slightly increase EC in some North Delta channels, water quality would be monitored at several existing or new stations, In addition, implementation of Mitigation Measure BIO-6 would minimize salinity increases when necessary by opening culverts within these barriers. One culvert will remain open at all times and additional culverts may be opened to increase the Sacramento flow past the barriers. Although modeling shows only minor changes in EC associated with culvert operations, this additional flow from opening culverts will help reduce salinity downstream of the barriers and minimize adverse effects. Therefore, impacts on salinity levels would be less than significant.

Substantial changes to turbidity or salinity as a result of barrier construction, operations, and removal are not expected. Water quality degradation or significant impacts on water quality are not expected from implementing the project. Temporary turbidity increases during barrier installation and removal would be minimized to a less-than-significant level with the implementation of Mitigation Measure BIO-5. The proposed barriers would cause temporary changes in salinity, both positive and negative depending on Delta locations, but these changes would not violate any water quality standards and would be beneficial to help meet Delta water quality standards during drought conditions. Overall, these temporary impacts from the proposed project on water quality, water quality standards, and waste discharge requirements would be beneficial in the central and South Delta. Modeling shows that increased EC in some North Delta channels would be well below the 700 µS/cm average EC suitable for all agricultural crops (Hoffman 2010:98) and impacts would be less than significant with mitigation incorporated.

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 EDB would cause small changes in tidal variations locally, but almost no change would result to mean tidal elevations, which primarily control seepage. No effects on seepage flows are expected in the vicinity of the proposed barriers. Construction of the West False River barrier has been facilitated by strengthening of the adjacent levees by Reclamation Districts 830 and 2059 at Bradford and Jersey Islands in 2014, which could reduce seepage flows at these sites. However, this reduced local seepage would increase levee stability and would be so negligible that groundwater elevation in the vicinity of the West False River barrier would not be altered. No effects on groundwater hydrology (elevation and seepage flow) would occur from temporary construction, operation, and removal of the EDB. Therefore, no impact would occur.

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial on- or off-site erosion or siltation?

Less-than-Significant with Mitigation Incorporated. Delta channel levees are composed of a mixture of sand, silt, and clay and generally are stable under normal tidal flows and velocities. Tidal velocities are the result of tidal elevation gradients. Because the maximum flood-tide and ebb-tide elevation changes are relatively steady (about 4 feet in 4 hours), tidal velocities in most Delta channels are 2 to 3 feet per second. The EDB would block tidal flows in the channels and would greatly reduce tidal velocities in the vicinity of the proposed barriers, as illustrated for upstream and downstream of the West False River barrier with the DSM2 modeling results for June-October of the simulated hydrology (Table 3.9-1). Tidal velocities in the mainstem San Joaquin River would not differ greatly with and without the barriers, as illustrated by Jersey Point and San Andreas modeling results (Table 3.9-1). Flows that otherwise would enter and leave False River would be redistributed to adjacent channels (e.g., Fisherman's Cut, Dutch Slough, and Taylor Slough), which would experience greater tidal flows (Table 3.9-2). Estimates of tidal velocity derived from DSM2 modeling for the simulated hydrology (see Appendix C, "DSM2 Modeling of Tidal Flows and Salinity") suggest that the maximum tidal velocities in Fisherman's Cut would increase from 0.4-0.5 feet per second with no barriers to about 2.0-2.3 feet per second with the barriers; these increased velocities are within the typical range observed in Delta channels. For Dutch Slough, the maximum tidal velocity is estimated to increase from 2.0-2.3 feet per second with no barriers to 2.6-2.8 feet per second with the barriers. For Taylor Slough, the maximum tidal velocity is estimated to increase from around 0.4 feet per second with no barrier to 0.4-0.5 feet per second with the barriers (Table 3.9-2). These changes in velocity are not expected to result in changes in erosion potential in the channels near the West False River barrier.

The Sutter Slough and Steamboat Slough barriers would each include one open culvert (48 inches in diameter) at all times to facilitate fish passage, and additional culverts may be opened as necessary to minimize effects on downstream water quality, fish passage, and flow; flow velocities in the culverts may increase locally because the water surface elevation differences across a barrier may be increased during portions of the tidal cycle. However, the culverts would be located about 5 to 10 feet above the channel bottom; flow velocities near the bottom would be much less than the normal tidal velocities without the barriers. Although the velocities generally would be reduced near the barriers, excessive sediment deposition during the barrier installation and operation would not occur because the barriers would be in for only a short period of time and the peak sediment load on the Sacramento River occurs during high river discharge typically in the early spring or possibly not at all during a severe drought. The Sutter Slough and Steamboat Slough barriers would be removed by November 1 and the

Table 3.9-1
Simulated Velocities (feet per second) in West False River and the San Joaquin River With and Without the Proposed Project

Percentile	West False River (Downstream of Barrier)		West False River (Upstream of Barrier)		Jersey Point (RSAN018)		San Joaquin River at San Andreas (RSAN032)	
	No EDB	EDB	No EDB	EDB	No EDB	EDB	No EDB	EDB
0	-2.64	0.00	-2.32	-0.35	-2.14	-1.86	-1.17	-1.08
10	-2.26	0.00	-2.00	-0.18	-1.77	-1.52	-0.88	-0.74
20	-2.01	0.00	-1.78	-0.10	-1.53	-1.31	-0.76	-0.62
30	-1.60	0.00	-1.41	-0.06	-1.18	-0.99	-0.59	-0.47
40	-0.80	0.00	-0.67	-0.04	-0.60	-0.49	-0.26	-0.19
50	0.38	0.00	0.35	0.01	0.21	0.18	0.26	0.27
60	1.28	0.00	1.17	0.07	0.88	0.75	0.63	0.61
70	1.71	0.00	1.54	0.11	1.23	1.08	0.79	0.76
80	1.97	0.00	1.75	0.15	1.48	1.31	0.89	0.87
90	2.18	0.00	1.90	0.26	1.67	1.50	0.98	0.98
100	2.49	0.00	2.16	0.39	1.95	1.76	1.21	1.17

Notes: No EDB = No proposed project; EDB = Implementation of proposed project

The No EDB and EDB scenarios used June 2 – October 30 simulated hydrology; June 1 and October 31 were excluded because (for modeling purposes) these were the days that barrier installation and removal were assumed to occur.

The EDB scenario includes one culvert open at each of the Sutter and Steamboat slough barriers.

Source: Liu, pers. comm.

Table 3.9-2
Simulated Velocities (feet per second) in Fisherman's Cut, Dutch Slough, and Taylor Cut With and Without the Proposed Project

Percentile	Fisherman's Cut		Dutch Slough (SLDUT007)		Taylor Slough	
	No EDB	EDB	No EDB	EDB	No EDB	EDB
0	-0.48	-1.18	-2.27	-2.83	-0.41	-0.47
10	-0.40	-1.06	-1.94	-2.42	-0.34	-0.30
20	-0.36	-0.99	-1.75	-2.19	-0.30	-0.21
30	-0.29	-0.90	-1.45	-1.82	-0.24	-0.16
40	-0.17	-0.75	-0.75	-0.97	-0.16	-0.12
50	0.09	-0.35	0.37	0.55	0.00	-0.06
60	0.20	0.42	1.11	1.49	0.17	0.10
70	0.25	0.82	1.43	1.87	0.26	0.20
80	0.28	0.99	1.61	2.09	0.31	0.25
90	0.30	1.07	1.76	2.27	0.35	0.30
100	0.36	1.21	2.03	2.57	0.42	0.43

Notes:

No EDB = No proposed project; EDB = Implementation of proposed project

The No EDB and EDB scenarios used June 2 – October 30 simulated hydrology; June 1 and October 31 were excluded because (for modeling purposes) these were the days that barrier installation and removal were assumed to occur.

The EDB scenario includes one culvert open at each of the Sutter and Steamboat slough barriers.

Source: Liu, pers. comm.

West False River barrier would be removed by November 15; all three barriers would be removed prior to the onset of the rainy season and resulting increased sediment loads. Some portions of the West False River barrier (e.g., pilings on the levees) may be left in place to prevent additional levee disturbances; localized scour and deposition patterns would be modified, but the net effect on erosion and siltation would be small. Although the expected changes in erosion or siltation resulting from the temporary construction, operation, and removal of the EDB would be minimal, Environmental Commitments 1 and 10 in Section 2.9.1, "Environmental Commitments" and Mitigation Measure BIO-5 would be implemented to minimize erosion, scour damage, siltation, and turbidity. Therefore, the impact would be less than significant with mitigation.

Mitigation Measure BIO-5: Implement Turbidity Monitoring during Construction.

Timing: During barrier construction and removal

Responsibility: DWR and its contractors

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?

No Impact. The EDB would block the normal tidal flows in West False River, Steamboat Slough, and Sutter Slough. However, the barriers would not change the flood flows or the flood elevations during a major flood event. The barriers would not impose an increased risk of flood hazard to adjacent lands, nor would they block high flows. The proposed project would occur when no chance would exist for high surface runoff and available upstream reservoir flood storage capacity would be maximized (i.e., during drought conditions). Therefore, construction, operation, and removal of the EDB would not substantially increase the rate or amount of surface runoff in a manner which would result in on-or off-site flooding and operation is not expected to impact flood flows or impose additional flood hazards. No impact would occur.

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?

No Impact. The EDB would not affect any stormwater drainage systems and, therefore, would not create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems. The proposed project also would not provide any substantial additional sources of polluted runoff. Furthermore, environmental commitments would be implemented as part of the proposed project to minimize potential impacts of polluted runoff during barrier construction, operation, and removal (see Environmental Commitments 1, 2, and 3 in Section 2.9.1, "Environmental Commitments"). No impact would occur.

f) Otherwise substantially degrade water quality?

Less than Significant with Mitigation Incorporated. Aside from salinity and turbidity, (see Questions a and c above), the water quality parameters most likely to be affected by the temporary drought barriers would be temperature and dissolved oxygen (DO). A slight increase in temperature is anticipated in Sutter Slough and Steamboat Slough downstream of the EDB because of increased residence time, which would increase warming. However, water temperatures in the Cache Slough complex likely would not be affected, because most of the tidal exchange (i.e., controlling residence time for warming) is from the Sacramento River at Rio Vista. The changes in water temperature would be limited because the water temperatures in the Delta channels already would be at equilibrium temperatures controlled by daily meteorological conditions.

DO concentrations could decline under reduced tidal flow conditions in Sutter and Steamboat sloughs downstream of the EDB. DO concentration is indicative of the balance between ecological processes that increase oxygen (e.g., surface reaeration and algae photosynthesis) and ecological processes that reduce oxygen (e.g., algae respiration, sediment respiration, and nitrification of ammonia). A substantial source of ammonia comes from Sacramento Regional Wastewater Treatment Plant discharge near Freeport. Because the ammonia concentrations in the Sacramento River increase during low-flow conditions, and tidal flows downstream of the barriers would be reduced, a slight reduction may occur in the DO in Sutter and Steamboat sloughs. However, because surface reaeration would increase as the DO is reduced, the DO concentration is expected to remain similar to that in the Sacramento River.

With the implementation of Mitigation Measure BIO-6, water quality monitoring downstream of the barriers would be conducted and additional culverts would be opened to facilitate mixing and flow through the sloughs as necessary to prevent substantial degradation to water quality parameters as a result of construction, operation, and removal of the barriers. The impact would be less than significant with mitigation incorporated.

Mitigation Measure BIO-6: Develop a Water Quality Plan to Monitor Water Quality and Operate Barrier Culverts to Improve Water Quality.

Timing: Before and during barrier construction, operation, and removal

Responsibility: DWR and its contractors

g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

No Impact. The proposed project would not place housing within a 100-year flood hazard area. No impact would occur.

h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?

Less-than-Significant Impact. The EDB would be in place potentially from early June until November 15 (the Sutter Slough and Steamboat Slough barriers would be removed by November 1 and the West False River barrier would be removed by November 15). Because of the minimal Sierra Nevada snowpack and excess storage capacity in upstream reservoirs during drought conditions, and the lack of historic flooding from high flows prior to November 16 under any conditions, essentially no chance would exist of flood flows occurring in the Delta before the proposed barriers are removed by November 15. The proposed barriers would present no risk of impeding or directing flood flows.

In the case of an extremely unlikely high-flow event in the Delta prior to November 16, which has never occurred in recorded history (more than 150 years), the follow discussion is presented. The Sutter Slough and Steamboat Slough barriers each would have four culverts. Although the West False River barrier would block the substantial tidal flows (30,000 cfs) between Franks Tract and the San Joaquin River, flood flows from the San Joaquin River are extremely rare. About one-third of the San Joaquin River maximum flood flow (60,000 cfs in January 1997) entering the Delta moves down the river channel past Stockton. About two-thirds flows into the South Delta to Grant Line and Victoria Canals, and moves down the Middle River channels (15,000 cfs) to the San Joaquin River and down the Old River channels (25,000 cfs) to Franks Tract. DSM2 modeling of this flood event shows that the portion of the San Joaquin River flood flow that moves from Franks Tract through False River is about 10,000 cfs. If a major flood flow were to occur in the San Joaquin River while the West False River barrier is installed, this portion of the flood flow would be re-directed to the mouth of the Old River, Fisherman's Cut, and Dutch Slough. Therefore, the effects on water surface elevations in Franks Tract would be minor. No changes would occur in flood flows or flood water surface elevations that would result from the EDB. Therefore, the impact would be less than significant.

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 Impact. The discussions in Questions 1c), 1e), 1g), and 1h) above are relevant to this question. Because of the minimal Sierra Nevada snowpack and excess storage capacity in upstream reservoirs during drought conditions, and the lack of historic flooding from high flows prior to November 16 under any conditions, essentially no chance would exist of flood flows occurring in the Delta before the proposed barriers are removed by November 15. The barriers would present no risk to impeding or directing flood flows. Consequently, the barriers would present virtually no risk of exposing people or structures to significant risk from flooding.

The Sutter Slough and Steamboat Slough barriers would be in relatively shallow channels (10-15 feet deep at mean lower low water [MLLW]), and no additional stress would be placed on the adjacent levees because of the placement of the barriers. The West False River barrier would block a deeper channel (25 feet deep at MLLW), and greater stress would occur on the adjacent levees from the placement of the barrier and pilings. However, as noted above, as part of a separate project, Reclamation Districts 830 and 2059 reinforced the levees on Bradford and Jersey Islands, which would minimize increased stress on the levees from the West False River barrier. For this reason, installation and operation of the barriers would not increase flood hazards to adjacent lands protected by the channel levees. Therefore, the impact would be less than significant.

j) Result in inundation by seiche, tsunami, or mudflow?

No Impact. The proposed project would not result in inundation by seiche, tsunami, or mudflow. A seiche or mudflow would not be possible at the proposed barrier sites. The potential occurrence of a tsunami would be negligible, especially during the temporary nature of the proposed project. Therefore, no impact would occur.

k) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, such that water elevation is reduced and negatively affects diversions for beneficial uses?

Less-than-Significant with Mitigation Incorporated. This environmental issue has been added to the standard CEQA Environmental Checklist because tidal elevations are important for many agricultural diversions located downstream of the proposed Sutter Slough and Steamboat Slough barriers. With the implementation of Mitigation Measure HYDRO-1, DWR will monitor water surface elevations and provide emergency temporary pumps for any siphon or pump diversion that is adversely affected by the barriers because of lower water surface elevation. Appendix C, "DSM2 Modeling of Tidal Flows and Salinity," summarizes tidal elevations and tidal flows in several Delta channels that would be hydrologically affected by the EDB. Potential changes in tidal elevations and tidal flows from the proposed barriers were evaluated with the DSM2 for July in a year with simulated hydrology representative of Delta conditions during drought conditions. Agricultural diversions in the Delta are typically operated from April through October. The largest project-related effects on tidal elevations would be observed immediately downstream of the Sutter Slough and Steamboat Slough barriers. Tidal elevations would be slightly increased in the Sacramento River between Freeport and Walnut Grove. Much smaller changes in tidal elevations would be observed in the lower Sacramento River and in the San Joaquin River upstream of False River.

Figures C-8b (Sutter Slough tidal elevations) and C-9b (Steamboat Slough tidal elevations) in Appendix C, “DSM2 Modeling of Tidal Flows and Salinity,” indicate that changes in tidal elevations would be very similar at both barriers. The minimum elevations upstream of the barriers would increase slightly, and would therefore have no effects on agricultural diversion pumps or siphons located upstream of the barriers. The minimum elevations downstream of the barriers would be reduced to approximately the minimum elevations in Cache Slough at Ryer Island (Figure C-6b in Appendix C, “DSM2 Modeling of Tidal Flows and Salinity”), with minimum tidal elevations of 1.5-2.0 feet NAVD. This water surface elevation is up to 2 feet lower than the minimum elevations at the barrier locations (without the barriers). The Sacramento River flow increases the water surface elevations in the Sacramento River and in Sutter and Steamboat Sloughs upstream of Rio Vista. Because the upstream diversions from the Sacramento River would be partially blocked by the barriers, the range of tidal elevations in Sutter, Steamboat, and Miner sloughs would be increased and match the tidal range in Cache Slough. It is unlikely that any pump diversions would be substantially affected by the reduced minimum elevations because the channels are much deeper than the minimum tidal elevations. Siphon diversions may be more sensitive to this reduction of the low-tide elevations although the land elevation in the adjacent islands and tracts are generally several feet below the minimum water elevations in Cache Slough. However, DWR will implement Mitigation Measure HYDRO-1 to monitor water surface elevations and provide emergency temporary pumps for any siphon or pump diversion that is adversely affected by the barriers. This impact would be less than significant with mitigation incorporated.

Mitigation Measure HYDRO-1: Minimize Downstream Water Surface Elevation Impacts and Work with North Delta Water Agency to Minimize Salinity Changes for Water Users within the Agency’s Boundaries

Timing: During barrier operation

Responsibility: DWR

3.10 LAND USE AND PLANNING

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

3.10.1 ENVIRONMENTAL SETTING

EXISTING AND ADJACENT LAND USES

Sutter Slough

The Sutter Slough project site is located in the North Delta, about 0.6 mile directly west of the Sacramento River at the northwest end of Sutter Island, in Range 3E, Township 6N of the Courtland, California USGS 7.5-minute quadrangle. This site is approximately 1 mile southwest of the community of Courtland and 7 miles northwest of Walnut Grove, and is on the border between Yolo and Sacramento counties (see Figures 2-1 and 2-2).

Sutter Slough consists of open water, and the east levee shoreline is rock-lined with grasses, forbs, small riparian shrubs, and mature trees on the levee slope. The west levee shoreline is not rock-lined and contains a narrow, dense band of riparian shrubs and small trees.

The surrounding land uses in the vicinity of the Sutter Slough project site are agricultural—predominately row crops on the west side of the channel and orchards on the east side of the channel. Arrowhead Harbor Marina is approximately 3.5 miles west of the Sutter Slough project site (see Section 3.15, “Recreation,” for further discussion).

Three rural residences are located in the immediate vicinity of the Sutter Slough project site, on both sides of the river. One house is located on the east bank of the river channel, approximately 400 feet upstream from the emergency drought barrier site; a second house is located approximately 300 feet upstream from the emergency drought barrier site, but is set back approximately 275 feet from the east side of the river channel; and the third house is set back approximately 670 feet from the west side of the river channel.

Steamboat Slough

The Steamboat Slough project site is approximately 2.1 miles south-southeast of the Sutter Slough project site, and is located on the east side of Sutter Island and approximately 1 mile southwest of the Sacramento River in

Sacramento County. The site is in Range 4E, Township 5N of the Courtland, California USGS 7.5-minute quadrangle (see Figures 2-1 and 2-2).

Steamboat Slough consists of open water, and the banks on both sides of Steamboat Slough where the emergency drought barrier would be placed are extensively rock-lined. The upper banks of the levees support annual grass and forbs, with a few scattered, mature trees.

The surrounding land uses in the vicinity of the Steamboat Slough project site are agricultural. Arrowhead Harbor Marina is located approximately 3.5 miles west of the Steamboat Slough project site. Snug Harbor Resort and Hidden Harbor Marina are located on Steamboat Slough, approximately 6.5 and 8.5 miles south, respectively, of Steamboat Slough project site (see Section 3.15, "Recreation," for further discussion).

Three rural residences are located in the immediate vicinity of the Steamboat Slough project site, on both sides of the river channel. One residence is located on the west side of the channel, behind the levee, approximately 150 feet downstream from the emergency drought barrier site; a second residence also is located on the west side of the channel, behind the levee, approximately 515 feet upstream from the emergency drought barrier site and boat transfer ramps site; and a third residence, on the east side of the river channel, is located approximately 900 feet downstream from the emergency drought barrier site and boat transfer ramps site.

West False River

The West False River project site is located approximately 0.4 mile east of the confluence of West False River with the San Joaquin River, in Range 3E, Township 3N of the Jersey Island, California USGS 7.5-minute quadrangle, between Jersey and Bradford Islands in Contra Costa County, and is about 4.8 miles northeast of Oakley (see Figures 2-1 and 2-2).

West False River consists of open water, and the banks of the West False River project site are completely rock-lined. The surrounding land uses in the vicinity of the West False River project site are agricultural. Nine marinas are on the southwest side of Franks Tract, approximately 1.5 to 4.5 miles east of the West False River project site. Three other marinas are on Taylor Slough, approximately 1.5 to 2.1 miles south of the West False River project site (see Section 3.15, "Recreation," for further discussion).

One rural residence is located in the immediate vicinity of the West False River project site. This residence is approximately 1,800 feet east of the emergency drought barrier site.

County General Plan Land Use Designations and Zoning

Sutter Slough

The portion of the Sutter Slough project site within Yolo County is designated by the Yolo County General Plan as Agriculture (Yolo County 2010). The portion of the Sutter Slough project site within Sacramento County is designated by the Sacramento County General Plan as Recreation, with areas designated as Agricultural Cropland to the south (Sacramento County 2011).

The portion of the Sutter Slough project site within Yolo County is zoned Agricultural General Zone (A1), with adjacent areas zoned Agricultural Preserve (A-P). The A1 zone was established to provide uses on lands best suited for agriculture, and the A-P zone was established to preserve land best suited for agricultural use from the encroachment of nonagricultural uses (Yolo County 2014).

The portion of the Sutter Slough project site within Sacramento County is zoned Agricultural (20 acres), with adjacent areas zoned Agricultural (80 acres). These Agricultural districts were established to eliminate the encroachment of land uses that are incompatible with the long-term agricultural use of land, preserve the maximum amount of the limited supply of agricultural land, discourage the premature and unnecessary conversion of agricultural land to urban uses, assure the preservation of agricultural lands, and encourage the retention of sufficiently large agricultural lots to assure maintenance of viable agricultural units. (Sacramento County 2014.)

Steamboat Slough

The Steamboat Slough project site is designated by the Sacramento County General Plan as Natural Preserve, with areas designated as Agricultural Cropland surrounding the project site. The Steamboat Slough project site is zoned by Sacramento County as Agricultural (80 acres); the area just west of the project site is zoned Agricultural (40 acres) (Sacramento County 2011). These Agricultural districts are described in the discussion of Sutter Slough, above.

West False River

The areas adjacent to the West False River project site are designated by the Contra Costa County General Plan as Delta Recreation and Resources (to the north) and Public and Semi-Public (to the south). The West False River project site is zoned by Contra Costa County as General Agricultural (A-2); the area just south of the emergency drought barrier site is zoned Heavy Agricultural (A-3) (Contra Costa County 2008). These districts were established for all types of agriculture, agricultural uses, a farm stand, a detached single-family dwelling, a foster home, a family day care, and a residential second unit (Contra Costa County 2014).

Land Use and Resource Management Plan for the Primary Zone of the Delta

The Delta Protection Commission (DPC) has planning jurisdiction over portions of five counties: Contra Costa, Sacramento, San Joaquin, Solano, and Yolo. It was charged with developing a comprehensive regional plan to guide land use and resource management. The resulting Draft Land Use and Resource Management Plan for the Primary Zone of the Delta (Management Plan) was initially adopted by DPC in February 1995, and was updated in 2010. With the adoption of the Management Plan or any amendments by DPC, all local governments, as defined in Section 29725 of the California Public Resources Code, must submit to DPC proposed amendments that will result in their general plans, as defined in Section 65300 et seq. of the Government Code, being consistent with respect to lands located in the Primary Zone of the Delta.

DPC is updating the Management Plan to account for a variety of important events and changing needs. The current draft has not yet been adopted by the State. It contains policies to protect the Delta’s unique character, expand public access and recreation, and locate new transmission lines and utilities within existing corridors to minimize impacts (DPC 2010).

The currently adopted Management Plan outlines the long-term land use requirements for the Delta. Its goals, as set out in the Delta Protection Act, are to:

> Protect, maintain, and where possible, enhance and restore the overall quality of the Delta environment, including but not limited to agriculture, wildlife habitat, and recreational activities; assure orderly, balanced conservation and development of Delta land resources; and improve flood protection by structural and nonstructural means to ensure an increased level of public health and safety.

Also related to land management, the Delta Reform Act of 2009 granted the DSC with authority to ensure the consistency of state and local public agency actions within the Delta Plan. Section 85225.30 of the Water Code required the DSC to adopt administrative procedures governing appeals that are exempt from the normal state rulemaking process. State and local agencies proposing to undertake a project covered by the Delta Plan must prepare and file a "consistency determination" with the DSC, meaning that they must demonstrate that the project is consistent with requirements in the Delta Plan.

3.10.2 DISCUSSION

a) Physically divide an established community?

No Impact. Residences are located in the vicinity of all three project sites. These residences are not formally or informally known as an established community.

The EDB would interfere with navigation while they are in place because the three project sites normally are open to navigation (discussed further in Section 3.15, "Recreation"). However, implementing the proposed project would not physically divide an established community because alternate water and land routes would be available. Therefore, no impact would occur.

b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

Less-than-Significant Impact. The drought proclamation directed DWR to take necessary actions to protect water quality and water supply in the Delta, including installation of the EDB or temporary water supply connections as needed, and coordination with CDFW to minimize impacts on affected aquatic species. The proposed project would support this directive, combined with other actions underway to implement conservation programs, secure water supplies for at-risk communities, and protect critical environmental resources.

Implementation of the proposed project would consist of installation and removal of the EDB at the three project sites up to three times in 10 years, potentially geologic exploration between 2015 and 2025 at the three sites, and construction of two new gravel access roads on the east side of the Steamboat Slough project site. As discussed above, the EDB would be located in areas primarily designated and zoned for agricultural use. Construction of the proposed project would have the potential to indirectly affect agricultural land uses in the immediate vicinity of the EDB on a short-term basis, if water surface elevations in the affected channels were reduced below levels that agricultural diverters could pump water. Because of the temporary nature of the proposed project, the use of the project sites for the EDB would not preclude the overall agricultural land uses after the barriers' removal.

Any consistency issues between the proposed project and Sacramento County, Yolo County, or Contra Costa County land use designations and zoning codes would be issues related to land use regulations and not to a physical environmental consequence of project implementation. Therefore, any such consistency issues would not be considered a significant impact under CEQA, in and of itself. Prior to project implementation, a consistency determination would be filed with DSC to demonstrate that the proposed project is consistent with the requirements of the Delta Plan. Specific impacts associated with other resource and issue areas are addressed in each resource issue section of Chapter 3, "Environmental Checklist," where appropriate. These sections provide a detailed analysis of other relevant environmental effects resulting from project implementation. Thus, the proposed project would not conflict with an applicable land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect. Therefore, no impact would occur.

c) Conflict with any applicable habitat conservation plan or natural community conservation plan?

No Impact. The emergency drought barrier sites are not located within an area covered by an adopted habitat conservation plan or natural community conservation plan (HCP/NCCP), or any other habitat conservation plan (See Section 3.4, "Biological Resources," for further discussion). Thus, no adopted or approved HCP/NCCP is in effect that would apply to the proposed project. Therefore, no impact would occur.

3.11 MINERAL RESOURCES

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☒

3.11.1 ENVIRONMENTAL SETTING

In compliance with the Surface Mining and Reclamation Act, the California Geological Survey (CGS) has established a classification system to denote both the location and significance of key extractive resources. The Steamboat Slough project site is located in an area classified as MRZ-1: areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence (Dupras 1999). The EDB at the Sutter Slough and West False River project sites would be located in areas that have not been classified by CGS; however, because the geologic history and rock formations at all three project sites are the same, no mineral deposits would be likely to be present at either the Sutter Slough or West False River project sites.

The Sutter Slough project site is located in Yolo and Sacramento counties, the Steamboat Slough project sites is located in Sacramento County, and the West False River project site is located in Contra Costa County. None of the three project sites have been designated as locally important mineral resource recovery sites in the general plans of the counties (Sacramento County 2011:4-14; Yolo County 2009:Figure CO-5; and Contra Costa County 2005:Figure 8-4).

3.11.2 DISCUSSION

a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

No Impact. Construction of the three EDB would require a total of approximately 116,000 cubic yards of rock for each installation, which would be obtained from local quarries. Rock may be reused for future EDB-related construction or another project. Use of rock from existing quarries to build the barriers would be an appropriate use of local mineral resources. Implementation of the proposed project would have no effect on the ability to recover mineral resources in the vicinity of the proposed project, if any were present. The Steamboat Slough project site is classified as MRZ-1, indicating that no mineral resources are present (Dupras 1999), and because the geologic history and rock formations at the Sutter Slough and West False River project sites are the same as the Steamboat Slough project site, mineral deposits would be unlikely to be present at any of the three project sites. Therefore, no impact would occur.

b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

No Impact. The three project sites for the EDB are not designated as locally important mineral resource recovery sites in the *Sacramento County 2030 General Plan* (Sacramento County 2011:4-14), the Yolo County *2030 Countywide General Plan* (Yolo County 2009:Figure CO-5), or the *Contra Costa County General Plan* (Contra Costa County 2005:Figure 8-4). Thus, no loss of locally important minerals would occur. Therefore, no impact would occur.

3.12 NOISE

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or in other applicable local, state, or federal standards?	☐	☒	☐	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☒	☐	☐
e) 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?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

3.12.1 ENVIRONMENTAL SETTING

SOUND, NOISE, AND ACOUSTICS

Sound is the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air). Noise is defined as sound that is unwanted (i.e., loud, unexpected, or annoying). Acoustics is the physics of sound.

The amplitude of pressure waves generated by a sound source determines the perceived loudness of that source. A logarithmic scale is used to describe sound pressure level in terms of decibels (dB). The threshold of human hearing (near-total silence) is approximately 0 dB. A doubling of sound energy corresponds to an increase of 3 dB. In other words, when two sources at a given location are each producing sound of the same loudness, the resulting sound level at a given distance from that location is approximately 3 dB higher than the sound level produced by only one of the sources. For example, if one automobile produces a sound pressure level of 70 dB when it passes an observer, two cars passing simultaneously do not produce 140 dB; rather, they combine to produce 73 dB.

The perception of loudness can be approximated by filtering frequencies using the standardized A-weighting network. A strong correlation exists between A-weighted sound levels (expressed as dBA) and community response to noise. All noise levels reported in this section are in terms of A-weighting. As discussed above, doubling sound energy results in a 3-dB increase in sound. In typical noisy environments, noise-level changes of 1 to 2 dB are generally not perceptible by the healthy human ear; however, people can begin to detect 3-dB increases in noise levels. An increase of 5 dB is generally perceived as distinctly noticeable and a 10-dB increase is generally perceived as a doubling of loudness. The following are the sound level descriptors most commonly used in environmental noise analysis:

- Equivalent sound level (L_{eq}): An average of the sound energy occurring over a specified time period. In effect, the L_{eq} is the steady-state sound level containing the same acoustical energy as the time-varying sound that actually occurs during the same period. The 1-hour, A-weighted equivalent sound level ($L_{eq[h]}$) is the energy average of A-weighted sound levels occurring during a 1-hour period.

- Maximum sound level (L_{max}): The highest instantaneous sound level measured during a specified period.

- Day-night average level (L_{dn}): The energy average of A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to A-weighted sound levels occurring during nighttime hours (10 p.m. to 7 a.m.).

Sound from a localized source (i.e., point source) propagates uniformly outward in a spherical pattern, and the sound level attenuates (decreases) at a rate of 6 dB for each doubling of distance from a point/stationary source. Roadways and highways and, to some extent, moving trains consist of several localized noise sources on a defined path; these are treated as "line" sources, which approximate the effect of several point sources. Sound levels attenuate at a rate of 3 dB for each doubling of distance from a line source. Therefore, noise from a line source attenuates less with distance than noise from a point source with increased distance.

Groundborne Vibration

Groundborne vibration is energy transmitted in waves through the ground. Vibration attenuates at a rate of approximately 50 percent for each doubling of distance from the source. This approach considers only the attenuation from geometric spreading and tends to provide for a conservative assessment of vibration level at the receiver.

Vibration is an oscillatory motion that can be described in terms of the displacement, velocity, or acceleration. Vibration typically is described by its peak and root-mean-square (RMS) amplitudes. The RMS value can be considered an average value over a given time interval. The peak vibration velocity is the same as the "peak particle velocity" (PPV), generally presented in units of inches per second. PPV is the maximum instantaneous positive or negative peak of the vibration signal and is generally used to assess the potential for damage to buildings and structures. The RMS amplitude typically is used to assess human annoyance to vibration.

Existing Noise Conditions

As described in Chapter 2, "Project Description," three temporary barriers are proposed to be installed in the North and Central Delta, at the Sutter Slough, Steamboat Slough, and West False River project sites up to three times in 10 years, including potentially in consecutive years.

The surrounding land uses in the vicinity of the Sutter Slough project site are agricultural and rural residences, on both sides of the river. The closest noise-sensitive receptors to the Sutter Slough project site would be rural/agricultural residential properties in three locations: approximately 300 feet from the emergency drought barrier to the south and along Sutter Island Road, approximately 670 feet from the same barrier to the west along Morse Road, and approximately 400 feet from the same barrier to the southwest along Road 145.

The closest noise-sensitive receptors to the Steamboat Slough project site also would be rural/agricultural residential properties in three locations: along Sutter Island Road approximately 500 feet northeast and 150 feet west of the proposed temporary barrier, respectively. Residential properties also are located approximately 900 feet south of this barrier site, along Grand Island Road.

The closest noise-sensitive receptors to the West False River project site also would be rural/agricultural residential properties, located approximately 1,800 feet east of the proposed temporary barrier, 1 mile west and 1.5 miles south of the project site.

Existing noise sources in the area of the proposed project include vehicular traffic, agricultural operations, and natural noise (i.e., wildlife vocalizations, wind, and birds). No airports or airstrips are in the vicinity of the project sites. However, because of the rural/agricultural nature of the land surrounding the three project sites, ambient noise levels are expected to be quite low—at or below 55 dBA L_{eq}, 50 dBA L_{eq}, and 45 dBA L_{eq} during the daytime, evening, and nighttime hours, respectively.

3.12.2 Regulatory Setting

California Department of Transportation

The California Department of Transportation has developed guidelines for assessing the significance of vibration produced by transportation and construction sources (Table 3.12-1). These thresholds address the subjective reactions of people to both short-term vibration (e.g., from temporary construction activities) and long-term/permanent vibration (e.g., from transit operations).

Table 3.12-1
California Department of Transportation Guidelines on Potential Criteria for Vibration Annoyance

Human Response	Impact Levels, VdB re: 1 µin/sec (PPV, in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Barely perceptible	80 (0.040)	68 (0.010)
Distinctly perceptible	96 (0.250)	80 (0.040)
Strongly perceptible	107 (0.900)	88 (0.100)
Severe	114 (2.000)	100 (0.400)

Notes: µin/sec = microinches per second; in/sec = inches per second; PPV = peak particle velocity; VdB = vibration decibels

Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Source: Caltrans 2004

SACRAMENTO COUNTY GENERAL PLAN

The goals presented in the Sacramento County General Plan Noise Element (Sacramento County 2011) are to: 1) protect the citizens of Sacramento County from exposure to excessive noise, and 2) protect the economic base of Sacramento County by preventing incompatible land uses from encroaching on existing planned noise-producing uses. The General Plan defines a noise-sensitive outdoor area as the primary activity area associated with any given land use at which noise sensitivity exists. Noise sensitivity generally occurs in locations where an expectation of relative quiet exists, or where noise could interfere with a given activity. For example, a residential backyard would be considered a primary activity area because loud noise (from the outside) could interfere with the ability to engage in normal conversation.

The Noise Element of the Sacramento County General Plan establishes noise exposure criteria to aid in determining land use compatibility by defining the limits of noise exposure for sensitive land uses.

- NO-6. Where a project would consist of or include non-transportation noise sources, the noise generation of those sources shall be mitigated so as not to exceed the interior and exterior noise level standards of Table 3.12-2 at existing noise-sensitive areas in the project vicinity.

- NO-7. The "last use there" shall be responsible for noise mitigation. However, if a noise-generating use is proposed adjacent to lands zoned for uses which may have sensitivity to noise, then the noise generating use shall be responsible for mitigating its noise generation to a state of compliance with the Table 3.12-2 standards at the property line of the generating use in anticipation of the future neighboring development.

- NO-8. Noise associated with construction activities shall adhere to the County Code requirements. Specifically, Section 6.68.090(e) addresses construction noise within the County.

- NO-9. In the case of existing residential uses, sensitive outdoor areas shall be mitigated to 60 dB L_{dn}, when possible, through the application of feasible methods to reduce noise levels. If 60 dB L_{dn} cannot be achieved after the application of all feasible methods of reducing noise, then noise levels up to 65 dB L_{dn} will be allowed.

- NO-13. Where noise mitigation measures are required to satisfy the noise level standards of this Noise Element, emphasis shall be placed on the use of setbacks and site design to the extent feasible, prior to consideration of the use of noise barriers.

Table 3.12-2 Summary of Non-Transportation Noise Level Standards – Sacramento County Noise Element of the General Plan			
New Land Use	Noise Level – L_{50}/L_{max} (dB)		
	Outdoor Area		Interior
	Daytime	Nighttime	Day and Night
All residential	55/75	50/70	35/55
Transient lodging	55/75	---	35/55
Hospitals and nursing homes	55/75	---	35/55
Theaters and auditoriums	---	---	30/50
Churches, meeting halls, schools, libraries, etc.	55/75	---	35/60
Office buildings	60/75	---	45/65
Commercial buildings	---	---	45/65
Playgrounds, parks, etc.	65/75	---	---
Industry	60/80	---	50/70

Notes:

The standards shall be reduced by 5 dB for sounds consisting primarily of speech or music, and for recurring impulsive sounds. If the existing ambient noise level exceeds the standards, then the noise level standards shall be increased at 5 dB increments to encompass the ambient.

Interior noise level standards are applied within noise-sensitive areas of the various land uses, with windows and doors in the closed positions.

Outdoor activity areas of non-residential facilities are not commonly used during nighttime hours.

Hospitals are often noise-generating uses. The exterior noise level standards for hospitals are applicable only at clearly identified areas designated for outdoor relaxation by either hospital staff or patients.

Where median (L_{50}) noise level data are not available for a particular noise source, average (L_{eq}) values may be substituted for the standards of this table provided the noise source in question operates for at least 30 minutes of an hour. If the source in question operates less than 30 minutes per hour, then the maximum noise level standards shown would apply.

Source: Sacramento County 2011

SACRAMENTO COUNTY MUNICIPAL CODE

The Sacramento County Noise Control Ordinance, Chapter 6.68.090, Exemptions, establishes exemptions to the Chapter 6.68.070 exterior noise exposure limits. Specifically, Section 6.68.090(e) exempts construction noise based on the following:

> Noise sources associated with construction, repair, remodeling, demolition, paving or grading of any real property, provided said activities do not take place between the hours of 8 p.m. to 6 a.m. on weekdays and Friday commencing at 8 p.m. through 7 a.m. Saturday; Saturdays commencing at 8 p.m. through 7 a.m. on Sunday and on Sunday after the hour of 8 p.m. Provided, however, when an unforeseen or unavoidable condition occurs during a construction project and the nature of the project necessitates that work in process be continued until a specific phase is completed, the contractor or owner shall be allowed to continue work after 8 p.m. and to operate machinery and equipment necessary until completion of the specific work in progress can be brought to conclusion under conditions which will not jeopardize inspection acceptance or create undue financial hardship for the contractor or owner.

Therefore, noise produced by construction activities occurring between 6 a.m. and 8 p.m. on weekdays and between 7 a.m. and 8 p.m. on weekends would be exempt from Sacramento County's noise level criteria.

YOLO COUNTY GENERAL PLAN

The Yolo County General Plan Noise Element (originally adopted in 1976) identifies noise sources such as roadways, rails, and airports in the County. The 1983 revision of the General Plan Noise Element provides general policies but does not establish any specific noise level standards (Yolo County 2005).

Currently, Yolo County does not have a noise ordinance or other noise enforcement code.

CONTRA COSTA COUNTY GENERAL PLAN

Noise standards in unincorporated Contra Costa County are set forth in the Noise Element of the Contra Costa County General Plan 2005–2020 (2005). This element contains goals and policies to reduce or eliminate the effects of excessive noise in the community. The goals strive to improve the overall environment in all areas of Contra Costa County, by reducing annoying and physically harmful levels of noise and maintaining appropriate noise conditions. Policy 11-8 of the Noise Element specifies that construction should 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 does not have an ordinance specifically addressing construction noise. Noise complaints in the unincorporated area of the county are addressed through application of the peace disturbance sections and generic nuisance ordinances of the Contra Costa County Code.

3.12.3 DISCUSSION

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or in other applicable local, state, or federal standards?

Less than Significant with Mitigation Incorporated. The proposed project would generally be operated consistent with the Sacramento County Noise Control Ordinance (Yolo and Contra Costa counties do not have similar ordinances). Construction activities associated with the proposed project would be limited to daytime hours, generally between 6:00 a.m. and 8:00 p.m. on Monday through Friday and 7:00 a.m. to 8:00 p.m. weekends. Construction noise would not be exempt between 6:00 am and 7:00 a.m. on Fridays, and this would be a potentially significant impact. As discussed below under Question d), the unmitigated project-related construction noise levels could be as high as 85 dBA $L_{eq[h]}$ at the residential property closest to the project sites. This noise level would exceed the threshold of 65 dB L_{dn} (see NO-9 from the Sacramento County General Plan Noise Element above); implementation of Mitigation Measure NOISE-1 would reduce this potentially significant impact to a less-than-significant level.

Mitigation Measure NOISE-1: Employ Noise-Reducing Construction Measures.

Timing: During construction

Responsibility: DWR

Construction noise would be short-term and temporary, and operation of heavy-duty construction equipment would be intermittent throughout the day during construction. No permanent increase in ambient noise levels would result, as proposed project operation would create negligible noise.

b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

Less-than-Significant Impact. Absent vibration thresholds specific to the counties where the project sites are located, Transit Noise and Vibration Impact Assessment (FTA 2006) and the Transportation- and Construction-Induced Vibration Guidance Manual (Caltrans 2004) are two seminal works related to the analysis of groundborne noise and vibration, relating to transportation and construction-induced vibration that serve as useful tools for evaluating vibration impacts. For this reason, they have been used to assess the vibration impacts of the proposed project. California Department of Transportation (Caltrans) guidelines recommend that a standard of 0.2 inch per second PPV not be exceeded for the protection of normal residential buildings (Caltrans 2004). With respect to human response in residential uses (i.e., annoyance, sleep disruption), FTA recommends a maximum acceptable vibration standard of 80 vibration decibels (VdB) (FTA 2006).

No permanent increase in groundborne vibration would result from the proposed project. Construction may cause varying degrees of temporary ground vibration, depending on the equipment used and activities. Groundborne vibration levels caused by various types of equipment are summarized in Table 3.12-3.

Table 3.12-3
Typical Construction Equipment Vibration Levels

Equipment	PPV at 25 feet (in/sec)	Approximate L_V at 25 feet
Haul trucks	0.076	86
Large bulldozer	0.089	87
Pile Driver (upper range)	1.518	112
Pile Driver (typical)	0.644	104

Notes: in/sec = inches per second; L_V = velocity level in decibels (VdB) referenced to 1 microinch per second and based on the root mean square velocity amplitude; PPV = peak particle velocity.

Source: FTA 2006

Construction–related vibration would result from the use of heavy equipment for construction of the EDB. These activities would produce a vibration level of approximately 87 VdB (0.089 inch per second PPV) at a distance of 25 feet (which is the reference vibration level for operation of a large bulldozer [FTA 2006; Caltrans 2004]). The distance between proposed construction activities and the closest acoustically sensitive receptors would be approximately 150 feet (i.e., the distance to the residence west of the Steamboat Slough project site; residential properties closest to the other two project sites are more than 150 feet, as discussed previously). Assuming a standard reduction of 6 VdB per doubling of distance, the project-related construction vibration level for the nearest sensitive receiver would be approximately 71 to 72 VdB. This is below the recommended threshold of significance of 80 VdB, as noted above.

Vibration from vibratory pile driving (only applicable to West False River project site) typically is below the threshold beyond about 300 feet. With residences being 1,800 feet from the project site, and because of the short duration of this activity, the impact would be less than significant.

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

No Impact. The proposed project would have short-term construction activities and would not introduce any permanent sources of noise. In addition, it would not alter the local environment, such as by increasing the noise production/exposure associated with existing, permanent sources of noise in the area of the proposed project. Therefore, no impact would occur.

d) 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. Because of the rural and agricultural land uses in the area, ambient noise levels at the existing rural residential properties in the vicinity of the three project sites are expected to be approximately 55 dBA, 50 dBA, and 45 dBA Leq[h], respectively, during the daytime (7 a.m. to 7 p.m.), evening (7 p.m. to 10 p.m.), and nighttime (10 p.m. to 7 a.m.) hours. A project-related construction noise level of +10 dB above the assumed ambient level ($L_{eq[h]}$) would be considered significant by residential receivers in the vicinity of the proposed project. This is based on the Interim Construction Noise Guideline prepared by Australia's Department of Environment and Climate Change NSW (2009). This is considered to be an appropriate impact threshold for temporary noise exposure, like those that would be caused by the proposed short-term construction activities.

Construction activities would occur during daylight hours, up to approximately 10 to 12 hours per day, potentially 7 days per week. Equipment that is expected to be used during construction is listed in Table 3.12-4, which also summarizes typical noise levels produced by this equipment. L_{eq} sound levels at 50 feet are shown along with the typical acoustic use factor. The acoustic use factor is the percentage of time each piece of construction equipment is assumed to be operating at full power (i.e., its loudest condition) during construction.

Anticipated noise from equipment operations for each construction phase (i.e., rock placement, culvert placement, pile driving, and removal) was estimated based on the loudest pieces of equipment likely to operate at the same time. For the rock placement equipment, the total noise level estimate is 93 dBA at 50 feet. This would correspond to a sound level of 84 dBA L_{eq} at the nearest residences (150 feet). This indicates that the potential would exist for construction equipment operations on land to increase more than 10 dB above the assumed ambient noise levels in the area of the proposed project. The impact would be potentially significant. Implementation of Mitigation Measure NOISE-1 would reduce this potentially significant impact to a less-than-significant level.

Table 3.12-4
Typical Construction Noise Emission Levels

Equipment	Typical Noise Level (dBA, L_{eq})[a]	Acoustical Use Factor
Rip-rap (Rock) Placement		
Tugboat[b]	91	40
Cranes	83	16
Workboat[c]	75	40
Dozers	81	40
Loaders	76	40
Rock Haul/Dump Truck	80	40
Conveyors	84	40

Table 3.12-4 Typical Construction Noise Emission Levels		
Equipment	Typical Noise Level (dBA, L_{eq})[a]	Acoustical Use Factor
Total	**93**	
Culvert Placement		
Off-road fork lift	80	40
Cranes	83	16
Pickups	75	40
air compressor	82	40
Power generators	79	50
Tugboat[b]	91	40
Skid Steer Loaders	76	40
Service truck	80	40
Grader	87	40
Front-end loaders	76	40
Workboat[c]	75	40
Total	**94**	
Pile Driving		
Tugboat[b]	91	40
Cranes	83	16
Workboat[c]	75	40
Grader	87	40
Off-road fork lift	80	40
Compactor	73	40
Skid Steer Loaders	87	40
Off-road crane	83	16
Service truck	80	40
Pickups	75	40
Vibratory pile driver	101	20
Air compressor	82	40
Power generators	79	50
Total	**102**	
Removal		
Tugboat[b]	91	40
Long-reach excavators	81	40
Cranes	83	16
Workboat[c]	75	40
Excavators	81	40
Dump Trucks	80	40
Dozers	81	40
Front-end loaders	76	40
Grader	81	40
Total	**93**	

Notes:

[a] dBA, A-weighted decibel level, measured at 50 feet.

[b] Calculated for tugboat using 1,000 horsepower reciprocating engine with muffler (Hoover & Keith 2000).

Table 3.12-4 Typical Construction Noise Emission Levels		
Equipment	Typical Noise Level (dBA, L_{eq})[a]	Acoustical Use Factor
[c] Based on data for pickup truck.		
Source: Federal Highway Administration 2006		

For culvert placement construction equipment at all three project sites, the reasonable, worst-case total noise level estimate is 94 dBA L_{eq} at 50 feet. This corresponds to a sound level of 85 dBA at the nearest residences (150 feet). This indicates that construction equipment operations during culvert placement at the Sutter Slough and Steamboat Slough project sites would potentially increase (more than 10 dB) above the assumed ambient noise levels in the area of the proposed project. Construction activities, however, generally would not occur at times when people normally sleep and would be temporary and infrequent.

Also, for construction equipment during pile driving at the West False River project site, noise from all equipment (including the barge with vibratory driver) has been summed to develop a reasonable worst-case noise level for on-water construction activities. For this equipment, the total noise level estimate is 102 dBA L_{eq} at 50 feet. This would correspond to a sound level of 71 dBA at the nearest residences (1,800 feet). This indicates that no potential would exist for construction equipment operations on the water to increase more than 10 dB above the assumed ambient noise levels in the area of the proposed project.

As discussed above, the unmitigated project-related on-land construction noise levels could be as high as 85 dBA $L_{eq[h]}$ at the residential property closest to the project sites. This noise level would exceed the threshold of 10 dB above ambient noise levels; therefore, the impact would be potentially significant without mitigation. Implementation of Mitigation Measure Noise-1 would reduce this potentially significant impact to a less-than-significant level.

Mitigation Measure NOISE-1: Employ Noise-Reducing Construction Measures.

DWR will employ noise-reducing practices during construction. Measures that may be used to limit noise will include the following:

- Written notification of heavy construction activities will be provided to all noise-sensitive receptors located adjacent to the project site and heavy construction activities, or within 50 feet of such activities. Notification will include anticipated dates and hours when construction activities are anticipated to occur, and contact information, including a daytime telephone number, for the project representative to be contacted in the event that noise levels are deemed excessive. Recommendations to assist noise-sensitive land uses in reducing interior noise levels (e.g., closing windows and doors) will be included in the notification.

- Fixed/stationary equipment (e.g., generators, compressors) will be located as far as possible from noise-sensitive receptors. All impact tools will be shrouded or shielded, and all intake and exhaust ports on powered construction equipment will be muffled or shielded.

- All construction equipment will be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturers' recommendations. Equipment engine shrouds will be closed during equipment operation.

- All motorized construction equipment will be shut down when not in use, to prevent excessive idling noise.

- All construction equipment powered by gasoline or diesel engines will have sound control devices that are at least as effective as those originally provided by the manufacturer, and all equipment will be operated and maintained to minimize noise generation.

- Noise reducing enclosures will be used around noise generating equipment, and temporary barriers will be used between noise sources and noise sensitive land uses, where feasible and when noise levels would exceed the threshold of 10 dB above ambient noise levels.

Timing: During construction

Responsibility: DWR

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

No Impact. The project sites are not located within 2 miles of a public airport. The nearest public airport, Rio Vista Muni Airport, is approximately 9.5 miles southwest of the Steamboat Slough project site, approximately 11 miles southwest of the Sutter Slough project site, and approximately 9.5 miles northwest of the West False River project site. Because all project activities would be located outside the Airport Comprehensive Land Use Plan area and would not involve any aircraft uses for construction or operation, the proposed project would not affect any airport operations and would not expose people on- or off-site to excessive noise levels. Therefore, no impact would occur.

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

No Impact. No private airstrips are in the vicinity (within 2 miles) of the three project sites, and the proposed project would not affect any airstrip operations. The nearest private airstrip, Spezia Airport, is approximately 6 miles south of the Steamboat Slough project site, approximately 8 miles south of the Sutter Slough project site, and approximately 13 miles northeast of the West False River project site. Thus, implementing the proposed project would not expose people on- or off-site to excessive noise levels. Therefore, no impact would occur.

3.13 POPULATION AND HOUSING

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) 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)?	☐	☐	☐	☒
b) Displace substantial numbers of existing homes, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

3.13.1 ENVIRONMENTAL SETTING

Three residences are within approximately 670 feet of the Sutter Slough project site, three residences are within 900 feet of the Steamboat Slough project site, and one residence is 1,800 feet east of the West False River project site. Other scattered residences also are present in the vicinity of the proposed project, along Sutter Slough, Steamboat Slough, and West False River. Small, rural towns also are found in this region of the Delta, in the vicinity of the project sites. The community of Courtland is located in unincorporated Sacramento County, approximately 1 mile northwest of the Sutter Slough project site, and has a population of approximately 325. The community of Walnut Grove also is located in unincorporated Sacramento County, 5.3 miles southeast of the Steamboat Slough project site, and has a population of approximately 1,600. Bethel Island is located in unincorporated Contra Costa County, approximately 1.5 miles south of the West False River project site, and has a population of approximately 1,900 (U.S. Census Bureau 2014).

3.13.2 DISCUSSION

a) 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. The proposed project would not include constructing new homes or businesses or extending roadways or other infrastructure that could increase the population in the vicinity of the proposed project. Construction activities associated with the proposed project would be performed within approximately 30 to 60 days, and removal of the EDB would take approximately 30 to 60 days at the Sutter and Steamboat Slough sites and approximately 45 to 60 days at the West False River site, and would occur up to three times in 10 years, including potentially in consecutive years. Construction would require approximately 10 to 30 workers. Operation of the EDB would require minimal staff to open or close the culvert slide gates at the Sutter and Steamboat Slough barrier sites, as necessary for water quality and maintenance purposes, but would cease by November 1. Minimal staff would be required after the barrier at the West False River site was removed by November 15, for maintenance of the sheet pile abutments that would remain in place. Minimal staff also would be required to conduct bathymetric surveys, to confirm that the rock fill is removed from all of the project sites. Installation of the barriers would allow surface water to continue to be diverted locally and would not induce population growth beyond levels already planned and projected by local governments. Therefore, implementing the proposed project would not directly or indirectly induce substantial population growth. Therefore, no impact would occur.

b) Displace substantial numbers of existing homes, necessitating the construction of replacement housing elsewhere?

No Impact. None of the proposed project activities would displace the existing residences that are near or in the vicinity of the Sutter Slough, Steamboat Slough, and West False River project sites. Therefore, implementation of the proposed project would not displace existing housing or necessitate construction of replacement housing elsewhere. Therefore, no impact would occur.

c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?

No Impact. For the reasons described in Question b) above, implementing the proposed project would not displace a substantial number of people or necessitate construction of replacement housing elsewhere. Therefore, no impact would occur.

3.14 PUBLIC SERVICES

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, 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?	☐	☐	☒	☐

3.14.1 ENVIRONMENTAL SETTING

Project-related temporary barriers would be installed at three project sites (at Sutter Slough, Steamboat Slough, and West False River). No schools, parks, or other public services are in the vicinity of these project sites. Therefore, the following discussion provides an overview of fire protection and police protection services for the project sites.

FIRE PROTECTION SERVICES

Sutter Slough Project Site

Fire protection services for the Sutter Slough project site would be provided by either the Clarksburg Fire Protection District (CFPD) in Yolo County or the Courtland Fire Department (CFD) in Sacramento County. The CFPD is located at 52902 Clarksburg Road in the unincorporated community of Clarksburg, approximately 7 miles northwest of the Sutter Slough project site. The CFPD is staffed by 20 volunteer fire fighters, one fire chief, one assistant chief, one captain, and four lieutenants that provide fire suppression and emergency medical services to Clarksburg and the surrounding unincorporated areas (CFPD 2014).

The CFD has two stations and over 22 volunteer employees and protects an area that spans over 33 square miles, including the Sutter Slough project site (CFD 2014). The closest CFD station to the Sutter Slough project site is Station 91, located approximately 1 mile east at 154 Magnolia Avenue in Courtland.

Steamboat Slough Site

The CFD also would provide fire protection services for the Steamboat Slough project site. The closest CFD station to the Sutter Slough project site is Station 91, located approximately 2 miles north at 154 Magnolia Avenue in Courtland.

West False River Project Site

Fire protection services would be provided to the West False River project site by the East Contra Costa County Fire Protection District (ECCFPD). The ECCFPD has five stations that provide emergency medical services, fire suppression, rescue, and hazardous materials response to the cities of Brentwood and Oakley and the unincorporated communities of Bethel Island, Discovery Bay, Knightsen, and Byron (ECCFPD 2014). The closest ECCFPD station to the West False River project site is Station 93, located approximately 6 miles southwest at 530 O'Hara Avenue in the City of Oakley.

POLICE PROTECTION SERVICES

Sutter Slough Project Site

Law enforcement services would be provided to the Sutter Slough project site by either the Sacramento County Sheriff's Department (SCSD) or Yolo County Sheriff's Department (YCSD).

The SCSD provide law enforcement services to the unincorporated county. The SCSD operates several facilities, including a headquarters building, main jail, the Rio Cosumnes Correctional Center, five station houses, 10 community service centers, a training academy, firearms training facility, marine enforcement detail, and an air support bureau. The closest SCSD service center to the Sutter Slough project site is the Wilton Station, located approximately 20 miles east at 10661 Alta Mesa Road in the community of Wilton. The service center handles non-emergency calls for the rural areas of Delta, Wilton, Herald, Freeport, Laguna West, and the unincorporated areas of Galt (SCSD 2014).

The YCSD provides law enforcement services to the cities Woodland, Davis, Winters, West Sacramento; U.C. Davis; and the unincorporated towns of Brooks, Capay, Clarksburg, Dunnigan, Esparto, Guinda, Knights Landing, Madison, Rumsey, Yolo, and Zamora. In addition, the YCSD operates a marine patrol search and rescue that provides countywide search and rescue services for lost, stranded, and injured victims in the Sacramento River, Cache Canyon, and Putah Creek. The YCSD is located at 140 Tony Diaz Drive in the City of Woodland, approximately 25 miles north of the project site.

Steamboat Slough Project Site

Law enforcement services would be provided to the Steamboat Slough project site by the SCSD. The closest SCSD service center to the Sutter Slough project site is the Wilton Station, located approximately 19 miles northeast at 10661 Alta Mesa Road in the community of Wilton.

West False River Project Site

The Contra Costa County Sheriff's Department provides law enforcement services in the unincorporated portions of Contra Costa County, special districts, as well as contracted services with the Contra Costa County Housing Authority, A.C. Transit, the Contra Costa Water District, and Contra Costa Regional Medical Center (Contra

Costa County Sheriff's Department 2014). The Sheriff's Department includes patrol services and criminal and coroner investigations; operates the County jail; and has a marine patrol unit and an air support unit. The Sheriff's Department headquarters and dispatch office is located at 651 Pine Street in the City of Martinez, approximately 25 miles southwest of the project site.

3.14.2 DISCUSSION

a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:

Fire protection?

No Impact. Fire protection services for the Sutter Slough and Steamboat Slough project sites would be provided by CFD Station 91. The CFPD also would provide fire protection services to the Sutter Slough project site. Fire protection services for the West False River project site would be provided by ECCFPD Station 93.

Implementation of the proposed project would include installation and removal of barriers at the three project sites up to three times in 10 years, potentially geologic exploration between 2015 and 2025 at the three sites, and construction of two new gravel access roads on the east side of the Steamboat Slough site. Access to the project sites would be maintained during construction activities, and in the event of a fire at the project sites, access roads could accommodate fire-fighting crews and equipment. In addition, the proposed project would not generate new residents in the vicinity of the proposed project, nor would it include construction of any structures that would require additional fire protection services. No impact would occur.

Police protection?

Less-than-Significant Impact. The SCSD would provide law enforcement services to the Sutter Slough and Steamboat Slough project sites. The YCSD would provide law enforcement services to the Sutter Slough project site. Law enforcement for the West False River project site would be provided by the Contra Costa County Sheriff's Department. Bradford Island is located north of the West False River project site, and the island is only accessible by the ferry slip located on the southwest tip of the island or by helicopter. The Contra Costa Sheriff's Department provides law enforcement services to Bradford Island via marine patrol. Access to the Bradford Island ferry slip would be maintained during construction activities, and no changes would occur in law enforcement services to Bradford Island. Local sheriff marine patrols would detour around the EDB, using Fisherman's Cut to access West False River and the Sacramento River to access Sutter and Steamboat sloughs.

The proposed project would not include any new housing, businesses, or other development that would increase demand for police protection services and facilities.

Because alternate routes would be available, and the proposed project would be a limited size and of short duration, the impact on police protection would be less than significant.

Schools?

No Impact. The proposed project would not provide any new housing that would generate new students in the community. Therefore, implementation of the proposed project would not increase the demand for school services and facilities. No impact would occur.

Parks?

No Impact. The proposed project would not provide any new housing that would generate new residents who would require new or expanded park facilities. No impact would occur.

Other public facilities?

Less-than-Significant Impact. No other public facilities exist in the vicinity that would be affected by project implementation. Water intakes close to the downstream side of the EDB temporarily may experience lower water levels during low tide; a discussion of water supplies is presented in Section 3.17.2, "Discussion." The impact on other public facilities would be less than significant.

3.15 RECREATION

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	☐	☐	☒	☐

3.15.1 ENVIRONMENTAL SETTING

The project sites are located in Sutter Slough, Steamboat Slough, and West False River. Arrowhead Harbor Marina is located approximately 3.5 miles west of the Sutter and Steamboat Slough project sites. Snug Harbor Resort and Hidden Harbor Marina are located on Steamboat Slough, approximately 6.5 and 8.5 miles south, respectively, of the Sutter and Steamboat Slough project sites. Nine marinas are on the southwest side of Franks Tract, approximately 1.5 to 4.5 miles east of the West False River project site. Three other marinas are on Taylor Slough, approximately 1.5 to 2.1 miles south of the West False River project site. All of the marinas support extensive recreational opportunities, including boating, swimming, fishing, golfing, and hiking. In addition, dozens more marinas and other facilities offer boat access to the Sacramento River and other channels in the Delta, for access to the area and vicinity of the proposed project (Delta Recreation 2014).

According to a boating survey, conducted by the Delta Protection Commission in 1997, boating is the most popular recreational activity in the Delta, and power boats are the most common vessel type. Personal watercraft were the second most common vessel (15.1 percent), followed by sailboats (6.2 percent), paddle boats (5.6 percent), and houseboats (4.0 percent). Seventy-six percent of survey participants indicated they operate their boats only between the hours of 8 a.m. and 4 p.m. (DPC 1997:Chapter III.)

In 2002, the California Department of Boating and Waterways completed the study, Sacramento–San Joaquin Delta Boating Needs Assessment 2000–2020. A summary of the pertinent survey results is as follows. In 2000, an estimated 6.4 million boating-related visitor days (a 2-day trip would equal 2 visitor days per individual) and 2.14 million boating trips to the Delta were recorded. On a peak day in 2000, more than 8,300 boats and 25,000 visitors boated in the Delta. Ninety-three percent of boating trips in the Delta were made by small boats (i.e., trailerable boats 26 feet long or shorter). Distance traveled while boating in the Delta ranged from an average of 20 miles for large boats to an average of 24 miles for small boats. Large-boat owners were more likely to stay in the Delta overnight and tended to stay a little longer than small-boat owners when taking overnight trips. Compared to the large-boat group, small-boat owners were more likely to fish or water-ski during their trips. Summer was the primary season of use for owners of both large and small boats, but 70 percent of boat owners indicated that they also used the Delta during the fall. In terms of boating travel patterns, 58 percent of large-boat owners traveled on connected waterways up to 50 miles from homeport, while most of the remaining 42 percent tended to travel shorter distances. Large-boat owners were most likely to cruise the Delta's waters, dine at a restaurant, sight see, or view wildlife, while small-boat boat owners were more likely to fish, camp, ski, or wake-board. The single most important aspect for the user boating experience was cited as water quality, and the need for improved water quality also was the most cited response to improve recreational boating in the Delta among those surveyed. (DBW 2002:Chapter 4.)

3.15.2 Discussion

a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

No Impact. Implementing the proposed project would not cause physical deterioration of existing recreational facilities. The proposed project would install temporary barriers in three Delta water channels up to three times in 10 years, including potentially in consecutive years, to protect water quality; it would not increase the population in the vicinity of the proposed project by introducing new housing or employment opportunities, and thus it would not contribute to increased use of existing regional or local parks, marinas, or other recreational facilities, causing their deterioration. Therefore, no impact would occur.

b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?

Less-than-Significant Impact. The EDB, which could be present from early May to November 15 up to three times in 10 years and potentially in successive years, would restrict recreational boat thru-traffic in Sutter Slough and West False River. Signs would be posted at both entrances to Sutter Slough, informing boaters of the closure and that Steamboat Slough would provide boat passage only for vessels up to 24 feet long and up to 10,000 pounds. Signs also would be posted at both entrances to West False River, informing boaters of the closure and availability of alternative routes (e.g., Fisherman's Cut or False River east for vessel traffic between the South Delta and the San Joaquin River; and the mainstem San Joaquin River for vessel traffic between Antioch and the eastern Delta).

Steamboat Slough is navigable by both commercial and recreational traffic, and boat transfer ramps on each side of the emergency drought barrier at this project site would be provided on the east side of the channel. As described in Chapter 2, "Project Description," two 12-foot-wide gravel roads would be constructed to provide connectivity with Grand Island Road. A State-provided boat tender with a pickup truck and trailer would be present on the apron during daytime hours. When a boat approached, the trailer would be backed into the water, the boat would be placed on the trailer, and it would be driven to the boat ramp on the other side, where it would be placed back in the river. The south ramp would be approximately 90 feet long, and the north ramp would be approximately 120 feet long. Dock anchors (comparable to mooring lines) would be used to stabilize the boat ramps. (The site-specific environmental impacts associated with construction of the two gravel access roads and the boat ramps on either side of the Steamboat Slough rock barrier are evaluated in each relevant topic area in Chapter 3, "Environmental Checklist.")

As discussed in Chapter 2, "Project Description," navigational markers would be used to prevent boaters from entering the immediate construction area, and speed limits would be posted. Safe vessel passage procedures would be coordinated with the U.S. Coast Guard District 11 and California Department of Parks and Recreation's

Division of Boating and Waterways (Cal Boating). An educational program would be offered to inform boaters about the purpose of the project and the expected duration of proposed project activities. The program would include notices in local newspapers and boater publications as appropriate; notices also would be posted at local marinas and boat launches, in the Local Notice to Mariners, and on the proposed project website.

Operation of the EDB at all three project sites could occur from early May to November 15 up to three times in 10 years, including potentially in successive years. After the barriers are removed in November, full recreational boat access would resume in each waterway.

The proposed project would not have a substantial adverse effect on recreation because public notices would be posted, temporary boat transfer ramps would be provided to facilitate navigation, alternate routes would be available, and the proposed project would be a limited size and of short duration. Therefore, the impact would be less than significant.

3.16 TRANSPORTATION AND TRAFFIC

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☒	☐
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☒	☐
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?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☒	☐
f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☒	☐

3.16.1 ENVIRONMENTAL SETTING

Roads in the vicinity of the project sites include Sutter Island Road, Road 145, Levee Road, Grand Island Road, Bradford Island Levee Road, and Jersey Island Road. State Route (SR) 160 and SR 84 are located nearby.

STATE HIGHWAYS

SR 160 is the primary state highway providing access to the area of the proposed project. SR 84 is another state highway located in the vicinity of the proposed project, and it is a two-lane conventional highway that extends from the Solano County line to West Sacramento City limits.

LOCAL ROADWAYS

Local access to the project sites would be provided by existing access roads to and within the Delta. Main access to the Sutter Slough project site would be from Road 145 and Levee Road. The monitoring equipment and operable culverts for the Sutter Slough project site would be accessed from Levee Road on the north or from Road 145. Project workers would access the boat transfer ramps at the Steamboat Slough project site from Grand Island Road, and the monitoring equipment and operable slide gates would be accessed from Sutter Island Road (both of which are public roads), or by boat. Workers at the West False River project site would access the site from Jersey Island Road.

BICYCLE FACILITIES, PUBLIC TRANSIT FACILITIES, AND AIRPORTS

No bicycle or public transit facilities or airports are located in the vicinity of the project sites.

3.16.2 DISCUSSION

a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?

Less-than-Significant Impact. Construction activities for the proposed project are not expected to adversely affect road traffic or transportation patterns. Because of the limited size of the proposed project, transport of materials and heavy equipment for construction would require a minimal number of truck trips; most materials and construction equipment would be brought to the project sites by barges, and most construction would take place in the water. Boat traffic may be temporarily restricted during construction for safety reasons. Boat traffic that normally uses Sutter Slough and West False River would use detours while the barriers are in place (using the Sacramento River around the Sutter Slough site and Fisherman's Cut around the West False River site), and temporary boat transfer ramps would be provided on each side of the Sutter Slough barrier site to facilitate passage of boats up to 22 feet long. Access to the Bradford Island ferry slip would be maintained during project activities. Because boat ramps would be provided to facilitate navigation, alternate navigation routes would be available, the temporary nature of the project, and the limited size of the proposed project, the impact on boat traffic would be less than significant.

The minimal hauling would be for transporting culvert frames from West Sacramento, block mats from Tracy, and steel from Oakland to the West False River project site. The materials would be stored until needed at existing, nearby DWR storage facilities. The movements of materials and construction equipment by barges and completion of most construction activities in the water would minimize traffic disturbances. Therefore, the impact would be less than significant.

b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?

Less-than-Significant Impact. As mentioned under Question a) above, transport of materials and heavy equipment would require a minimal number of trucks trips, and movement of materials and construction equipment by barges and completion of most construction activities in the water would help minimize traffic disturbances. Construction activities for the proposed project would not have the capacity to increase traffic or cause a substantial change in existing traffic patterns. Also, as described in Section 2.9.1, "Environmental Commitments," DWR would adhere to the standard construction best management practices described in the California Department of Transportation's Construction Site Best Management Practices Manual (California Department of Transportation 2003). Therefore, the proposed project would not add sufficient trips to degrade levels of service and would not conflict with an applicable congestion management program. Therefore, the impact would be less than significant.

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. No public airports are located in the vicinity of the project sites. The proposed project would not interfere with air traffic patterns. Therefore, no impact would occur.

d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

No Impact. The majority of construction activities for the proposed project would occur in the river at each site. The exceptions would be construction of the gravel roads to be used to access the boat ramps at Steamboat Slough, transport of road materials and boat ramps to this project site, and perhaps the installation of portions of the king piles and sheet piles at the West False River project site. The proposed project would not include any change to roadway design in the vicinity of the proposed project or introduce incompatible uses. Thus, the safety of the local transportation network would not be affected. Project operation would not result in any changes in land uses and would not alter the compatibility of uses served by the roadway network. Therefore, no impact would occur.

e) Result in inadequate emergency access?

Less-than-Significant Impact. Implementation of the proposed project would not require any road closures. The majority of construction activities for the proposed project would occur in the river at each site; therefore, no traffic flow would be significantly interrupted on any roadway. Construction-related traffic increases would be minimal relative to roadway capacity, would be temporary, and would occur in an area with low levels of existing traffic. Therefore, the proposed project would not impair or interfere with emergency access to local roads, and would not result in traffic delays that could substantially increase emergency response times or reduce emergency vehicle access. Therefore, the impact would be less than significant.

f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?

Less-than-Significant Impact. No public transit, bicycle, or pedestrian facilities are available in the vicinity of the project sites. Truck trips off-site would be limited to those needed at the start and conclusion of construction, and other trips would be limited to commute trips by up to 10 to 30 construction workers throughout construction, especially when the piles are being driven. Construction-related traffic would be minimal and would not interfere with any transit routes or service, or with operation of public transit, bicycle, or pedestrian facilities. Therefore, the proposed project would not conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, nor would it otherwise decrease the performance of such facilities. Therefore, the impact would be less than significant.

3.17 UTILITIES AND SERVICE SYSTEMS

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b) 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?	☐	☐	☐	☒
c) 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?	☐	☐	☐	☒
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☒	☐	☐
e) Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand, in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

3.17.1 ENVIRONMENTAL SETTING

The three project sites are not served by any public water supply system or municipal wastewater collection and treatment systems.

Solid waste generated at the Sutter Slough project site would be disposed at the Kiefer Landfill in Sacramento County or the Yolo County Central Landfill in Yolo County. Solid waste generated at the Steamboat Slough project site would be disposed at the Kiefer Landfill in Sacramento County. Solid waste generated at the West False River project site would be disposed at the Keller Canyon Landfill in Contra Costa County. All three landfills are permitted to accept general residential, commercial, and industrial refuse for disposal, including municipal solid waste, construction and demolition debris, green materials, agricultural debris, and other nonhazardous-designated debris. According to CalRecycle, the Kiefer Landfill, the Yolo County Central Landfill, and the Keller Canyon Landfill have permitted capacities to accept solid waste through January 1, 2064; January 1, 2081; and December 31, 2030, respectively (CalRecycle 2014a, 2014b, 2014c).

Per the 2013 California Green Building Code, 100 percent of trees, stumps, rocks, and associated vegetation and soils resulting primarily from land clearing must be reused or recycled (Title 24, Part 11, Chapter 5) (California Building Standards Commission 2014).

3.17.2 DISCUSSION

a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?

No Impact. The proposed project would not result in the need for wastewater service. In addition, the proposed project would not include any new development that would require wastewater treatment. Thus, the proposed project would not result in wastewater discharges that would exceed the Central Valley Regional Water Quality Control Board's requirements. Therefore, no impact would occur.

b) 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?

No Impact. The proposed project would not include any new development that would require water treatment. As discussed under Question a) above, the proposed project would not require wastewater service. Thus, expansion of existing or construction of new water or wastewater facilities would not be required. Therefore, no impact would occur.

c) 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?

No Impact. The proposed project would not create or contribute runoff that would exceed the capacity of any stormwater drainage systems, because no such systems exist in the vicinity of the proposed project. Furthermore, the proposed project would not include construction of new impervious surfaces or other development that would require new stormwater drainage facilities or expansion of existing facilities. Therefore, no impact would occur.

d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

Less than Significant with Mitigation Incorporated. No new water supplies would be required for the proposed project. In addition, the proposed project would not include any new development that would require public water supplies. Thus, no new or expanded water supply entitlements would be needed. The proposed project has the potential to temporarily impact water intakes close to the downstream side of the EDB. These locations may temporarily experience lower water levels during low tide (up to approximately 1.5 feet lower during the daily tidal cycle) while the barriers are in place. DWR will implement Mitigation Measure HYDRO-1 to provide emergency temporary pumps for any siphon or pump diversion that is adversely affected by the barriers. Therefore, this impact would be less than significant with mitigation incorporated.

Mitigation Measure HYDRO-1: Minimize Downstream Water Surface Elevation Impacts and Work with North Delta Water Agency to Minimize Salinity Changes for Water Users within the Agency's Boundaries

Timing: During barrier operation

Responsibility: DWR

e) Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand, in addition to the provider's existing commitments?

No Impact. As discussed under Questions a) and b) above, the proposed project would not generate any wastewater. Thus, the proposed project would not exceed a wastewater treatment provider's capacity. Therefore, no impact would occur.

f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?

Less-than-Significant Impact. Proposed project activities would not include demolition or other similar activities that would generate solid waste. As discussed in Chapter 2, "Project Description," minimal vegetation and clearing would be required on the levees before placement of rock or the installation of sheet piles, and the gravel access roads at the Steamboat Slough project site also would be cleared and grubbed of trees and other vegetation. In compliance with the 2013 California Green Building Code, 100 percent of any vegetation or trees that were removed would be reused or recycled.

As described in Section 3.17.1, "Environmental Setting," any solid waste generated during proposed project activities would be disposed in the Kiefer Landfill, the Yolo County Central Landfill, or the Keller Canyon Landfill. Solid waste generated during proposed project activities would be incidental, and these landfill facilities have sufficient permitted capacity to accommodate the solid waste disposal needs of the proposed project. Operation of the proposed project would not generate solid waste. Therefore, the impact would be less than significant.

g) Comply with federal, state, and local statutes and regulations related to solid waste?

No Impact. As discussed under Question f) above, vegetation and trees that were removed would be reused or recycled, in compliance with the 2013 California Green Building Code. Any solid waste generated during proposed project activities would be incidental and would be disposed in the Kiefer Landfill, the Yolo County Central Landfill, or the Keller Canyon Landfill. Transportation and disposal would be in accordance with all applicable federal, state, and local statutes and regulations. Therefore, no impact would occur.

3.18 MANDATORY FINDINGS OF SIGNIFICANCE

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of an endangered, rare, or threatened species, or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☐	☐	☒	☐
c) Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☒	☐

Authority: Public Resources Code Sections 21083, 21083.5.
Reference: Government Code Sections 65088.4.
Public Resources Code Sections 21080, 21083.5, 21095; *Eureka Citizens for Responsible Govt. v. City of Eureka* (2007) 147 Cal.App.4th 357; *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th at 1109; *San Franciscans Upholding the Downtown Plan v. City and County of San Francisco* (2002) 102 Cal.App.4th 656.

3.18.1 DISCUSSION

a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of an endangered, rare, or threatened species, or eliminate important examples of the major periods of California history or prehistory?

Less than Significant with Mitigation Incorporated. The analysis conducted in this IS concludes that with incorporation of the Environmental Commitments in the project description and mitigation measures, implementation of the proposed project would not have a significant impact on the environment. As evaluated in Section 3.4, "Biological Resources," impacts on biological resources would be less than significant with the incorporation of Environmental Commitments and mitigation measures. Therefore, the proposed project would not substantially degrade the quality of the environment; substantially reduce the habitat of a fish or wildlife species; cause a fish or wildlife population to drop below self-sustaining levels; threaten to eliminate a plant or animal community; or reduce the number or restrict the range of an endangered, rare, or threatened species.

As discussed in Section 3.5, “Cultural Resources,” the proposed project would not eliminate important examples of the major periods of California history or prehistory, and impacts on cultural resources would be less than significant with incorporation of the mitigation measures presented in Section 3.5.

b) Does the project have impacts that are individually limited, but cumulatively considerable? (“Cumulatively considerable” means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)

Less-than-Significant Impact. The proposed project almost exclusively would result in short-term, temporary impacts that would be limited primarily to the three project sites and their immediate vicinities. As discussed in this IS, the proposed project would result in less-than-significant impacts or no impacts on aesthetics, geology and soils, hazards and hazardous materials, land use and planning, mineral resources, population and housing, public services, recreation, and transportation and traffic. The proposed project’s impacts on air quality, agriculture and forestry resources, biological resources, cultural resources, GHG emissions, hydrology and water quality, noise, and utilities and services systems would be mitigated to less than significant with the incorporation of mitigation measures. Incorporation of Environmental Commitments, in combination with implementation of mitigation measures for several resource areas and the temporary nature of the proposed project, with short-term barrier installations up to three times in a 10-year period, would combine to minimize the project’s contributions to any significant cumulative impacts on any environmental resources.

Similar temporary barriers were constructed and removed in the Delta in 1976 and 1977 during the 1976-1977 drought. There were no known or identified adverse cumulative effects resulting from implementation of the previous barriers, although numerous studies were ongoing in the Delta during and after barrier implementation.

Recently completed projects in the vicinity of the proposed project include two levee strengthening projects in 2014 on Bradford and Jersey Islands, adjacent to the proposed West False River barrier, by Reclamation Districts 2059 and 830, respectively. No lasting adverse impacts resulted from these projects; therefore, the proposed project would not interact with these two localized projects in any manner and would not make a cumulatively considerable incremental contribution to any significant cumulative impacts involving these two levee projects.

DWR’s proposed Delta Flood Emergency Facilities Improvement Project would include improvements at potential rock storage facilities to facilitate levee repairs during flood fighting. Improvements would occur at DWR’s Stockton West Webber and Rio Vista transfer facilities sites, and the Delta Flood Emergency Facilities Improvement Project would also include the movement of quarry rock stockpiles from Stockton to the Rio Vista site. Mitigation measures were included in the Initial Study/Mitigated Negative Declaration (IS/MND) and subsequent IS/MND prepared for the Delta Flood Emergency Facilities Improvement Project to reduce environmental effects to less-than-significant levels. No lasting significant impacts or cumulatively considerable incremental contributions to significant cumulative impacts would occur given the short-term nature of the projects and mitigation measures in place to minimize potential effects.

Installation of the proposed project in 2015 is considered as part of the Interagency 2015 Drought Contingency Strategy developed by Reclamation, DWR, USFWS, NMFS, and CDFW. The December 11, 2014 draft of the Interagency 2015 Drought Contingency Strategy includes several core principles for CVP and SWP operations, one of which is to control salt water intrusion in the Delta. As noted in the draft, installation of emergency drought barriers will be considered in 2015 only when necessary to lessen water quality impacts if winter forecasts suggest that there will be insufficient water in upstream reservoirs without installation of the barriers necessary to protect water quality and to meet health and safety and other critical water supply needs. The Interagency 2015 Drought Contingency Strategy and the January 15, 2015 Drought Contingency Plan, which forms an integral part of the strategy, were prepared as guidance documents and the proposed project is consistent with the guidance in those documents. Neither the Interagency 2015 Drought Contingency Strategy nor the January 15, 2015 Drought Contingency Plan, which are guidance documents, trigger CEQA. Action within these plans will only be undertaken where a Temporary Urgency Change Petition is submitted to the State Water Resources Control Board and consultation occurs with the Fisheries Agencies to obtain the appropriate permitting for the specific actions proposed for implementation. Additional agency action is necessary where these plans call for the immediate installation of the Proposed Project.

For the reasons stated above, the proposed project would not make a cumulatively considerable incremental contribution to any significant cumulative adverse impact.

c) Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?

Less-than-Significant Impact. As discussed above, the proposed project would result in less-than-significant impacts with incorporation of the Environmental Commitments (see Section 2.9.1, "Environmental Commitments") and mitigation measures, and would not cause substantial adverse effects on human beings, either directly or indirectly. Mitigation measures would be implemented to reduce the proposed project's potential significant effects on air quality, agriculture and forestry resources, biological resources, cultural resources, GHG emissions, hydrology and water quality, noise, and utilities and services systems to less-than-significant levels. Therefore, the impact would be less than significant and the proposed project would not cause substantial adverse effect on human beings, either directly or indirectly.

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No references cited.

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APPENDIX A

Air Quality and Greenhouse Gas Emission Calculations

Sutter Slough Construction

Sacramento Valley Air Basin, Annual

1.0 Project Characteristics

1.1 Land Usage

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.5	**Precipitation Freq (Days)**	65
Climate Zone	2			**Operational Year**	2015
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Construction Phase - DWR assumptions

Off-road Equipment - DWR assumptions

Off-road Equipment - DWR assumptions

Off-road Equipment - DWR assumptions

Off-road Equipment - DWR assumptions

Trips and VMT - on-road emissions performed off-model using EMFAC2011

Table Name	Column Name	Default Value	New Value
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tblConstructionPhase	PhaseEndDate	2/24/2015	2/27/2015
tblConstructionPhase	PhaseStartDate	1/23/2015	1/26/2015
tblConstructionPhase	PhaseStartDate	2/4/2015	2/9/2015
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tblOffRoadEquipment	OffRoadEquipmentType	Pavers	Excavators
tblOffRoadEquipment	OffRoadEquipmentType	Rollers	Rubber Tired Dozers
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tblOffRoadEquipment	OffRoadEquipmentType		Generator Sets
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tblTripsAndVMT	PhaseName		Place Culverts - 2 days
tblTripsAndVMT	PhaseName		Place Culverts - 5 days
tblTripsAndVMT	PhaseName		Removal
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tblTripsAndVMT	WorkerTripNumber	5.00	0.00
tblTripsAndVMT	WorkerTripNumber	18.00	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2015	0.0671	0.7491	0.4565	5.8000e-004	0.0339	0.0377	0.0716	0.0186	0.0348	0.0534	0.0000	54.7770	54.7770	0.0161	0.0000	55.1145
Total	**0.0671**	**0.7491**	**0.4565**	**5.8000e-004**	**0.0339**	**0.0377**	**0.0716**	**0.0186**	**0.0348**	**0.0534**	**0.0000**	**54.7770**	**54.7770**	**0.0161**	**0.0000**	**55.1145**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2015	0.0671	0.7491	0.4565	5.8000e-004	0.0339	0.0377	0.0716	0.0186	0.0348	0.0534	0.0000	54.7770	54.7770	0.0161	0.0000	55.1145
Total	**0.0671**	**0.7491**	**0.4565**	**5.8000e-004**	**0.0339**	**0.0377**	**0.0716**	**0.0186**	**0.0348**	**0.0534**	**0.0000**	**54.7770**	**54.7770**	**0.0161**	**0.0000**	**55.1145**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**					**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**					**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Place Rock	Site Preparation	1/9/2015	1/22/2015	5	10	
2	Place Culverts - 2 days	Grading	1/26/2015	1/27/2015	5	2	
3	Place Culverts - 5 days	Building Construction	1/28/2015	2/3/2015	5	5	
4	Removal	Paving	2/9/2015	2/27/2015	5	15	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Place Rock	Tractors/Loaders/Backhoes	2	9.00	97	0.37
Removal	Excavators	2	8.00	157	0.38
Place Rock	Other Material Handling Equipment	2	9.00	196	0.34
Place Culverts - 2 days	Forklifts	1	6.00	149	0.73
Place Culverts - 5 days	Cranes	1	7.00	208	0.29
Place Culverts - 5 days	Forklifts	1	5.00	149	0.20
Place Rock	Cranes	2	9.00	208	0.29
Removal	Excavators	2	8.00	157	0.38
Removal	Rubber Tired Dozers	1	8.00	358	0.40
Place Culverts - 5 days	Generator Sets	1	8.00	84	0.50
Place Culverts - 2 days	Skid Steer Loaders	1	6.00	37	0.40
Place Culverts - 5 days	Air Compressors	1	8.00	78	0.32
Removal	Graders	1	8.00	162	0.41
Removal	Tractors/Loaders/Backhoes	1	8.00	75	0.37
Place Rock	Rubber Tired Dozers	1	9.00	358	0.40

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Place Rock	7	0.00			10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Place Culverts - 2 days	2	0.00			10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Place Culverts - 5 days	4	0.00			10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Removal	7	0.00			10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Place Rock - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0339	0.0000	0.0339	0.0186	0.0000	0.0186	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0272	0.3149	0.1675	2.3000e-004		0.0151	0.0151		0.0139	0.0139	0.0000	21.6258	21.6258	6.4600e-003	0.0000	21.7614
Total	**0.0272**	**0.3149**	**0.1675**	**2.3000e-004**	**0.0339**	**0.0151**	**0.0490**	**0.0186**	**0.0139**	**0.0326**	**0.0000**	**21.6258**	**21.6258**	**6.4600e-003**	**0.0000**	**21.7614**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.2 Place Rock - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0339	0.0000	0.0339	0.0186	0.0000	0.0186	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0272	0.3149	0.1675	2.3000e-004		0.0151	0.0151		0.0139	0.0139	0.0000	21.6258	21.6258	6.4600e-003	0.0000	21.7614
Total	**0.0272**	**0.3149**	**0.1675**	**2.3000e-004**	**0.0339**	**0.0151**	**0.0490**	**0.0186**	**0.0139**	**0.0326**	**0.0000**	**21.6258**	**21.6258**	**6.4600e-003**	**0.0000**	**21.7614**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Place Culverts - 2 days - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	9.4000e-004	9.7000e-003	5.8500e-003	1.0000e-005		5.3000e-004	5.3000e-004		4.9000e-004	4.9000e-004	0.0000	0.7691	0.7691	2.3000e-004	0.0000	0.7739
Total	**9.4000e-004**	**9.7000e-003**	**5.8500e-003**	**1.0000e-005**		**5.3000e-004**	**5.3000e-004**		**4.9000e-004**	**4.9000e-004**	**0.0000**	**0.7691**	**0.7691**	**2.3000e-004**	**0.0000**	**0.7739**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Place Culverts - 2 days - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	9.4000e-004	9.7000e-003	5.8500e-003	1.0000e-005		5.3000e-004	5.3000e-004		4.9000e-004	4.9000e-004	0.0000	0.7691	0.7691	2.3000e-004	0.0000	0.7739
Total	**9.4000e-004**	**9.7000e-003**	**5.8500e-003**	**1.0000e-005**		**5.3000e-004**	**5.3000e-004**		**4.9000e-004**	**4.9000e-004**	**0.0000**	**0.7691**	**0.7691**	**2.3000e-004**	**0.0000**	**0.7739**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Place Culverts - 5 days - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.0600e-003	0.0372	0.0197	3.0000e-005		2.2100e-003	2.2100e-003		2.1200e-003	2.1200e-003	0.0000	2.9747	2.9747	6.1000e-004	0.0000	2.9874
Total	**4.0600e-003**	**0.0372**	**0.0197**	**3.0000e-005**		**2.2100e-003**	**2.2100e-003**		**2.1200e-003**	**2.1200e-003**	**0.0000**	**2.9747**	**2.9747**	**6.1000e-004**	**0.0000**	**2.9874**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Place Culverts - 5 days - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.0600e-003	0.0372	0.0197	3.0000e-005		2.2100e-003	2.2100e-003		2.1200e-003	2.1200e-003	0.0000	2.9747	2.9747	6.1000e-004	0.0000	2.9874
Total	**4.0600e-003**	**0.0372**	**0.0197**	**3.0000e-005**		**2.2100e-003**	**2.2100e-003**		**2.1200e-003**	**2.1200e-003**	**0.0000**	**2.9747**	**2.9747**	**6.1000e-004**	**0.0000**	**2.9874**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.5 Removal - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0349	0.3873	0.2634	3.1000e-004		0.0198	0.0198		0.0182	0.0182	0.0000	29.4075	29.4075	8.7800e-003	0.0000	29.5918
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0349**	**0.3873**	**0.2634**	**3.1000e-004**		**0.0198**	**0.0198**		**0.0182**	**0.0182**	**0.0000**	**29.4075**	**29.4075**	**8.7800e-003**	**0.0000**	**29.5918**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.5 Removal - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0349	0.3873	0.2634	3.1000e-004		0.0198	0.0198		0.0182	0.0182	0.0000	29.4074	29.4074	8.7800e-003	0.0000	29.5918
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0349**	**0.3873**	**0.2634**	**3.1000e-004**		**0.0198**	**0.0198**		**0.0182**	**0.0182**	**0.0000**	**29.4074**	**29.4074**	**8.7800e-003**	**0.0000**	**29.5918**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Total					

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by

4.4 Fleet Mix

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.463485	0.061854	0.180909	0.155557	0.057717	0.007416	0.018839	0.040154	0.001832	0.001702	0.006979	0.000705	0.002851

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**					**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**					**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

DWR EDB - Steamboat Slough

Sacramento Valley Air Basin, Annual

1.0 Project Characteristics

1.1 Land Usage

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	3.5	**Precipitation Freq (Days)**	65
Climate Zone	2			**Operational Year**	2015
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Construction Phase - DWR construction assumptions

Off-road Equipment - DWR assumptions

Off-road Equipment - DWR assumptions

Off-road Equipment - DWR assumptions

Off-road Equipment - DWR assumptions

Off-road Equipment - DWR assumptions

Off-road Equipment - DWR assumptions

Off-road Equipment - DWR assumptions

Off-road Equipment - DWR assumptions

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	0.00	15.00
tblConstructionPhase	NumDays	0.00	5.00
tblConstructionPhase	NumDays	0.00	10.00
tblConstructionPhase	NumDays	0.00	3.00
tblConstructionPhase	NumDays	0.00	10.00
tblConstructionPhase	NumDays	0.00	2.00
tblConstructionPhase	NumDays	0.00	30.00
tblConstructionPhase	NumDays	0.00	15.00
tblConstructionPhase	PhaseStartDate	2/14/2015	2/16/2015
tblConstructionPhase	PhaseStartDate	1/24/2015	1/26/2015
tblConstructionPhase	PhaseStartDate	1/31/2015	2/2/2015
tblConstructionPhase	PhaseStartDate	1/17/2015	1/19/2015
tblConstructionPhase	PhaseStartDate	3/7/2015	3/9/2015
tblConstructionPhase	PhaseStartDate	4/18/2015	4/20/2015
tblOffRoadEquipment	HorsePower	97.00	75.00
tblOffRoadEquipment	HorsePower	174.00	162.00
tblOffRoadEquipment	HorsePower	226.00	208.00
tblOffRoadEquipment	HorsePower	89.00	149.00
tblOffRoadEquipment	HorsePower	226.00	208.00
tblOffRoadEquipment	HorsePower	174.00	162.00
tblOffRoadEquipment	HorsePower	167.00	196.00
tblOffRoadEquipment	HorsePower	89.00	149.00
tblOffRoadEquipment	HorsePower	64.00	37.00
tblOffRoadEquipment	HorsePower	255.00	358.00
tblOffRoadEquipment	HorsePower	89.00	149.00
tblOffRoadEquipment	HorsePower	162.00	157.00
tblOffRoadEquipment	HorsePower	174.00	162.00

tblOffRoadEquipment	HorsePower	97.00	75.00
tblOffRoadEquipment	HorsePower	97.00	75.00
tblOffRoadEquipment	HorsePower	255.00	358.00
tblOffRoadEquipment	HorsePower	97.00	75.00
tblOffRoadEquipment	LoadFactor	0.48	0.32
tblOffRoadEquipment	LoadFactor	0.20	0.20
tblOffRoadEquipment	LoadFactor	0.40	0.34
tblOffRoadEquipment	LoadFactor	0.74	0.50
tblOffRoadEquipment	LoadFactor	0.40	0.40
tblOffRoadEquipment	OffRoadEquipmentType	Cement and Mortar Mixers	Graders
tblOffRoadEquipment	OffRoadEquipmentType	Cranes	Air Compressors
tblOffRoadEquipment	OffRoadEquipmentType		Cranes
tblOffRoadEquipment	OffRoadEquipmentType		Graders
tblOffRoadEquipment	OffRoadEquipmentType	Rubber Tired Dozers	Other Material Handling Equipment
tblOffRoadEquipment	OffRoadEquipmentType		Generator Sets
tblOffRoadEquipment	OffRoadEquipmentType		Skid Steer Loaders
tblOffRoadEquipment	OffRoadEquipmentType	Cranes	Rubber Tired Dozers
tblOffRoadEquipment	OffRoadEquipmentType	Cranes	Excavators
tblOffRoadEquipment	OffRoadEquipmentType	Cranes	Graders
tblOffRoadEquipment	OffRoadEquipmentType	Forklifts	Rubber Tired Dozers
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	PhaseName		Place Culverts - 15
tblOffRoadEquipment	PhaseName		Place Culverts - 10
tblOffRoadEquipment	PhaseName		Place Rock
tblOffRoadEquipment	PhaseName		Place Culverts - 3

tblOffRoadEquipment	PhaseName		Removal - 30
tblOffRoadEquipment	PhaseName		Place Rock
tblOffRoadEquipment	PhaseName		Place Culverts - 5
tblOffRoadEquipment	PhaseName		Place Culverts - 5
tblOffRoadEquipment	UsageHours	4.00	13.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblOffRoadEquipment	UsageHours	8.00	10.00
tblProjectCharacteristics	OperationalYear	2014	2015
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2015	0.1356	1.4913	0.9226	1.1600e-003	0.0000	0.0780	0.0780	0.0000	0.0719	0.0719	0.0000	110.6002	110.6002	0.0327	0.0000	111.2876
Total	**0.1356**	**1.4913**	**0.9226**	**1.1600e-003**	**0.0000**	**0.0780**	**0.0780**	**0.0000**	**0.0719**	**0.0719**	**0.0000**	**110.6002**	**110.6002**	**0.0327**	**0.0000**	**111.2876**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2015	0.1356	1.0432	0.9226	1.1600e-003	0.0000	0.0780	0.0780	0.0000	0.0719	0.0719	0.0000	110.6000	110.6000	0.0327	0.0000	111.2875
Total	**0.1356**	**1.0432**	**0.9226**	**1.1600e-003**	**0.0000**	**0.0780**	**0.0780**	**0.0000**	**0.0719**	**0.0719**	**0.0000**	**110.6000**	**110.6000**	**0.0327**	**0.0000**	**111.2875**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**30.05**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**					**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**					**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Place Rock	Building Construction	1/5/2015	1/16/2015	5	10	
2	Place Culverts - 2	Building Construction	1/19/2015	1/20/2015	5	2	
3	Place Culverts - 3	Building Construction	1/21/2015	1/23/2015	5	3	
4	Place Culverts - 5	Building Construction	1/26/2015	1/30/2015	5	5	
5	Place Culverts - 10	Building Construction	2/2/2015	2/13/2015	5	10	
6	Place Culverts - 15	Building Construction	2/16/2015	3/6/2015	5	15	
7	Removal - 30	Building Construction	3/9/2015	4/17/2015	5	30	
8	Removal - 15	Building Construction	4/20/2015	5/8/2015	5	15	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Place Culverts - 15	Tractors/Loaders/Backhoes	2	8.00	75	0.37
Place Culverts - 10	Graders	1	8.00	162	0.41
Place Rock	Cranes	2	13.00	208	0.29
Place Culverts - 3	Cranes	1	8.00	208	0.29
Place Culverts - 5	Air Compressors	1	8.00	78	0.32
Place Culverts - 5	Forklifts	2	8.00	149	0.20
Place Culverts - 5	Generator Sets	1	8.00	84	0.50
Removal - 30	Graders	1	8.00	162	0.41
Place Rock	Other Material Handling Equipment	2	10.00	196	0.34
Place Culverts - 5	Skid Steer Loaders	1	8.00	37	0.37
Place Culverts - 5	Forklifts	1	8.00	149	0.20
Place Rock	Rubber Tired Dozers	1	10.00	358	0.40
Place Culverts - 2	Forklifts	2	8.00	149	0.20
Removal - 30	Excavators	5	8.00	157	0.38
Removal - 15	Graders	1	8.00	162	0.41
Place Rock	Tractors/Loaders/Backhoes	2	10.00	75	0.37
Place Culverts - 2	Tractors/Loaders/Backhoes	2	8.00	75	0.37
Removal - 30	Rubber Tired Dozers	1	8.00	358	0.40
Removal - 30	Tractors/Loaders/Backhoes	2	8.00	75	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Place Rock					16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Place Culverts - 2					16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Place Culverts - 5					16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Place Culverts - 10					16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Place Culverts - 15					16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Removal - 30					16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Removal - 15					16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Place Rock - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0320	0.3725	0.1912	2.6000e-004		0.0175	0.0175		0.0161	0.0161	0.0000	25.1500	25.1500	7.5100e-003	0.0000	25.3076
Total	**0.0320**	**0.3725**	**0.1912**	**2.6000e-004**		**0.0175**	**0.0175**		**0.0161**	**0.0161**	**0.0000**	**25.1500**	**25.1500**	**7.5100e-003**	**0.0000**	**25.3076**

3.2 Place Rock - 2015

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0320	0.2912	0.1912	2.6000e-004		0.0175	0.0175		0.0161	0.0161	0.0000	25.1499	25.1499	7.5100e-003	0.0000	25.3076
Total	**0.0320**	**0.2912**	**0.1912**	**2.6000e-004**		**0.0175**	**0.0175**		**0.0161**	**0.0161**	**0.0000**	**25.1499**	**25.1499**	**7.5100e-003**	**0.0000**	**25.3076**

3.2 Place Rock - 2015

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Place Culverts - 2 - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.1500e-003	0.0118	7.4500e-003	1.0000e-005		7.7000e-004	7.7000e-004		7.1000e-004	7.1000e-004	0.0000	0.9471	0.9471	2.8000e-004	0.0000	0.9531
Total	**1.1500e-003**	**0.0118**	**7.4500e-003**	**1.0000e-005**		**7.7000e-004**	**7.7000e-004**		**7.1000e-004**	**7.1000e-004**	**0.0000**	**0.9471**	**0.9471**	**2.8000e-004**	**0.0000**	**0.9531**

3.3 Place Culverts - 2 - 2015

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.1500e-003	0.0118	7.4500e-003	1.0000e-005		7.7000e-004	7.7000e-004		7.1000e-004	7.1000e-004	0.0000	0.9471	0.9471	2.8000e-004	0.0000	0.9531
Total	**1.1500e-003**	**0.0118**	**7.4500e-003**	**1.0000e-005**		**7.7000e-004**	**7.7000e-004**		**7.1000e-004**	**7.1000e-004**	**0.0000**	**0.9471**	**0.9471**	**2.8000e-004**	**0.0000**	**0.9531**

3.3 Place Culverts - 2 - 2015

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Place Culverts - 3 - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.0200e-003	0.0121	4.2100e-003	1.0000e-005		5.5000e-004	5.5000e-004		5.1000e-004	5.1000e-004	0.0000	0.7370	0.7370	2.2000e-004	0.0000	0.7416
Total	**1.0200e-003**	**0.0121**	**4.2100e-003**	**1.0000e-005**		**5.5000e-004**	**5.5000e-004**		**5.1000e-004**	**5.1000e-004**	**0.0000**	**0.7370**	**0.7370**	**2.2000e-004**	**0.0000**	**0.7416**

3.4 Place Culverts - 3 - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.0200e-003	0.0121	4.2100e-003	1.0000e-005		5.5000e-004	5.5000e-004		5.1000e-004	5.1000e-004	0.0000	0.7370	0.7370	2.2000e-004	0.0000	0.7416
Total	**1.0200e-003**	**0.0121**	**4.2100e-003**	**1.0000e-005**		**5.5000e-004**	**5.5000e-004**		**5.1000e-004**	**5.1000e-004**	**0.0000**	**0.7370**	**0.7370**	**2.2000e-004**	**0.0000**	**0.7416**

3.5 Place Culverts - 5 - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.7300e-003	0.0415	0.0270	4.0000e-005		2.6200e-003	2.6200e-003		2.5000e-003	2.5000e-003	0.0000	3.6667	3.6667	8.1000e-004	0.0000	3.6837
Total	**4.7300e-003**	**0.0415**	**0.0270**	**4.0000e-005**		**2.6200e-003**	**2.6200e-003**		**2.5000e-003**	**2.5000e-003**	**0.0000**	**3.6667**	**3.6667**	**8.1000e-004**	**0.0000**	**3.6837**

3.5 Place Culverts - 5 - 2015

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.7300e-003	0.0300	0.0270	4.0000e-005		2.6200e-003	2.6200e-003		2.5000e-003	2.5000e-003	0.0000	3.6667	3.6667	8.1000e-004	0.0000	3.6837
Total	**4.7300e-003**	**0.0300**	**0.0270**	**4.0000e-005**		**2.6200e-003**	**2.6200e-003**		**2.5000e-003**	**2.5000e-003**	**0.0000**	**3.6667**	**3.6667**	**8.1000e-004**	**0.0000**	**3.6837**

3.5 Place Culverts - 5 - 2015

Mitigated Construction Off-Site

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.6 Place Culverts - 10 - 2015

Unmitigated Construction On-Site

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	tons/yr										MT/yr					
Off-Road	4.9300e-003	0.0504	0.0231	3.0000e-005		2.8400e-003	2.8400e-003		2.6100e-003	2.6100e-003	0.0000	2.7661	2.7661	8.3000e-004	0.0000	2.7834
Total	**4.9300e-003**	**0.0504**	**0.0231**	**3.0000e-005**		**2.8400e-003**	**2.8400e-003**		**2.6100e-003**	**2.6100e-003**	**0.0000**	**2.7661**	**2.7661**	**8.3000e-004**	**0.0000**	**2.7834**

3.6 Place Culverts - 10 - 2015

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.9300e-003	0.0504	0.0231	3.0000e-005		2.8400e-003	2.8400e-003		2.6100e-003	2.6100e-003	0.0000	2.7661	2.7661	8.3000e-004	0.0000	2.7834
Total	**4.9300e-003**	**0.0504**	**0.0231**	**3.0000e-005**		**2.8400e-003**	**2.8400e-003**		**2.6100e-003**	**2.6100e-003**	**0.0000**	**2.7661**	**2.7661**	**8.3000e-004**	**0.0000**	**2.7834**

3.6 Place Culverts - 10 - 2015

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.7 Place Culverts - 15 - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.1600e-003	0.0396	0.0280	4.0000e-005		3.1000e-003	3.1000e-003		2.8500e-003	2.8500e-003	0.0000	3.4317	3.4317	1.0200e-003	0.0000	3.4532
Total	**4.1600e-003**	**0.0396**	**0.0280**	**4.0000e-005**		**3.1000e-003**	**3.1000e-003**		**2.8500e-003**	**2.8500e-003**	**0.0000**	**3.4317**	**3.4317**	**1.0200e-003**	**0.0000**	**3.4532**

3.7 Place Culverts - 15 - 2015

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.1600e-003	0.0396	0.0280	4.0000e-005		3.1000e-003	3.1000e-003		2.8500e-003	2.8500e-003	0.0000	3.4317	3.4317	1.0200e-003	0.0000	3.4532
Total	**4.1600e-003**	**0.0396**	**0.0280**	**4.0000e-005**		**3.1000e-003**	**3.1000e-003**		**2.8500e-003**	**2.8500e-003**	**0.0000**	**3.4317**	**3.4317**	**1.0200e-003**	**0.0000**	**3.4532**

3.7 Place Culverts - 15 - 2015

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.8 Removal - 30 - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0803	0.8878	0.6069	7.3000e-004		0.0463	0.0463		0.0426	0.0426	0.0000	69.7525	69.7525	0.0208	0.0000	70.1898
Total	**0.0803**	**0.8878**	**0.6069**	**7.3000e-004**		**0.0463**	**0.0463**		**0.0426**	**0.0426**	**0.0000**	**69.7525**	**69.7525**	**0.0208**	**0.0000**	**70.1898**

3.8 Removal - 30 - 2015

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0803	0.5324	0.6069	7.3000e-004		0.0463	0.0463		0.0426	0.0426	0.0000	69.7525	69.7525	0.0208	0.0000	70.1898
Total	**0.0803**	**0.5324**	**0.6069**	**7.3000e-004**		**0.0463**	**0.0463**		**0.0426**	**0.0426**	**0.0000**	**69.7525**	**69.7525**	**0.0208**	**0.0000**	**70.1898**

3.8 Removal - 30 - 2015

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.9 Removal - 15 - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	7.3900e-003	0.0757	0.0347	4.0000e-005		4.2500e-003	4.2500e-003		3.9100e-003	3.9100e-003	0.0000	4.1491	4.1491	1.2400e-003	0.0000	4.1751
Total	**7.3900e-003**	**0.0757**	**0.0347**	**4.0000e-005**		**4.2500e-003**	**4.2500e-003**		**3.9100e-003**	**3.9100e-003**	**0.0000**	**4.1491**	**4.1491**	**1.2400e-003**	**0.0000**	**4.1751**

3.9 Removal - 15 - 2015

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	7.3900e-003	0.0757	0.0347	4.0000e-005		4.2500e-003	4.2500e-003		3.9100e-003	3.9100e-003	0.0000	4.1491	4.1491	1.2400e-003	0.0000	4.1751
Total	**7.3900e-003**	**0.0757**	**0.0347**	**4.0000e-005**		**4.2500e-003**	**4.2500e-003**		**3.9100e-003**	**3.9100e-003**	**0.0000**	**4.1491**	**4.1491**	**1.2400e-003**	**0.0000**	**4.1751**

3.9 Removal - 15 - 2015

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Total					

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.463485	0.061854	0.180909	0.155557	0.057717	0.007416	0.018839	0.040154	0.001832	0.001702	0.006979	0.000705	0.002851

5.0 Energy Detail

4.4 Fleet Mix

Historical Energy Use: N

5.1 Mitigation Measures Energy

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**					**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**					**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

West False River Construction

Contra Costa County, Annual

1.0 Project Characteristics

1.1 Land Usage

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	58
Climate Zone	4			**Operational Year**	2015
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Construction Phase - DWR assumptions

Off-road Equipment - DWR assumptions

Off-road Equipment - DWR assumptions

Off-road Equipment - DWR assumptions

Off-road Equipment - DWR assumptions

Off-road Equipment - DWR assumptions

Trips and VMT - on-road emissions performed off-model using EMFAC2011

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	0.00	15.00
tblConstructionPhase	NumDays	0.00	37.00

tblConstructionPhase	NumDays	0.00	10.00
tblConstructionPhase	NumDays	0.00	45.00
tblConstructionPhase	NumDays	0.00	5.00
tblConstructionPhase	PhaseEndDate	4/7/2015	4/10/2015
tblConstructionPhase	PhaseStartDate	3/18/2015	3/23/2015
tblConstructionPhase	PhaseStartDate	4/11/2015	4/13/2015
tblGrading	AcresOfGrading	3.13	0.00
tblOffRoadEquipment	HorsePower	162.00	157.00
tblOffRoadEquipment	HorsePower	226.00	208.00
tblOffRoadEquipment	HorsePower	226.00	208.00
tblOffRoadEquipment	HorsePower	174.00	162.00
tblOffRoadEquipment	HorsePower	80.00	84.00
tblOffRoadEquipment	HorsePower	162.00	157.00
tblOffRoadEquipment	HorsePower	255.00	358.00
tblOffRoadEquipment	HorsePower	255.00	358.00
tblOffRoadEquipment	HorsePower	89.00	149.00
tblOffRoadEquipment	HorsePower	97.00	75.00
tblOffRoadEquipment	HorsePower	97.00	75.00
tblOffRoadEquipment	HorsePower	64.00	37.00
tblOffRoadEquipment	HorsePower	167.00	196.00
tblOffRoadEquipment	HorsePower	226.00	208.00
tblOffRoadEquipment	HorsePower	89.00	149.00
tblOffRoadEquipment	HorsePower	226.00	208.00
tblOffRoadEquipment	HorsePower	174.00	162.00
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.29	0.29
tblOffRoadEquipment	LoadFactor	0.29	0.29
tblOffRoadEquipment	LoadFactor	0.41	0.41

tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.40	0.40
tblOffRoadEquipment	LoadFactor	0.40	0.40
tblOffRoadEquipment	LoadFactor	0.20	0.20
tblOffRoadEquipment	LoadFactor	0.37	0.37
tblOffRoadEquipment	LoadFactor	0.48	0.32
tblOffRoadEquipment	LoadFactor	0.37	0.37
tblOffRoadEquipment	LoadFactor	0.37	0.37
tblOffRoadEquipment	LoadFactor	0.40	0.34
tblOffRoadEquipment	LoadFactor	0.29	0.29
tblOffRoadEquipment	LoadFactor	0.20	0.20
tblOffRoadEquipment	LoadFactor	0.29	0.29
tblOffRoadEquipment	LoadFactor	0.41	0.41
tblOffRoadEquipment	LoadFactor	0.74	0.50
tblOffRoadEquipment	OffRoadEquipmentType	Cement and Mortar Mixers	Excavators
tblOffRoadEquipment	OffRoadEquipmentType	Concrete/Industrial Saws	Cranes
tblOffRoadEquipment	OffRoadEquipmentType	Concrete/Industrial Saws	Cranes
tblOffRoadEquipment	OffRoadEquipmentType	Cranes	Graders
tblOffRoadEquipment	OffRoadEquipmentType	Graders	Rollers
tblOffRoadEquipment	OffRoadEquipmentType	Pavers	Excavators
tblOffRoadEquipment	OffRoadEquipmentType	Rollers	Rubber Tired Dozers
tblOffRoadEquipment	OffRoadEquipmentType	Rubber Tired Dozers	Forklifts
tblOffRoadEquipment	OffRoadEquipmentType	Tractors/Loaders/Backhoes	Air Compressors
tblOffRoadEquipment	OffRoadEquipmentType	Tractors/Loaders/Backhoes	Skid Steer Loaders
tblOffRoadEquipment	OffRoadEquipmentType		Other Material Handling Equipment
tblOffRoadEquipment	OffRoadEquipmentType		Cranes
tblOffRoadEquipment	OffRoadEquipmentType		Forklifts

tblOffRoadEquipment	OffRoadEquipmentType		Cranes
tblOffRoadEquipment	OffRoadEquipmentType		Graders
tblOffRoadEquipment	OffRoadEquipmentType		Generator Sets
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	UsageHours	1.00	8.00
tblOffRoadEquipment	UsageHours	6.00	10.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblOffRoadEquipment	UsageHours	8.00	10.00
tblProjectCharacteristics	OperationalYear	2014	2015
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblTripsAndVMT	PhaseName		Place Rock
tblTripsAndVMT	PhaseName		Drive Piles - 5 days
tblTripsAndVMT	PhaseName		Drive Piles - 10 days
tblTripsAndVMT	PhaseName		Removal - 15 days
tblTripsAndVMT	PhaseName		Removal - 45 days
tblTripsAndVMT	WorkerTripNumber	30.00	0.00
tblTripsAndVMT	WorkerTripNumber	18.00	0.00
tblTripsAndVMT	WorkerTripNumber	13.00	0.00
tblTripsAndVMT	WorkerTripNumber	23.00	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2015	0.3162	3.6101	1.9755	2.8300e-003	0.0000	0.1783	0.1783	0.0000	0.1643	0.1643	0.0000	269.0926	269.0926	0.0796	0.0000	270.7648
Total	**0.3162**	**3.6101**	**1.9755**	**2.8300e-003**	**0.0000**	**0.1783**	**0.1783**	**0.0000**	**0.1643**	**0.1643**	**0.0000**	**269.0926**	**269.0926**	**0.0796**	**0.0000**	**270.7648**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2015	0.3162	3.6101	1.9755	2.8300e-003	0.0000	0.1783	0.1783	0.0000	0.1643	0.1643	0.0000	269.0923	269.0923	0.0796	0.0000	270.7645
Total	**0.3162**	**3.6101**	**1.9755**	**2.8300e-003**	**0.0000**	**0.1783**	**0.1783**	**0.0000**	**0.1643**	**0.1643**	**0.0000**	**269.0923**	**269.0923**	**0.0796**	**0.0000**	**270.7645**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**					**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**					**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Place Rock	Demolition	1/5/2015	2/24/2015	5	37	
2	Drive Piles - 5 days	Site Preparation	2/25/2015	3/3/2015	5	5	
3	Drive Piles - 10 days	Grading	3/4/2015	3/17/2015	5	10	
4	Removal - 15 days	Building Construction	3/23/2015	4/10/2015	5	15	
5	Removal - 45 days	Paving	4/13/2015	6/12/2015	5	45	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Place Rock	Other Material Handling Equipment	3	12.00	196	0.34
Removal - 45 days	Excavators	3	8.00	157	0.38
Place Rock	Cranes	4	12.00	208	0.29
Drive Piles - 10 days	Cranes	2	12.00	208	0.29
Removal - 15 days	Graders	1	8.00	162	0.41
Drive Piles - 5 days	Rollers	1	10.00	84	0.38
Removal - 45 days	Excavators	3	8.00	157	0.38
Removal - 45 days	Rubber Tired Dozers	1	8.00	358	0.40
Place Rock	Rubber Tired Dozers	1	8.00	358	0.40
Drive Piles - 10 days	Forklifts	1	12.00	149	0.20
Place Rock	Tractors/Loaders/Backhoes	4	10.00	75	0.37
Drive Piles - 10 days	Air Compressors	1	10.00	78	0.32
Removal - 45 days	Tractors/Loaders/Backhoes	2	8.00	75	0.37
Drive Piles - 5 days	Skid Steer Loaders	1	8.00	37	0.37
Drive Piles - 5 days	Cranes	1	12.00	208	0.29
Drive Piles - 5 days	Forklifts	2	4.00	149	0.20
Drive Piles - 5 days	Cranes	1	4.00	208	0.29
Drive Piles - 5 days	Graders	1	10.00	162	0.41
Drive Piles - 10 days	Generator Sets	1	10.00	84	0.50

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Place Rock	12	0.00			12.40	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Drive Piles - 5 days	7	0.00			12.40	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Drive Piles - 10 days	5	0.00			12.40	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Removal - 15 days	1	0.00			12.40	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Removal - 45 days	9	0.00			12.40	6.60	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Place Rock - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1753	2.0519	0.9371	1.5000e-003		0.0976	0.0976		0.0897	0.0897	0.0000	143.0119	143.0119	0.0427	0.0000	143.9085
Total	**0.1753**	**2.0519**	**0.9371**	**1.5000e-003**		**0.0976**	**0.0976**		**0.0897**	**0.0897**	**0.0000**	**143.0119**	**143.0119**	**0.0427**	**0.0000**	**143.9085**

3.2 Place Rock - 2015

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1753	2.0519	0.9371	1.5000e-003		0.0976	0.0976		0.0897	0.0897	0.0000	143.0117	143.0117	0.0427	0.0000	143.9083
Total	**0.1753**	**2.0519**	**0.9371**	**1.5000e-003**		**0.0976**	**0.0976**		**0.0897**	**0.0897**	**0.0000**	**143.0117**	**143.0117**	**0.0427**	**0.0000**	**143.9083**

3.2 Place Rock - 2015

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Drive Piles - 5 days - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.7900e-003	0.0935	0.0421	6.0000e-005		5.0300e-003	5.0300e-003		4.6200e-003	4.6200e-003	0.0000	5.9190	5.9190	1.7700e-003	0.0000	5.9561
Total	**8.7900e-003**	**0.0935**	**0.0421**	**6.0000e-005**	**0.0000**	**5.0300e-003**	**5.0300e-003**	**0.0000**	**4.6200e-003**	**4.6200e-003**	**0.0000**	**5.9190**	**5.9190**	**1.7700e-003**	**0.0000**	**5.9561**

3.3 Drive Piles - 5 days - 2015

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.7900e-003	0.0935	0.0421	6.0000e-005		5.0300e-003	5.0300e-003		4.6200e-003	4.6200e-003	0.0000	5.9190	5.9190	1.7700e-003	0.0000	5.9561
Total	**8.7900e-003**	**0.0935**	**0.0421**	**6.0000e-005**	**0.0000**	**5.0300e-003**	**5.0300e-003**	**0.0000**	**4.6200e-003**	**4.6200e-003**	**0.0000**	**5.9190**	**5.9190**	**1.7700e-003**	**0.0000**	**5.9561**

3.3 Drive Piles - 5 days - 2015

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Drive Piles - 10 days - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0177	0.1814	0.0827	1.4000e-004		9.6700e-003	9.6700e-003		9.1200e-003	9.1200e-003	0.0000	13.0005	13.0005	3.1800e-003	0.0000	13.0672
Total	**0.0177**	**0.1814**	**0.0827**	**1.4000e-004**		**9.6700e-003**	**9.6700e-003**		**9.1200e-003**	**9.1200e-003**	**0.0000**	**13.0005**	**13.0005**	**3.1800e-003**	**0.0000**	**13.0672**

3.4 Drive Piles - 10 days - 2015

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0177	0.1814	0.0827	1.4000e-004		9.6700e-003	9.6700e-003		9.1200e-003	9.1200e-003	0.0000	13.0005	13.0005	3.1800e-003	0.0000	13.0672
Total	**0.0177**	**0.1814**	**0.0827**	**1.4000e-004**		**9.6700e-003**	**9.6700e-003**		**9.1200e-003**	**9.1200e-003**	**0.0000**	**13.0005**	**13.0005**	**3.1800e-003**	**0.0000**	**13.0672**

3.4 Drive Piles - 10 days - 2015

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.5 Removal - 15 days - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	7.3900e-003	0.0757	0.0347	4.0000e-005		4.2500e-003	4.2500e-003		3.9100e-003	3.9100e-003	0.0000	4.1491	4.1491	1.2400e-003	0.0000	4.1751
Total	**7.3900e-003**	**0.0757**	**0.0347**	**4.0000e-005**		**4.2500e-003**	**4.2500e-003**		**3.9100e-003**	**3.9100e-003**	**0.0000**	**4.1491**	**4.1491**	**1.2400e-003**	**0.0000**	**4.1751**

3.5 Removal - 15 days - 2015

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	7.3900e-003	0.0757	0.0347	4.0000e-005		4.2500e-003	4.2500e-003		3.9100e-003	3.9100e-003	0.0000	4.1491	4.1491	1.2400e-003	0.0000	4.1751
Total	**7.3900e-003**	**0.0757**	**0.0347**	**4.0000e-005**		**4.2500e-003**	**4.2500e-003**		**3.9100e-003**	**3.9100e-003**	**0.0000**	**4.1491**	**4.1491**	**1.2400e-003**	**0.0000**	**4.1751**

3.5 Removal - 15 days - 2015

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.6 Removal - 45 days - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1070	1.2077	0.8789	1.0800e-003		0.0618	0.0618		0.0569	0.0569	0.0000	103.0122	103.0122	0.0308	0.0000	103.6580
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.1070**	**1.2077**	**0.8789**	**1.0800e-003**		**0.0618**	**0.0618**		**0.0569**	**0.0569**	**0.0000**	**103.0122**	**103.0122**	**0.0308**	**0.0000**	**103.6580**

3.6 Removal - 45 days - 2015

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1070	1.2077	0.8789	1.0800e-003		0.0618	0.0618		0.0569	0.0569	0.0000	103.0121	103.0121	0.0308	0.0000	103.6579
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.1070**	**1.2077**	**0.8789**	**1.0800e-003**		**0.0618**	**0.0618**		**0.0569**	**0.0569**	**0.0000**	**103.0121**	**103.0121**	**0.0308**	**0.0000**	**103.6579**

3.6 Removal - 45 days - 2015

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Total					

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.527595	0.065111	0.176365	0.146583	0.036541	0.004920	0.009546	0.020124	0.001217	0.001491	0.006333	0.002119	0.002054

4.4 Fleet Mix

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**					**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**					**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

DWR Emergency Drought Barrier
Construction Emissions Summary

EDB/Phase/Vehicle	Work Days	Amount	Hours/Day	Total Work Hours	Daily Trips (one-way)	Miles/Trip	Total VMT	Pollutants (total tons) ROG	NO_X	PM_{10}	$PM_{2.5}$	MT CO_2e
SUTTER SLOUGH												
Place Rock								***0.03***	***0.45***	***0.02***	***0.02***	***298.61***
Tug/Barge - loaded	4.0	3	10									
Tug/Barge - unloaded	4.0	3	8									260
Work Boat	10.0	1	5	50				0.004	0.037	0.002	0.002	
Rock Haul/Dump Truck	10.0	2	9				9,000	0.00	0.09	0.00	0.00	16.47
Construction Equipment								0.03	0.31	0.02	0.01	21.76
Place Culverts								***0.01***	***0.05***	***0.00***	***0.00***	***42.68***
Pickups	5.0	2	6				900	0.00	0.00	0.00	0.00	0.37
Tug/Barges - loaded	2.0	1	8									
Tug/Barges - unloaded	2.0	1	8									39
Service Truck	2.0	1	4				40	0.00	0.00	0.00	0.00	0.02
Construction Equipment								0.01	0.05	0.00	0.00	3.76
Removal								***0.05***	***0.68***	***0.03***	***0.03***	***1,218.60***
Tug/Barge - loaded	15.0	4	8									
Tug/Barge - unloaded	15.0	4	8									1,156
Work Boat	15.0	2	5	150				0.012	0.110	0.005	0.005	
Dump Trucks	15.0	3	8				18,000	0.00	0.19	0.00	0.00	32.93
Construction Equipment								0.03	0.39	0.02	0.02	29.59
Construction Worker	45.0	25			50	15	33,750	***0.00***	***0.01***	***0.00***	***0.00***	***13.18***
Mobilization Truck Trips	4.0	25			50	15	3,000	***0.00***	***0.03***	***0.00***	***0.00***	***5.49***
Total Tug/Barge - loaded & unloaded								***1.50***	***22.36***	***1.11***	***1.11***	***1,454.99***
Total Emissions - Sacramento County (tons)								**0.79**	**11.79**	**0.58**	**0.58**	**1,516.78**
Average Daily Emissions - Unmitigated (lbs/day)								52.96	786.19	38.90	38.69	
Total Emissions -Yolo County (tons)								**0.79**	**11.79**	**0.58**	**0.58**	**1,516.78**
STEAMBOAT SLOUGH												
Place Rock								***0.04***	***0.57***	***0.02***	***0.02***	***245.43***
Tug/Barge - loaded	10.0	3	6									
Tug/Barges - unloaded	10.0	3	5									193
Work Boat	10.0	1	5	50				0.004	0.037	0.002	0.002	
Rock Haul/Dump Truck	10.0	3	10				15,000	0.00	0.16	0.00	0.00	27.44
Construction Equipment								0.03	0.37	0.02	0.02	25.31
Place Culverts								***0.03***	***0.24***	***0.01***	***0.01***	***50.96***
Pickups	5.0	3	8				1,800	0.00	0.00	0.00	0.00	0.73
Tug/Barge - loaded	2.0	1	8									
Tug/Barge - unloaded	2.0	1	8									39
Service Truck	5.0	1	8				200	0.00	0.00	0.00	0.00	0.08
Work Boat	15.0	1	8	120				0.01	0.09	0.00	0.00	
Construction Equipment								0.016	0.155	0.010	0.009	11.615
Removal								***0.12***	***1.64***	***0.07***	***0.06***	***2,474.33***
Tug/Barge - loaded	30.0	4	8									
Tug/Barge - unloaded	30.0	4	8									2,312
Work Boat	30.0	1	8	240				0.02	0.18	0.01	0.01	
Dump Trucks	30.0	4	8				48,000	0.01	0.50	0.01	0.01	87.82
Construction Equipment								0.09	0.96	0.05	0.05	74.36
Construction Worker	45.0	30			60	15	40,500	***0.00***	***0.02***	***0.00***	***0.00***	***15.82***
Mobilization Truck Trips	4.0	30			60	15	3,600	***0.00***	***0.04***	***0.00***	***0.00***	***6.59***
Total Tug/Barge - loaded & unloaded								***2.83***	***42.24***	***2.10***	***2.10***	***2,543.36***
Total Emissions - Sacramento County (tons)								3.01	44.75	2.21	2.20	2,793.13
Average Daily Emissions (unmitigated lbs/day)								109.60	1,627.20	80.49	80.02	101,568.40
WEST FALSE RIVER												
Place Rock								***0.21***	***2.99***	***0.12***	***0.11***	***2,159.87***
Tug/Barge - loaded	20.0	6	7									
Tug/Barge - unloaded	20.0	6	6									1,880
Work Boat	37.0	1	5	185				0.01	0.14	0.01	0.01	
Rock Haul/Dump Truck	37.0	4	10				74,000	0.02	0.80	0.01	0.01	136.00
Construction Equipment								0.18	2.05	0.10	0.09	143.91
Drive Piles								**0.04**	**0.39**	**0.02**	**0.02**	**598.38**
Tug/Barge - loaded	10.0	2	12									
Tug/Barge - unloaded	10.0	2	12									578
Work Boat	10.0	2	8	160				0.01	0.12	0.01	0.01	
Service Truck	10.0	1	4				200	0.00	0.00	0.00	0.00	0.08
Pickups	10.0	4	5				3,000	0.00	0.00	0.00	0.00	1.24
Construction Equipment								0.03	0.27	0.01	0.01	19.02
Removal								***0.17***	***2.40***	***0.09***	***0.09***	***4,864.44***
Tug/Barge - loaded	40.0	6	8									
Tug/Barge - unloaded	40.0	6	8									4,624
Work Boat	45.0	2	5	450				0.03	0.33	0.02	0.02	
Dump Trucks	45.0	4	8				72,000	0.02	0.78	0.01	0.01	132.32
Construction Equipment								0.11	1.28	0.07	0.06	107.83
Construction Worker	45.0	30			60	15	40,500	***0.00***	***0.02***	***0.00***	***0.00***	***16.04***
Mobilization Truck Trips	4.0	100			200	15	12,000	***0.00***	***0.13***	***0.00***	***0.00***	***22.05***
Total Tug/Barge - loaded & unloaded								***8.87***	***132.54***	***6.59***	***6.59***	***7,082.29***
Total Emissions - Contra Costa County (tons)								9.30	138.48	6.83	6.81	7,660.78
Average Daily Emissions (umitigated - lbs/day)								165.99	2,472.77	121.91	121.62	

	Emission Factors (g/mile)				
Air Basin/Vehicle Class	ROG	NO_X	PM_{10}	$PM_{2.5}$	CO2
SVAB					
Haul/Dump/Rock/Equip Truck (HHDT)	0.246	9.439	0.224	0.152	1738.127
Service Truck (LDT)	0.064	0.428	0.066	0.038	386.424
Worker (LDA/LDT)	0.055	0.401	0.064	0.035	371.123
SFBAAB					
Haul/Dump/Rock/Equip Truck (HHDT)	0.273	9.852	0.147	0.136	1745.903
Service Truck (LDT)	0.068	0.494	0.028	0.026	391.510
Worker (LDA/LDT)	0.059	0.449	0.024	0.022	376.143

	Emission Factors (g/hp-hr)				
Off-Road Type/Parameter	ROG	NO_X	PM_{10}	$PM_{2.5}$	CO2
Work Boats (176-250 hp)					
Main Engine (avg 0.45 load)	0.680	7.310	0.360	0.360	
Deterioration Factor	0.280	0.140	0.440	0.440	
Fuel Correction Factor	1.000	0.948	0.822	0.822	
Average Age	9				
Useful Life	17				
Main Engine Load Factor	0.45				
Average Horsepower	200				

http://www.arb.ca.gov/msei/chc-appendix-b-emission-estimates-ver02-27-2012.pdf

Note: Used model year 2000 as average age of work boats

Vehicle Class	Average Speed (mph)
Pickups	15
Service Truck	5
Dump Truck	50

Drought Temporary Rock Barriers									
Inventory and Calculation of Greenhouse Gas Emissions									
Sutter Slough									
	Emissions from Construction Equipment								
Line	**Type of Equipment**	**Number per Day**	**Total Operation Days**	**Operating Hours Per Day**	**Total Operation Hours[1]**	**Horsepower**	**Default Load Factors (from CalEEMod)**	**Suggested Load Factor (if applicable)**	
	PLACE ROCK								
1	Tug/barge - Loaded	3	4.0	10	120.0	1000.0	0.5		
	Tug/barge - Empty	3	4.0	8	96.0	1000.0	0.6		
2	Cranes	2	10.0	9	180.0	208.0	0.2881		
3	Work boat	1	10.0	5	50.0		OFFROAD	0.3	
4	Dozers	1	10.0	8	80.0	358.0	0.3953		
5	Loaders	2	10.0	9	180.0	75.0	0.3685		
6	Rock Haul/Dump Truck	2	10.0	9	180.0		EMFAC	0.35	
7	Conveyors (Other Mat Handling Equip)	2	10.0	9	180.0	196.0	0.3417		
8	**PLACE CULVERTS**								
9	Off road fork lift	1	5.0	5	25.0	149.0	0.201		
10	Cranes	1	5.0	7	35.0	208.0	0.2881		
11	Pickups	2	5.0	6	60.0		EMFAC	0.15	
12	air compressor	1	5.0	8	40.0	78.0	0.3216		
13	Power generators	1	5.0	8	40.0	84.0	0.4958		
14	Tug/barge - Loaded	1	2.0	8	16.0	1000.0	0.5		
	Tug/barge - Empty	1	2.0	8	16.0	1000.0	0.6		
15	Off road fork lift	1	2.0	6	12.0	149.0	0.201		
16	Skid Steer Loaders	1	2.0	6	12.0	37.0	0.3685		
17	Service truck	1	2.0	4	8.0		EMFAC	0.2	
18	**REMOVAL**								
19	Tug/barge - Loaded	4	15.0	8	480.0	1000.0	0.5		
	Tug/barge - Empty	4	15.0	8	480.0	1000.0	0.6		
20	long reach excavators	2	15.0	8	240.0	157.0	0.3819		
21	work boat	2	15.0	5	150.0		OFFROAD	0.3	
22	Excavators	2	15.0	8	240.0	157.0	0.3819		
23	Dump Trucks	3	15.0	8	360.0		EMFAC	0.35	
24	Dozers	1	15.0	8	120.0	358.0	0.3953		
25	Front end loaders	1	15.0	8	120.0	75.0	0.3685		
26	Grader	1	15.0	8	120.0	162.0	0.4087		

Inventory and Calculation of Greenhouse Gas Emissions									
Steamboat Slough									
	Emissions from Construction Equipment								
Line	**Type of Equipment**	**Number per Day**	**Total Operation Days**	**Operating Hours Per Day**	**Total Operation Hours[1]**	**Horsepower**	**Default Load Factors (from CalEEMod)**	**Suggested Load Factor (if applicable)**	
	PLACE ROCK								
1	Tug/barge - Loaded	3	10.0	6	180.0	1000.0	0.5		
	Tug/barge - Empty	3	10.0	5	150.0	1000.0	0.6		
2	Cranes	2	10.0	13	260.0	208.0	0.2881		
3	Work boat	1	10.0	5	50.0		OFFROAD	0.3	
4	Dozers (RTD)	1	10.0	10	100.0	358.0	0.3953		
5	Loaders (T/L/B)	2	10.0	10	200.0	75.0	0.3685		
6	Rock Haul/Dump Truck	3	10.0	10	300.0		EMFAC	0.35	
7	Conveyors (Other Mat Handling Equip)	2	10.0	10	200.0	196.0	0.3417		
8	**PLACE CULVERTS**								
9	Off road fork lift	2	5.0	8	80.0	149.0	0.201		
10	Cranes	1	3.0	8	24.0	208.0	0.2881		
11	Pickups	3	5.0	8	120.0		EMFAC	0.15	
12	air compressor	1	5.0	8	40.0	78.0	0.3216		
13	Power generators	1	5.0	8	40.0	84.0	0.4958		
14	Tug/barge - Loaded	1	2.0	8	16.0	1000.0	0.5		
	Tug/barge - Empty	1	2.0	8	16.0	1000.0	0.6		
15	Off road fork lift	1	5.0	8	40.0	149.0	0.201		
16	Skid Steer Loaders	1	5.0	8	40.0	37.0	0.3685		
17	Service truck	1	5.0	8	40.0		EMFAC	0.2	
18	Grader	1	10.0	8	80.0	162.0	0.4087		
19	Front end loaders (T/L/B)	2	15.0	8	240.0	75.0	0.3685		
20	Work boat	1	15.0	8	120.0		OFFROAD	0.3	
21	**REMOVAL**								
22	Tug/barge - Loaded	4	30.0	8	960.0	1000.0	0.5		
	Tug/barge - Empty	4	30.0	8	960.0	1000.0	0.6		
23	long reach excavators	2	30.0	8	480.0	157.0	0.3819		
24	work boat	1	30.0	8	240.0		OFFROAD	0.3	
25	Excavators	3	30.0	8	720.0	157.0	0.3819		
26	Dump Trucks	4	30.0	8	960.0		EMFAC	0.35	
27	Dozers	1	30.0	8	240.0	358.0	0.3953		
28	Front end loaders	2	30.0	8	480.0	75.0	0.3685		
29	Grader	1	15.0	8	120.0	162.0	0.4087		

Drought Temporary Rock Barriers
Inventory and Calculation of Greenhouse Gas Emissions
West False River

Line	Type of Equipment	Number per Day	Total Operation Days	Operating Hours Per Day	Total Operation Hours[1]	Horsepower	Default Load Factors (from CalEEMod)	Suggested Load Factor (if applicable)	
	Emissions from Construction Equipment								
	PLACE ROCK								
1	Tug/barge - Loaded	6	20.0	7	840.0	1000.0	0.5		
	Tug/barge - Empty	6	20.0	6	720.0	1000.0	0.6		
2	Cranes	4	37.0	12	1776.0	208.0	0.2881		
3	Work boat	1	37.0	5	185.0		OFFROAD	0.3	
4	Dozers	1	37.0	8	177.6	358.0	0.3953		
5	Loaders	4	37.0	10	1480.0	75.0	0.3685		
6	Rock Haul/Dump Truck	4	37.0	10	1480.0		EMFAC	0.35	
7	Conveyors (Gen Mat Handling Equip)	3	37.0	12	1332.0	196.0	0.3417		
8	**DRIVE PILES**								
9	Tug/barge - Loaded	2	10.0	12	240.0	1000.0	0.5		
	Tug/barge - Empty	2	10.0	12	240.0	1000.0	0.6		
10	Cranes	2	10.0	12	240.0	208.0	0.2881		
11	Work boats	2	10.0	8	160.0		OFFROAD	0.3	
12	Grader	1	5.0	10	30.0	162.0	0.4087		
13	Off road fork lift	1	10.0	12	120.0	149.0	0.201		
14	Compactor (Rollers)	1	5.0	10	50.0	84.0	0.3752		
15	Skid Steer Loaders	1	5.0	8	40.0	37.0	0.3685		
16	Off road crane	1	5.0	12	60.0	208.0	0.2881		
17	Service truck	1	10.0	4	40.0		EMFAC	0.2	
18	Off road fork lift	2	5.0	4	40.0	149.0	0.201		
19	Cranes	1	5.0	4	20.0	208.0	0.2881		
20	Pickups	4	10.0	5	200.0		EMFAC	0.15	
21	air compressor	1	10.0	10	100.0	78.0	0.3216		
22	Power generators	1	10.0	10	100.0	84.0	0.4958		
23	**REMOVAL**								
24	Tug/barge - Loaded	8	40.0	8	2560.0	1000.0	0.5		
	Tug/barge - Empty	8	40.0	8	2560.0	1000.0	0.6		
25	long reach excavators	3	45.0	8	1080.0	157.0	0.3819		
26	work boat	2	45.0	5	450.0		OFFROAD	0.3	
27	Excavators	3	45.0	8	1080.0	157.0	0.3819		
28	Dump Trucks	4	45.0	8	1440.0		EMFAC	0.35	
29	Dozers	1	45.0	8	216.0	358.0	0.3953		
30	Front end loaders	2	45.0	8	720.0	75.0	0.3685		
31	Grader	1	15.0	8	72.0	162.0	0.4087		

ARB OffRoad Model, 2007, Appendix B - "Emissions Estimation Methodology for Commercial Harbor Craft Operating in California"
http://www.arb.ca.gov/msei/chc-appendix-b-emission-estimates-ver02-27-2012.pdf
ARB OffRoad Model, 2010 Update, Appendix C - "Emission Inventory Methodology"
http://www.arb.ca.gov/regact/2010/chc10/appc.pdf

$$E = EF_0 \times F \times (1 + D \times A/UL) \times HP \times LF \times Hr$$

E is the amount of emissions of a pollutant (HC, CO, NOx, or PM) emitted during one period
EF_0 is the model year, horsepower and engine use (propulsion or auxiliary) specific zero hour emission factor (when engine is new)
F is the fuel correction factor which accounts for emission reduction benefits from burning cleaner fuel
D is the horsepower and pollutant specific engine deterioration factor, which is the percentage increase of emission factors at the end of the useful life of the engine
A is the age of the engine when the emissions are estimated
UL is the vessel type and engine use specific engine useful life
HP is rated horsepower of the engine
LF is the vessel type and engine use specific engine load factor
Hr is the number of annual operating hours of the engine

Tug Boat Propulsion and Auxiliary Engine Information to be Entered

Emissions Estimate Year:	**2015**
Propulsion Engine Model Year:	**1986**
Auxiliary Engine Model Year:	**1986**
Propulsion Engine Horsepower (bhp):	**2000**
Auxiliary Engine Horsepower (bhp):	**150**
Propulsion Engine Annual Hours of Operation:	**1208**
Auxiliary Engine Annual Hours of Operation:	**1208**

Sutter Slough

	Propulsion Engine					Auxiliary Engine				
	HC	CO	NOx	PM10	PM2.5	HC	CO	NOx	PM10	PM2.5
EF_0 (g/bhp-hr):	0.9	3.07	12.98	0.5	0.5	1.12	4.43	11	0.46	0.46
F:	0.72	1	0.948	0.822	0.822	0.72	1	0.948	0.822	0.822
D:	0.44	0.25	0.21	0.67	0.67	0.28	0.16	0.14	0.44	0.44
Emissions Estimate Year:	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015
Engine Model Year:	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986
A (years):	29	29	29	29	29	29	29	29	29	29
UL (years):	21	21	21	21	21	23	23	23	23	23
HP (bhp):	2000	2000	2000	2000	2000	150	150	150	150	150
LF:	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Hr (hours):	1208	1208	1208	1208	1208	1208	1208	1208	1208	1208
E (g)	1258418	4988896	19175190	955858	955858	98853	482328	1111550	53263	53263
E (lb)	2774.3	10998.4	42273.3	2107.3	2107.3	217.9	1063.3	2450.5	117.4	117.4
E (tons)	1.39	5.50	21.14	1.05	1.05	0.11	0.53	1.23	0.06	0.06

http://www.arb.ca.gov/regact/2010/chc10/appc.pdf

$$E = EF_0 \times F \times (1 + D \times A/UL) \times HP \times LF \times Hr$$

E is the amount of emissions of a pollutant (HC, CO, NOx, or PM) emitted during one period
EF_0 is the model year, horsepower and engine use (propulsion or auxiliary) specific zero hour emission factor (when engine is new)
F is the fuel correction factor which accounts for emission reduction benefits from burning cleaner fuel
D is the horsepower and pollutant specific engine deterioration factor, which is the percentage increase of emission factors at the end of the useful life of the engine
A is the age of the engine when the emissions are estimated
UL is the vessel type and engine use specific engine useful life
HP is rated horsepower of the engine
LF is the vessel type and engine use specific engine load factor
Hr is the number of annual operating hours of the engine

Tug Boat Propulsion and Auxiliary Engine Information to be Entered

Emissions Estimate Year:	**2015**
Propulsion Engine Model Year:	**1986**
Auxiliary Engine Model Year:	**1986**
Propulsion Engine Horsepower (bhp):	**2000**
Auxiliary Engine Horsepower (bhp):	**150**
Propulsion Engine Annual Hours of Operation:	**2282**
Auxiliary Engine Annual Hours of Operation:	**2282**

Steamboat Slough

	Propulsion Engine					Auxiliary Engine				
	HC	CO	NOx	PM10	PM2.5	HC	CO	NOx	PM10	PM2.5
EF_0 (g/bhp-hr):	0.9	3.07	12.98	0.5	0.5	1.12	4.43	11	0.46	0.46
F:	0.72	1	0.948	0.822	0.822	0.72	1	0.948	0.822	0.822
D:	0.44	0.25	0.21	0.67	0.67	0.28	0.16	0.14	0.44	0.44
Emissions Estimate Year:	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015
Engine Model Year:	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986
A (years):	29	29	29	29	29	29	29	29	29	29
UL (years):	21	21	21	21	21	23	23	23	23	23
HP (bhp):	2000	2000	2000	2000	2000	150	150	150	150	150
LF:	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Hr (hours):	2282	2282	2282	2282	2282	2282	2282	2282	2282	2282
E (g)	2377244	9424388	36223331	1805685	1805685	186741	911152	2099800	100618	100618
E (lb)	5240.8	20776.9	79857.4	3980.8	3980.8	411.7	2008.7	4629.2	221.8	221.8
E (tons)	2.62	10.39	39.93	1.99	1.99	0.21	1.00	2.31	0.11	0.11

ARB OffRoad Model, 2007, Appendix B - "Emissions Estimation Methodology for Commercial Harbor Craft Operating in California"
http://www.arb.ca.gov/msei/chc-appendix-b-emission-estimates-ver02-27-2012.pdf
ARB OffRoad Model, 2010 Update, Appendix C - "Emission Inventory Methodology"
http://www.arb.ca.gov/regact/2010/chc10/appc.pdf

$$E = EF_0 \text{ x } F \text{ x } (1 + D \text{ X } A/UL) \text{ x } HP \text{ x } LF \text{ x } Hr$$

E is the amount of emissions of a pollutant (HC, CO, NOx, or PM) emitted during one period
EF_0 is the model year, horsepower and engine use (propulsion or auxiliary) specific zero hour emission factor (when engine is new)
F is the fuel correction factor which accounts for emission reduction benefits from burning cleaner fuel
D is the horsepower and pollutant specific engine deterioration factor, which is the percentage increase of emission factors at the end of the useful life of the engine
A is the age of the engine when the emissions are estimated
UL is the vessel type and engine use specific engine useful life
HP is rated horsepower of the engine
LF is the vessel type and engine use specific engine load factor
Hr is the number of annual operating hours of the engine

Tug Boat Propulsion and Auxiliary Engine Information to be Entered

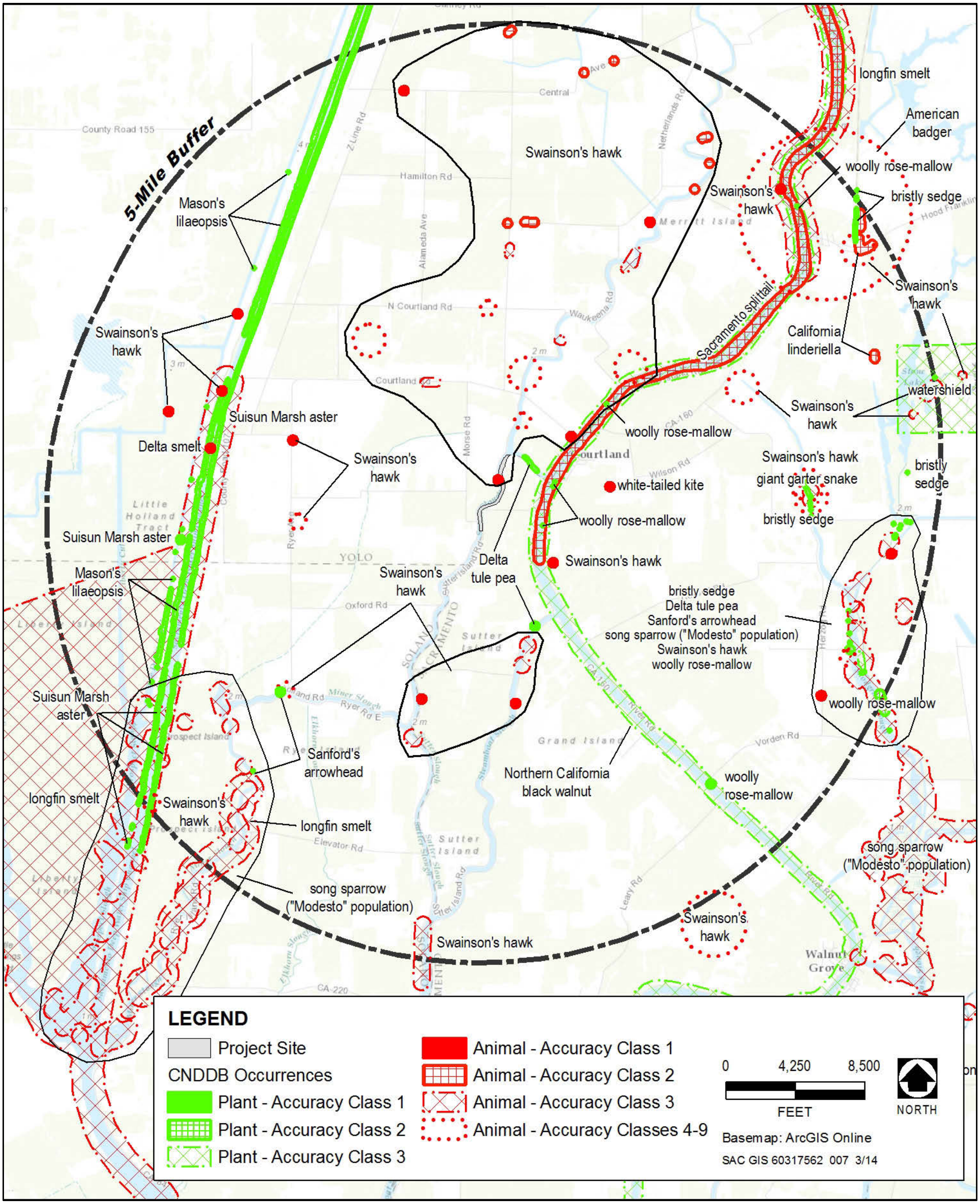
Emissions Estimate Year:	**2015**
Propulsion Engine Model Year:	**1986**
Auxiliary Engine Model Year:	**1986**
Propulsion Engine Horsepower (bhp):	**2000**
Auxiliary Engine Horsepower (bhp):	**150**
Propulsion Engine Annual Hours of Operation:	**7160**
Auxiliary Engine Annual Hours of Operation:	**7160**

West False River

	Propulsion Engine					Auxiliary Engine				
	HC	CO	NOx	PM10	PM2.5	HC	CO	NOx	PM10	PM2.5
EF_0 (g/bhp-hr):	0.9	3.07	12.98	0.5	0.5	1.12	4.43	11	0.46	0.46
F:	0.72	1	0.948	0.822	0.822	0.72	1	0.948	0.822	0.822
D:	0.44	0.25	0.21	0.67	0.67	0.28	0.16	0.14	0.44	0.44
Emissions Estimate Year:	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015
Engine Model Year:	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986
A (years):	29	29	29	29	29	29	29	29	29	29
UL (years):	21	21	21	21	21	23	23	23	23	23
HP (bhp):	2000	2000	2000	2000	2000	150	150	150	150	150
LF:	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Hr (hours):	7160	7160	7160	7160	7160	7160	7160	7160	7160	7160
E (g)	7458838	29569948	113654271	5665514	5665514	585918	2858829	6588329	315699	315699
E (lb)	16443.6	65189.5	250560.6	12490.1	12490.1	1291.7	6302.5	14524.5	696.0	696.0
E (tons)	8.22	32.59	125.28	6.25	6.25	0.65	3.15	7.26	0.35	0.35

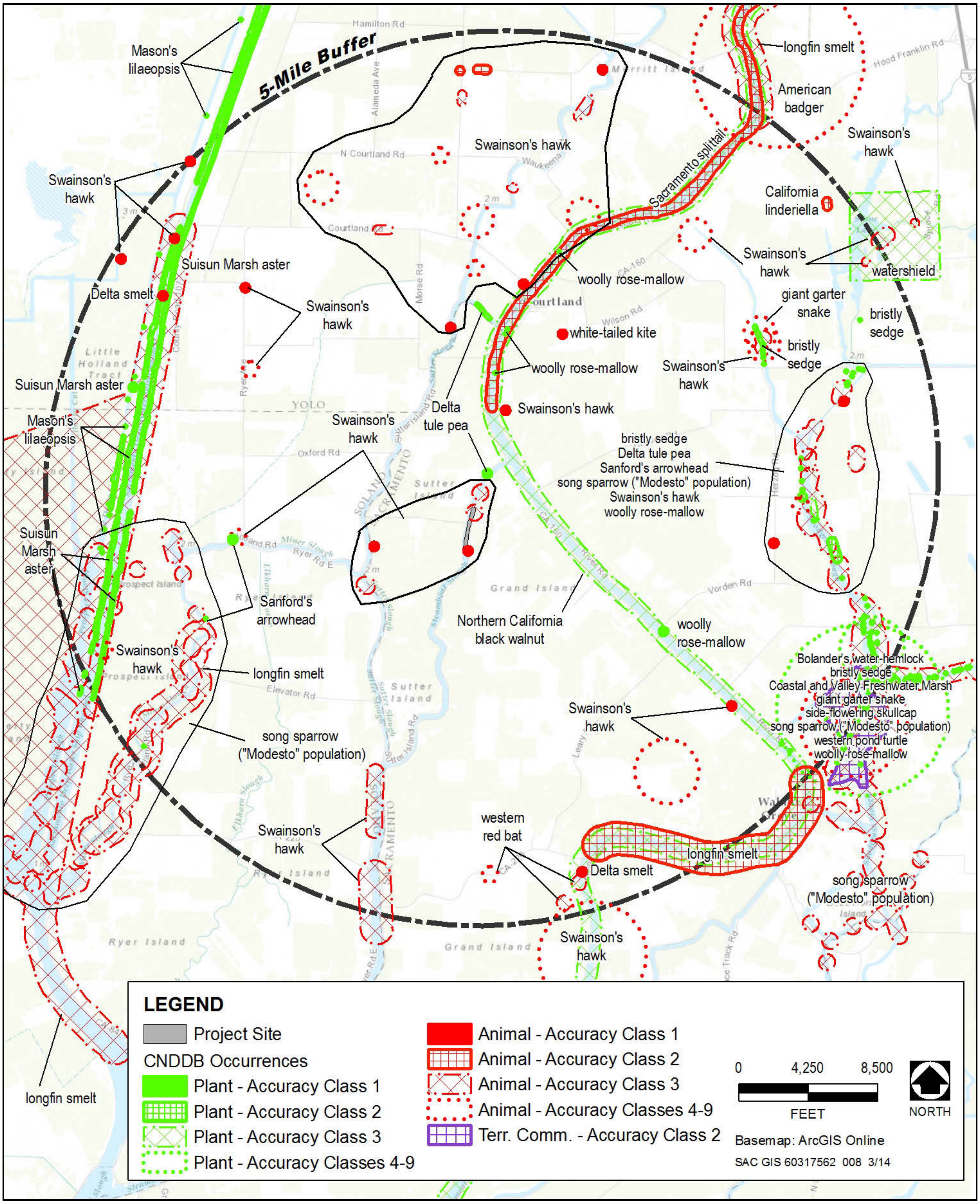
APPENDIX B

Special-Status Species Database Searches



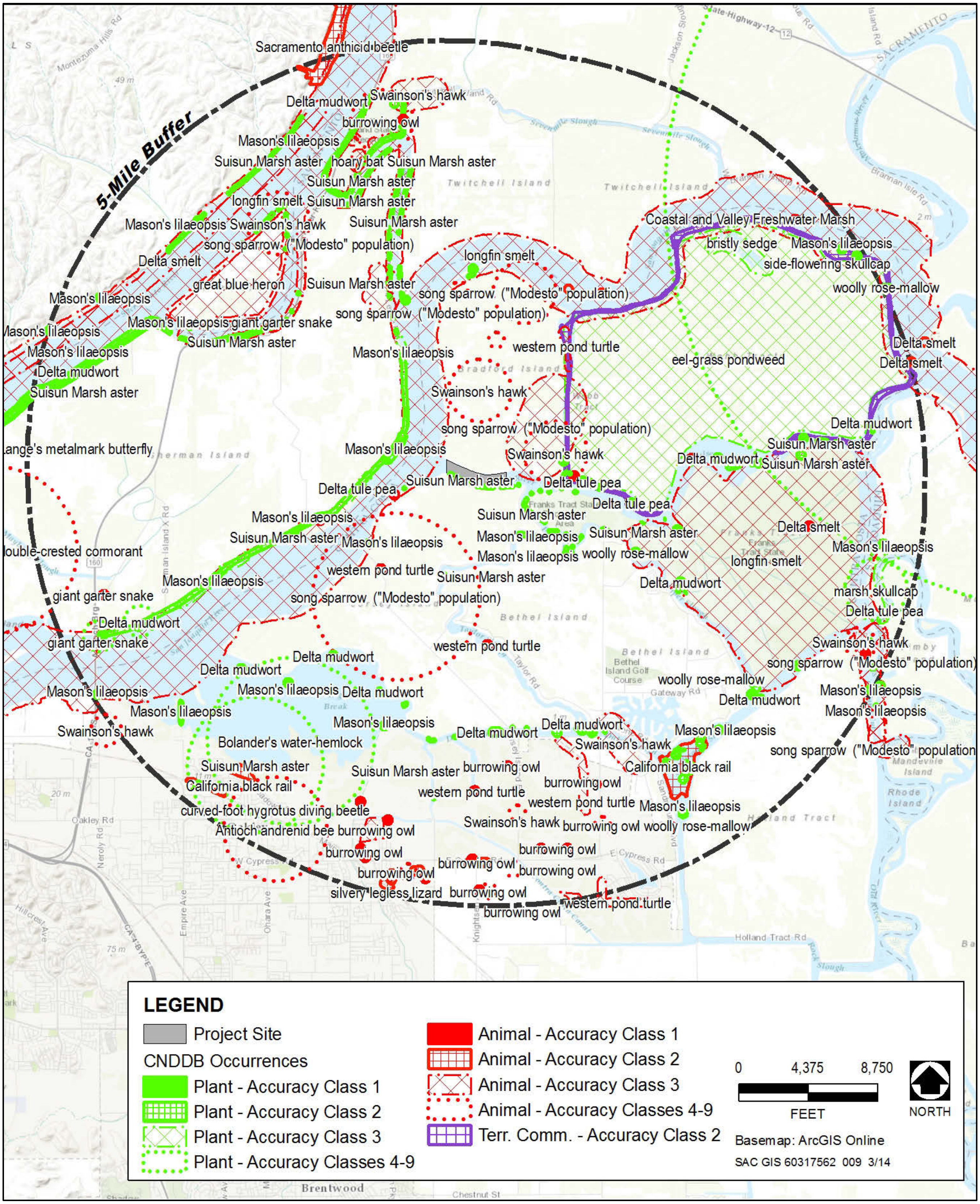
Source: CDFW 2014

Figure B-1. **Sutter Slough CNDDB Map**



Source: CDFW 2014

Figure B-2. **Steamboat Slough CNDDB Map**



Source: CDFW 2014

Figure B-3. **False River CNDDB Map**

CNPS California Native Plant Rare and Endangered Plant Inventory

Plant List

28 matches found. *Click on scientific name for details*

Search Criteria

Rare Plant Rank is one of [1A, 1B, 2A, 2B, 3, 4],
FESA is one of [Endangered, Threatened, Species of Concern, Not Listed],
CESA is one of [Endangered, Threatened, Rare, Not Listed], Found in 9 Quads around 38121C5

Scientific Name	Common Name	Family	Lifeform	Rare Plant Rank	State Rank	Global Rank
Astragalus tener var. ferrisiae	Ferris' milk-vetch	Fabaceae	annual herb	1B.1	S1	G2T1
Astragalus tener var. tener	alkali milk-vetch	Fabaceae	annual herb	1B.2	S2	G2T2
Atriplex joaquinana	San Joaquin spearscale	Chenopodiaceae	annual herb	1B.2	S2	G2
Brasenia schreberi	watershield	Cabombaceae	perennial rhizomatous herb	2B.3	S2	G5
Carex comosa	bristly sedge	Cyperaceae	perennial rhizomatous herb	2B.1	S2	G5
Centromadia parryi ssp. rudis	Parry's rough tarplant	Asteraceae	annual herb	4.2	S3.2	G3T3
Cicuta maculata var. bolanderi	Bolander's water-hemlock	Apiaceae	perennial herb	2B.1	S2	G5T3T4
Cuscuta obtusiflora var. glandulosa	Peruvian dodder	Convolvulaceae	annual vine (parasitic)	2B.2	SH	G5T4T5
Downingia pusilla	dwarf downingia	Campanulaceae	annual herb	2B.2	S2	GU
Hesperevax caulescens	hogwallow starfish	Asteraceae	annual herb	4.2	S3.2	G3
Hibiscus lasiocarpos var. occidentalis	woolly rose-mallow	Malvaceae	perennial rhizomatous herb	1B.2	S2	G5T2
Juglans hindsii	Northern California black walnut	Juglandaceae	perennial deciduous tree	1B.1	S1	G1
Lasthenia ferrisiae	Ferris' goldfields	Asteraceae	annual herb	4.2	S3.2	G3
Lathyrus jepsonii var. jepsonii	Delta tule pea	Fabaceae	perennial herb	1B.2	S2.2	G5T2
Legenere limosa	legenere	Campanulaceae	annual herb	1B.1	S2	G2
Lepidium latipes var. heckardii	Heckard's pepper-grass	Brassicaceae	annual herb	1B.2	S2	G4T2
Lilaeopsis masonii	Mason's lilaeopsis	Apiaceae	perennial rhizomatous herb	1B.1	S2	G2
Limosella australis	Delta mudwort	Scrophulariaceae	perennial stoloniferous herb	2B.1	S2	G4G5
Myosurus minimus ssp. apus	little mousetail	Ranunculaceae	annual herb	3.1	S2.2	G5T2Q

Navarretia leucocephala ssp. bakeri	Baker's navarretia	Polemoniaceae	annual herb	1B.1	S2	G4T2
Neostapfia colusana	Colusa grass	Poaceae	annual herb	1B.1	S2	G2
Plagiobothrys hystriculus	bearded popcorn-flower	Boraginaceae	annual herb	1B.1	S2	G2
Sagittaria sanfordii	Sanford's arrowhead	Alismataceae	perennial rhizomatous herb	1B.2	S3	G3
Scutellaria galericulata	marsh skullcap	Lamiaceae	perennial rhizomatous herb	2B.2	S2	G5
Scutellaria lateriflora	side-flowering skullcap	Lamiaceae	perennial rhizomatous herb	2B.2	S1	G5
Symphyotrichum lentum	Suisun Marsh aster	Asteraceae	perennial rhizomatous herb	1B.2	S2	G2
Trifolium hydrophilum	saline clover	Fabaceae	annual herb	1B.2	S2	G2
Tuctoria mucronata	Crampton's tuctoria or Solano grass	Poaceae	annual herb	1B.1	S1	G1

Suggested Citation

CNPS, Rare Plant Program. 2014. Inventory of Rare and Endangered Plants (online edition, v8-02). California Native Plant Society, Sacramento, CA. Website http://www.rareplants.cnps.org [accessed 16 July 2014].

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Contributors
- The Calflora Database
- The California Lichen Society

CNPS California Native Plant Rare and Endangered Plant Inventory

Plant List

60 matches found. *Click on scientific name for details*

Search Criteria

Rare Plant Rank is one of [1A, 1B, 2A, 2B, 3, 4],
FESA is one of [Endangered, Threatened, Species of Concern, Not Listed],
CESA is one of [Endangered, Threatened, Rare, Not Listed], Found in 9 Quads around 38121A6

Scientific Name	Common Name	Family	Lifeform	Rare Plant Rank	State Rank	Global Rank
Amsinckia grandiflora	large-flowered fiddleneck	Boraginaceae	annual herb	1B.1	S1	G1
Arctostaphylos auriculata	Mt. Diablo manzanita	Ericaceae	perennial evergreen shrub	1B.3	S2	G2
Arctostaphylos manzanita ssp. laevigata	Contra Costa manzanita	Ericaceae	perennial evergreen shrub	1B.2	S2	G5T2
Astragalus tener var. tener	alkali milk-vetch	Fabaceae	annual herb	1B.2	S2	G2T2
Atriplex cordulata var. cordulata	heartscale	Chenopodiaceae	annual herb	1B.2	S2	G3T2
Atriplex coronata var. coronata	crownscale	Chenopodiaceae	annual herb	4.2	S3.2	G4T3
Atriplex depressa	brittlescale	Chenopodiaceae	annual herb	1B.2	S2	G2
Atriplex joaquinana	San Joaquin spearscale	Chenopodiaceae	annual herb	1B.2	S2	G2
Blepharizonia plumosa	big tarplant	Asteraceae	annual herb	1B.1	S2	G2
Brasenia schreberi	watershield	Cabombaceae	perennial rhizomatous herb	2B.3	S2	G5
Calandrinia breweri	Brewer's calandrinia	Montiaceae	annual herb	4.2	S3.2?	G4
California macrophylla	round-leaved filaree	Geraniaceae	annual herb	1B.1	S2	G2
Calochortus pulchellus	Mt. Diablo fairy-lantern	Liliaceae	perennial bulbiferous herb	1B.2	S2	G2
Carex comosa	bristly sedge	Cyperaceae	perennial rhizomatous herb	2B.1	S2	G5
Centromadia parryi ssp. congdonii	Congdon's tarplant	Asteraceae	annual herb	1B.1	S2	G3T2
Centromadia parryi ssp. parryi	pappose tarplant	Asteraceae	annual herb	1B.2	S1	G3T1
Centromadia parryi ssp. rudis	Parry's rough tarplant	Asteraceae	annual herb	4.2	S3.2	G3T3
Chloropyron molle ssp. molle	soft bird's-beak	Orobanchaceae	annual herb (hemiparasitic)	1B.2	S1	G2T1
		Apiaceae	perennial herb	2B.1	S2	G5T3T4

Cicuta maculata var. bolanderi	Bolander's water-hemlock					
Convolvulus simulans	small-flowered morning-glory	Convolvulaceae	annual herb	4.2	S3.2	G3
Cryptantha hooveri	Hoover's cryptantha	Boraginaceae	annual herb	1A	SH	GH
Downingia pusilla	dwarf downingia	Campanulaceae	annual herb	2B.2	S2	GU
Eriogonum nudum var. psychicola	Antioch Dunes buckwheat	Polygonaceae	perennial herb	1B.1	S1	G5T1
Eriogonum truncatum	Mt. Diablo buckwheat	Polygonaceae	annual herb	1B.1	S2	G2
Eryngium racemosum	Delta button-celery	Apiaceae	annual / perennial herb	1B.1	S1	G1Q
Erysimum capitatum var. angustatum	Contra Costa wallflower	Brassicaceae	perennial herb	1B.1	S1	G5T1
Eschscholzia rhombipetala	diamond-petaled California poppy	Papaveraceae	annual herb	1B.1	S1	G1
Fritillaria agrestis	stinkbells	Liliaceae	perennial bulbiferous herb	4.2	S3.2	G3
Fritillaria liliacea	fragrant fritillary	Liliaceae	perennial bulbiferous herb	1B.2	S2	G2
Galium andrewsii ssp. gatense	phlox-leaf serpentine bedstraw	Rubiaceae	perennial herb	4.2	S3.2	G5T3
Helianthella castanea	Diablo helianthella	Asteraceae	perennial herb	1B.2	S2	G2
Hesperevax caulescens	hogwallow starfish	Asteraceae	annual herb	4.2	S3.2	G3
Hesperolinon breweri	Brewer's western flax	Linaceae	annual herb	1B.2	S2	G2
Hibiscus lasiocarpos var. occidentalis	woolly rose-mallow	Malvaceae	perennial rhizomatous herb	1B.2	S2	G5T2
Isocoma arguta	Carquinez goldenbush	Asteraceae	perennial shrub	1B.1	S1	G1
Juglans hindsii	Northern California black walnut	Juglandaceae	perennial deciduous tree	1B.1	S1	G1
Lasthenia conjugens	Contra Costa goldfields	Asteraceae	annual herb	1B.1	S1	G1
Lathyrus jepsonii var. jepsonii	Delta tule pea	Fabaceae	perennial herb	1B.2	S2.2	G5T2
Lilaeopsis masonii	Mason's lilaeopsis	Apiaceae	perennial rhizomatous herb	1B.1	S2	G2
Limosella australis	Delta mudwort	Scrophulariaceae	perennial stoloniferous herb	2B.1	S2	G4G5
Madia radiata	showy golden madia	Asteraceae	annual herb	1B.1	S2	G2
Malacothamnus hallii	Hall's bush-mallow	Malvaceae	perennial evergreen shrub	1B.2	S2	G2Q
Myosurus minimus ssp. apus	little mousetail	Ranunculaceae	annual herb	3.1	S2.2	G5T2Q
Navarretia heterandra	Tehama navarretia	Polemoniaceae	annual herb	4.3	S3.3	G3
Navarretia leucocephala ssp. bakeri	Baker's navarretia	Polemoniaceae	annual herb	1B.1	S2	G4T2
Navarretia nigelliformis ssp. nigelliformis	adobe navarretia	Polemoniaceae	annual herb	4.2	S3.2	G4T3
	shining navarretia	Polemoniaceae	annual herb	1B.2	S2	G4T2

Navarretia nigelliformis ssp. radians						
Neostapfia colusana	Colusa grass	Poaceae	annual herb	1B.1	S2	G2
Oenothera deltoides ssp. howellii	Antioch Dunes evening-primrose	Onagraceae	perennial herb	1B.1	S1	G5T1
Plagiobothrys hystriculus	bearded popcorn-flower	Boraginaceae	annual herb	1B.1	S2	G2
Potamogeton zosteriformis	eel-grass pondweed	Potamogetonaceae	annual herb	2B.2	S2.2?	G5
Sagittaria sanfordii	Sanford's arrowhead	Alismataceae	perennial rhizomatous herb	1B.2	S3	G3
Scutellaria galericulata	marsh skullcap	Lamiaceae	perennial rhizomatous herb	2B.2	S2	G5
Scutellaria lateriflora	side-flowering skullcap	Lamiaceae	perennial rhizomatous herb	2B.2	S1	G5
Senecio aphanactis	chaparral ragwort	Asteraceae	annual herb	2B.2	S2	G3?
Senecio hydrophiloides	sweet marsh ragwort	Asteraceae	perennial herb	4.2	S2S3	G4G5
Sidalcea keckii	Keck's checkerbloom	Malvaceae	annual herb	1B.1	S1	G1
Symphyotrichum lentum	Suisun Marsh aster	Asteraceae	perennial rhizomatous herb	1B.2	S2	G2
Tropidocarpum capparideum	caper-fruited tropidocarpum	Brassicaceae	annual herb	1B.1	S1	G1
Viburnum ellipticum	oval-leaved viburnum	Adoxaceae	perennial deciduous shrub	2B.3	S2.3	G5

Suggested Citation

CNPS, Rare Plant Program. 2014. Inventory of Rare and Endangered Plants (online edition, v8-02). California Native Plant Society, Sacramento, CA. Website http://www.rareplants.cnps.org [accessed 16 July 2014].

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Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 140312015430

Database Last Updated: September 18, 2011

Quad Lists

Listed Species

Invertebrates

- Branchinecta conservatio
  - Conservancy fairy shrimp (E)
- Branchinecta lynchi
  - vernal pool fairy shrimp (T)
- Desmocerus californicus dimorphus
  - valley elderberry longhorn beetle (T)
- Elaphrus viridis
  - delta green ground beetle (T)
- Lepidurus packardi
  - Critical habitat, vernal pool tadpole shrimp (X)
  - vernal pool tadpole shrimp (E)

Fish

- Acipenser medirostris
  - green sturgeon (T) (NMFS)

- Hypomesus transpacificus
  - Critical habitat, delta smelt (X)
  - delta smelt (T)

- Oncorhynchus mykiss
  - Central Valley steelhead (T) (NMFS)
  - Critical habitat, Central Valley steelhead (X) (NMFS)

- Oncorhynchus tshawytscha
  - Central Valley spring-run chinook salmon (T) (NMFS)
  - Critical Habitat, Central Valley spring-run chinook (X) (NMFS)
  - Critical habitat, winter-run chinook salmon (X) (NMFS)
  - winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

- Ambystoma californiense
  - California tiger salamander, central population (T)

- Rana draytonii
  - California red-legged frog (T)

Reptiles

- Thamnophis gigas
  - giant garter snake (T)

Birds

- Rallus longirostris obsoletus
  - California clapper rail (E)

Plants

- Neostapfia colusana
  - Colusa grass (T)
  - Critical habitat, Colusa grass (X)

- Tuctoria mucronata
  - Critical habitat, Solano grass (=Crampton's tuctoria) (X)
  - Solano grass (=Crampton's tuctoria) (E)

Quads Containing Listed, Proposed or Candidate Species:

THORNTON (479B)

ISLETON (480A)

RIO VISTA (480B)

FLORIN (496B)

BRUCEVILLE (496C)

CLARKSBURG (497A)

SAXON (497B)

LIBERTY ISLAND (497C)

COURTLAND (497D)

County Lists

Contra Costa County

Listed Species

Invertebrates

- Apodemia mormo langei
  - Lange's metalmark butterfly (E)

- Branchinecta conservatio
  - Conservancy fairy shrimp (E)

- Branchinecta longiantenna
  - Critical habitat, longhorn fairy shrimp (X)
  - longhorn fairy shrimp (E)

- Branchinecta lynchi
  - Critical habitat, vernal pool fairy shrimp (X)
  - vernal pool fairy shrimp (T)

- Desmocerus californicus dimorphus
  - valley elderberry longhorn beetle (T)

- Elaphrus viridis
  - delta green ground beetle (T)

- Lepidurus packardi
  - vernal pool tadpole shrimp (E)

- Speyeria callippe callippe
    - callippe silverspot butterfly (E)

- Syncaris pacifica
    - California freshwater shrimp (E)

Fish

- Acipenser medirostris
    - green sturgeon (T) (NMFS)

- Eucyclogobius newberryi
    - tidewater goby (E)

- Hypomesus transpacificus
    - Critical habitat, delta smelt (X)
    - delta smelt (T)

- Oncorhynchus kisutch
    - coho salmon - central CA coast (E) (NMFS)
    - Critical habitat, coho salmon - central CA coast (X) (NMFS)

- Oncorhynchus mykiss
    - Central California Coastal steelhead (T) (NMFS)
    - Central Valley steelhead (T) (NMFS)
    - Critical habitat, Central California coastal steelhead (X) (NMFS)
    - Critical habitat, Central Valley steelhead (X) (NMFS)

- Oncorhynchus tshawytscha
    - Central Valley spring-run chinook salmon (T) (NMFS)
    - Critical Habitat, Central Valley spring-run chinook (X) (NMFS)
    - Critical habitat, winter-run chinook salmon (X) (NMFS)
    - winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

- Ambystoma californiense
    - California tiger salamander, central population (T)
    - Critical habitat, CA tiger salamander, central population (X)

- Rana draytonii
    - California red-legged frog (T)
    - Critical habitat, California red-legged frog (X)

Reptiles

- Masticophis lateralis euryxanthus
    - Alameda whipsnake [=striped racer] (T)
    - Critical habitat, Alameda whipsnake (X)

- Thamnophis gigas
    - giant garter snake (T)

Birds

- Charadrius alexandrinus nivosus
    - western snowy plover (T)

- Pelecanus occidentalis californicus
    - California brown pelican (E)

- Rallus longirostris obsoletus
    - California clapper rail (E)

- Sternula antillarum (=Sterna, =albifrons) browni
    - California least tern (E)

- Strix occidentalis caurina
    - northern spotted owl (T)

Mammals

- Reithrodontomys raviventris
    - salt marsh harvest mouse (E)

- Vulpes macrotis mutica
    - San Joaquin kit fox (E)

Plants

- Amsinckia grandiflora
    - large-flowered fiddleneck (E)

- Arctostaphylos pallida
    - pallid manzanita (=Alameda or Oakland Hills manzanita) (T)

- Calochortus tiburonensis
    - Tiburon mariposa lily (T)

- Castilleja affinis ssp. neglecta
    - Tiburon paintbrush (E)

- Chorizanthe robusta var. robusta
    - robust spineflower (E)

- Clarkia franciscana
    - Presidio clarkia (E)

- Cordylanthus mollis ssp. mollis
    - soft bird's-beak (E)

- Cordylanthus palmatus
    - palmate-bracted bird's-beak (E)

- Erysimum capitatum ssp. angustatum
    - Contra Costa wallflower (E)
    - Critical Habitat, Contra Costa wallflower (X)

- Hesperolinon congestum
    - Marin dwarf-flax (=western flax) (T)

- Holocarpha macradenia
    - Critical habitat, Santa Cruz tarplant (X)
    - Santa Cruz tarplant (T)

- Lasthenia conjugens
    - Contra Costa goldfields (E)
    - Critical habitat, Contra Costa goldfields (X)

- Neostapfia colusana
    - Colusa grass (T)

- Oenothera deltoides ssp. howellii
    - Antioch Dunes evening-primrose (E)
    - Critical habitat, Antioch Dunes evening-primrose (X)

- Pentachaeta bellidiflora
    - white-rayed pentachaeta (E)

- Sidalcea keckii
    - Keck's checker-mallow (=checkerbloom) (E)

- Streptanthus niger
    - Tiburon jewelflower (E)

- Suaeda californica
    - California sea blite (E)

- Trifolium amoenum

  - showy Indian clover (E)

Proposed Species

Plants

- Cordylanthus mollis ssp. mollis
  - Critical habitat, soft bird's-beak (PX)

Sacramento County

Listed Species

Invertebrates

- Apodemia mormo langei
  - Lange's metalmark butterfly (E)

- Branchinecta conservatio
  - Conservancy fairy shrimp (E)

- Branchinecta lynchi
  - Critical habitat, vernal pool fairy shrimp (X)
  - vernal pool fairy shrimp (T)

- Desmocerus californicus dimorphus
  - Critical habitat, valley elderberry longhorn beetle (X)
  - valley elderberry longhorn beetle (T)

- Elaphrus viridis
  - delta green ground beetle (T)

- Lepidurus packardi
  - Critical habitat, vernal pool tadpole shrimp (X)
  - vernal pool tadpole shrimp (E)

Fish

- Acipenser medirostris
    - green sturgeon (T) (NMFS)

- Hypomesus transpacificus
    - Critical habitat, delta smelt (X)
    - delta smelt (T)

- Oncorhynchus mykiss
    - Central Valley steelhead (T) (NMFS)
    - Critical habitat, Central Valley steelhead (X) (NMFS)

- Oncorhynchus tshawytscha
    - Central Valley spring-run chinook salmon (T) (NMFS)
    - Critical Habitat, Central Valley spring-run chinook (X) (NMFS)
    - Critical habitat, winter-run chinook salmon (X) (NMFS)
    - winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

- Ambystoma californiense
    - California tiger salamander, central population (T)
    - Critical habitat, CA tiger salamander, central population (X)

- Rana draytonii
    - California red-legged frog (T)

Reptiles

- Thamnophis gigas
    - giant garter snake (T)

Birds

- Charadrius alexandrinus nivosus
    - western snowy plover (T)

- Rallus longirostris obsoletus
    - California clapper rail (E)

- Sternula antillarum (=Sterna, =albifrons) browni
    - California least tern (E)

- Vireo bellii pusillus
    - Least Bell's vireo (E)

Mammals

- Reithrodontomys raviventris
    - salt marsh harvest mouse (E)

- Sylvilagus bachmani riparius
    - riparian brush rabbit (E)

- Vulpes macrotis mutica
    - San Joaquin kit fox (E)

Plants

- Arctostaphylos myrtifolia
    - Ione manzanita (T)

- Calystegia stebbinsii
    - Stebbins's morning-glory (E)

- Castilleja campestris ssp. succulenta
    - Critical habitat, succulent (=fleshy) owl's-clover (X)
    - succulent (=fleshy) owl's-clover (T)

- Ceanothus roderickii
    - Pine Hill ceanothus (E)

- Cordylanthus mollis ssp. mollis
  - soft bird's-beak (E)

- Cordylanthus palmatus
  - palmate-bracted bird's-beak (E)

- Eriogonum apricum var. apricum
  - Ione buckwheat (E)

- Eriogonum apricum var. prostratum
  - Irish Hill buckwheat (E)

- Erysimum capitatum ssp. angustatum
  - Contra Costa wallflower (E)
  - Critical Habitat, Contra Costa wallflower (X)

- Fremontodendron californicum ssp. decumbens
  - Pine Hill flannelbush (E)

- Galium californicum ssp. sierrae
  - El Dorado bedstraw (E)

- Lasthenia conjugens
  - Contra Costa goldfields (E)

- Neostapfia colusana
  - Colusa grass (T)

- Oenothera deltoides ssp. howellii
  - Antioch Dunes evening-primrose (E)
  - Critical habitat, Antioch Dunes evening-primrose (X)

- Orcuttia tenuis
  - Critical habitat, slender Orcutt grass (X)
  - slender Orcutt grass (T)

- Orcuttia viscida
  - Critical habitat, Sacramento Orcutt grass (X)
  - Sacramento Orcutt grass (E)

- Senecio layneae
  - Layne's butterweed (=ragwort) (T)

- Sidalcea keckii
  - Keck's checker-mallow (=checkerbloom) (E)

Candidate Species

Birds

- Coccyzus americanus occidentalis
  - Western yellow-billed cuckoo (C)

San Joaquin County

Listed Species

Invertebrates

- Branchinecta conservatio
  - Conservancy fairy shrimp (E)
  - Critical habitat, Conservancy fairy shrimp (X)

- Branchinecta longiantenna
  - longhorn fairy shrimp (E)

- Branchinecta lynchi
  - Critical habitat, vernal pool fairy shrimp (X)
  - vernal pool fairy shrimp (T)

- Desmocerus californicus dimorphus
  - valley elderberry longhorn beetle (T)

- Elaphrus viridis
    - delta green ground beetle (T)

- Lepidurus packardi
    - Critical habitat, vernal pool tadpole shrimp (X)
    - vernal pool tadpole shrimp (E)

Fish

- Acipenser medirostris
    - green sturgeon (T) (NMFS)

- Hypomesus transpacificus
    - Critical habitat, delta smelt (X)
    - delta smelt (T)

- Oncorhynchus mykiss
    - Central Valley steelhead (T) (NMFS)
    - Critical habitat, Central Valley steelhead (X) (NMFS)

- Oncorhynchus tshawytscha
    - Central Valley spring-run chinook salmon (T) (NMFS)
    - Critical Habitat, Central Valley spring-run chinook (X) (NMFS)
    - Critical habitat, winter-run chinook salmon (X) (NMFS)
    - winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

- Ambystoma californiense
    - California tiger salamander, central population (T)
    - Critical habitat, CA tiger salamander, central population (X)

- Rana draytonii
    - California red-legged frog (T)
    - Critical habitat, California red-legged frog (X)

Reptiles

- Masticophis lateralis euryxanthus
  - Alameda whipsnake [=striped racer] (T)
  - Critical habitat, Alameda whipsnake (X)

- Thamnophis gigas
  - giant garter snake (T)

Birds

- Rallus longirostris obsoletus
  - California clapper rail (E)

- Vireo bellii pusillus
  - Least Bell's vireo (E)

Mammals

- Neotoma fuscipes riparia
  - riparian (San Joaquin Valley) woodrat (E)

- Sylvilagus bachmani riparius
  - riparian brush rabbit (E)

- Vulpes macrotis mutica
  - San Joaquin kit fox (E)

Plants

- Amsinckia grandiflora
  - Critical habitat, large-flowered fiddleneck (X)
  - large-flowered fiddleneck (E)

- Arctostaphylos myrtifolia
  - Ione manzanita (T)

- Castilleja campestris ssp. succulenta
    - Critical habitat, succulent (=fleshy) owl's-clover (X)
    - succulent (=fleshy) owl's-clover (T)

- Cordylanthus palmatus
    - palmate-bracted bird's-beak (E)

- Lasthenia conjugens
    - Critical habitat, Contra Costa goldfields (X)

- Orcuttia viscida
    - Critical habitat, Sacramento Orcutt grass (X)
    - Sacramento Orcutt grass (E)

- Tuctoria greenei
    - Greene's tuctoria (=Orcutt grass) (E)

Candidate Species

Birds

- Coccyzus americanus occidentalis
    - Western yellow-billed cuckoo (C)

Yolo County

Listed Species

Invertebrates

- Branchinecta conservatio
    - Conservancy fairy shrimp (E)

- Branchinecta lynchi
    - vernal pool fairy shrimp (T)

- Desmocerus californicus dimorphus
  - valley elderberry longhorn beetle (T)

- Elaphrus viridis
  - delta green ground beetle (T)

- Lepidurus packardi
  - Critical habitat, vernal pool tadpole shrimp (X)
  - vernal pool tadpole shrimp (E)

- Syncaris pacifica
  - California freshwater shrimp (E)

Fish

- Acipenser medirostris
  - green sturgeon (T) (NMFS)

- Hypomesus transpacificus
  - Critical habitat, delta smelt (X)
  - delta smelt (T)

- Oncorhynchus mykiss
  - Central Valley steelhead (T) (NMFS)
  - Critical habitat, Central Valley steelhead (X) (NMFS)

- Oncorhynchus tshawytscha
  - Central Valley spring-run chinook salmon (T) (NMFS)
  - Critical Habitat, Central Valley spring-run chinook (X) (NMFS)
  - Critical habitat, winter-run chinook salmon (X) (NMFS)
  - winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

- Ambystoma californiense
  - California tiger salamander, central population (T)
  - Critical habitat, CA tiger salamander, central population (X)

- Rana draytonii
  - California red-legged frog (T)

Reptiles

- Thamnophis gigas
  - giant garter snake (T)

Birds

- Charadrius alexandrinus nivosus
  - western snowy plover (T)

- Strix occidentalis caurina
  - northern spotted owl (T)

- Vireo bellii pusillus
  - Least Bell's vireo (E)

Plants

- Cordylanthus palmatus
  - palmate-bracted bird's-beak (E)

- Neostapfia colusana
  - Colusa grass (T)
  - Critical habitat, Colusa grass (X)

- Sidalcea keckii
  - Keck's checker-mallow (=checkerbloom) (E)

- Tuctoria mucronata
  - Critical habitat, Solano grass (=Crampton's tuctoria) (X)
  - Solano grass (=Crampton's tuctoria) (E)

Proposed Species

Amphibians

- Anaxyrus canorus
    - Yosemite toad (PX)

Candidate Species

Birds

- Coccyzus americanus occidentalis
    - Western yellow-billed cuckoo (C)

Key:

- (E) Endangered - Listed as being in danger of extinction.
- (T) Threatened - Listed as likely to become endangered within the foreseeable future.
- (P) Proposed - Officially proposed in the Federal Register for listing as endangered or threatened.
- (NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
- Critical Habitat - Area essential to the conservation of a species.
- (PX) Proposed Critical Habitat - The species is already listed. Critical habitat is being proposed for it.
- (C) Candidate - Candidate to become a proposed species.
- (V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
- (X) Critical Habitat designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, or may be affected by projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist and/or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list.
See our Protocol and Recovery Permits pages.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

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> Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

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- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.
- Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

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Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our Map Room page.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. More info

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6520.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be June 10, 2014.

These buttons will not appear on your list.

Revise Selection

Print this page

Print species list before going on to letter.

Make Official Letter

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 140321120655

Database Last Updated: September 18, 2011

Quad Lists

Listed Species

Invertebrates

- Apodemia mormo langei
  - Lange's metalmark butterfly (E)
- Branchinecta conservatio
  - Conservancy fairy shrimp (E)
- Branchinecta longiantenna
  - longhorn fairy shrimp (E)
- Branchinecta lynchi
  - Critical habitat, vernal pool fairy shrimp (X)
  - vernal pool fairy shrimp (T)
- Desmocerus californicus dimorphus
  - valley elderberry longhorn beetle (T)
- Elaphrus viridis
  - delta green ground beetle (T)
- Lepidurus packardi
  - vernal pool tadpole shrimp (E)

Fish

- Acipenser medirostris
  - green sturgeon (T) (NMFS)

- Hypomesus transpacificus
  - Critical habitat, delta smelt (X)
  - delta smelt (T)

- Oncorhynchus mykiss
  - Central Valley steelhead (T) (NMFS)
  - Critical habitat, Central Valley steelhead (X) (NMFS)

- Oncorhynchus tshawytscha
  - Central Valley spring-run chinook salmon (T) (NMFS)
  - Critical Habitat, Central Valley spring-run chinook (X) (NMFS)
  - Critical habitat, winter-run chinook salmon (X) (NMFS)
  - winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

- Ambystoma californiense
  - California tiger salamander, central population (T)
  - Critical habitat, CA tiger salamander, central population (X)

- Rana draytonii
  - California red-legged frog (T)

Reptiles

- Masticophis lateralis euryxanthus
  - Alameda whipsnake [=striped racer] (T)
  - Critical habitat, Alameda whipsnake (X)

- Thamnophis gigas
  - giant garter snake (T)

Birds

- Rallus longirostris obsoletus
  - California clapper rail (E)

- Sternula antillarum (=Sterna, =albifrons) browni
  - California least tern (E)

Mammals

- Reithrodontomys raviventris
  - salt marsh harvest mouse (E)

- Vulpes macrotis mutica
  - San Joaquin kit fox (E)

Plants

- Amsinckia grandiflora
  - large-flowered fiddleneck (E)
- Cordylanthus mollis ssp. mollis
  - soft bird's-beak (E)
- Erysimum capitatum ssp. angustatum
  - Contra Costa wallflower (E)
  - Critical Habitat, Contra Costa wallflower (X)
- Lasthenia conjugens
  - Contra Costa goldfields (E)
- Neostapfia colusana
  - Colusa grass (T)
- Oenothera deltoides ssp. howellii
  - Antioch Dunes evening-primrose (E)
  - Critical habitat, Antioch Dunes evening-primrose (X)
- Sidalcea keckii
  - Keck's checker-mallow (=checkerbloom) (E)

Quads Containing Listed, Proposed or Candidate Species:

WOODWARD ISLAND (463A)

BRENTWOOD (463B)

ANTIOCH SOUTH (464A)

ISLETON (480A)

RIO VISTA (480B)

JERSEY ISLAND (480C)

BOULDIN ISLAND (480D)

BIRDS LANDING (481A)

ANTIOCH NORTH (481D)

County Lists

Contra Costa County

Listed Species

Invertebrates

- Apodemia mormo langei
  - Lange's metalmark butterfly (E)

- Branchinecta conservatio
  - Conservancy fairy shrimp (E)

- Branchinecta longiantenna
  - Critical habitat, longhorn fairy shrimp (X)
  - longhorn fairy shrimp (E)

- Branchinecta lynchi
  - Critical habitat, vernal pool fairy shrimp (X)
  - vernal pool fairy shrimp (T)

- Desmocerus californicus dimorphus
  - valley elderberry longhorn beetle (T)

- Elaphrus viridis
  - delta green ground beetle (T)

- Lepidurus packardi
  - vernal pool tadpole shrimp (E)

- Speyeria callippe callippe
  - callippe silverspot butterfly (E)

- Syncaris pacifica
  - California freshwater shrimp (E)

Fish

- Acipenser medirostris
  - green sturgeon (T) (NMFS)

- Eucyclogobius newberryi
  - tidewater goby (E)

- Hypomesus transpacificus
  - Critical habitat, delta smelt (X)
  - delta smelt (T)

- Oncorhynchus kisutch
  - coho salmon - central CA coast (E) (NMFS)
  - Critical habitat, coho salmon - central CA coast (X) (NMFS)

- Oncorhynchus mykiss
  - Central California Coastal steelhead (T) (NMFS)
  - Central Valley steelhead (T) (NMFS)
  - Critical habitat, Central California coastal steelhead (X) (NMFS)
  - Critical habitat, Central Valley steelhead (X) (NMFS)

- Oncorhynchus tshawytscha
  - Central Valley spring-run chinook salmon (T) (NMFS)
  - Critical Habitat, Central Valley spring-run chinook (X) (NMFS)
  - Critical habitat, winter-run chinook salmon (X) (NMFS)
  - winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

- Ambystoma californiense
  - California tiger salamander, central population (T)
  - Critical habitat, CA tiger salamander, central population (X)

- Rana draytonii
  - California red-legged frog (T)
  - Critical habitat, California red-legged frog (X)

Reptiles

- Masticophis lateralis euryxanthus
    - Alameda whipsnake [=striped racer] (T)
    - Critical habitat, Alameda whipsnake (X)

- Thamnophis gigas
    - giant garter snake (T)

Birds

- Charadrius alexandrinus nivosus
    - western snowy plover (T)

- Pelecanus occidentalis californicus
    - California brown pelican (E)

- Rallus longirostris obsoletus
    - California clapper rail (E)

- Sternula antillarum (=Sterna, =albifrons) browni
    - California least tern (E)

- Strix occidentalis caurina
    - northern spotted owl (T)

Mammals

- Reithrodontomys raviventris
    - salt marsh harvest mouse (E)

- Vulpes macrotis mutica
    - San Joaquin kit fox (E)

Plants

- Amsinckia grandiflora
  - large-flowered fiddleneck (E)
- Arctostaphylos pallida
  - pallid manzanita (=Alameda or Oakland Hills manzanita) (T)
- Calochortus tiburonensis
  - Tiburon mariposa lily (T)
- Castilleja affinis ssp. neglecta
  - Tiburon paintbrush (E)
- Chorizanthe robusta var. robusta
  - robust spineflower (E)
- Clarkia franciscana
  - Presidio clarkia (E)
- Cordylanthus mollis ssp. mollis
  - soft bird's-beak (E)
- Cordylanthus palmatus
  - palmate-bracted bird's-beak (E)
- Erysimum capitatum ssp. angustatum
  - Contra Costa wallflower (E)
  - Critical Habitat, Contra Costa wallflower (X)
- Hesperolinon congestum
  - Marin dwarf-flax (=western flax) (T)
- Holocarpha macradenia
  - Critical habitat, Santa Cruz tarplant (X)

- Santa Cruz tarplant (T)

- Lasthenia conjugens
  - Contra Costa goldfields (E)
  - Critical habitat, Contra Costa goldfields (X)

- Neostapfia colusana
  - Colusa grass (T)

- Oenothera deltoides ssp. howellii
  - Antioch Dunes evening-primrose (E)
  - Critical habitat, Antioch Dunes evening-primrose (X)

- Pentachaeta bellidiflora
  - white-rayed pentachaeta (E)

- Sidalcea keckii
  - Keck's checker-mallow (=checkerbloom) (E)

- Streptanthus niger
  - Tiburon jewelflower (E)

- Suaeda californica
  - California sea blite (E)

- Trifolium amoenum
  - showy Indian clover (E)

Proposed Species

Plants

- Cordylanthus mollis ssp. mollis
  - Critical habitat, soft bird's-beak (PX)

Key:

- (E) Endangered - Listed as being in danger of extinction.
- (T) Threatened - Listed as likely to become endangered within the foreseeable future.
- (P) Proposed - Officially proposed in the Federal Register for listing as endangered or threatened.
- (NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
- Critical Habitat - Area essential to the conservation of a species.
- (PX) Proposed Critical Habitat - The species is already listed. Critical habitat is being proposed for it.
- (C) Candidate - Candidate to become a proposed species.
- (V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
- (X) Critical Habitat designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, or may be affected by projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist and/or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list.
See our Protocol and Recovery Permits pages.

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APPENDIX C

DSM2 Modeling of Tidal Flows and Salinity

INTRODUCTION

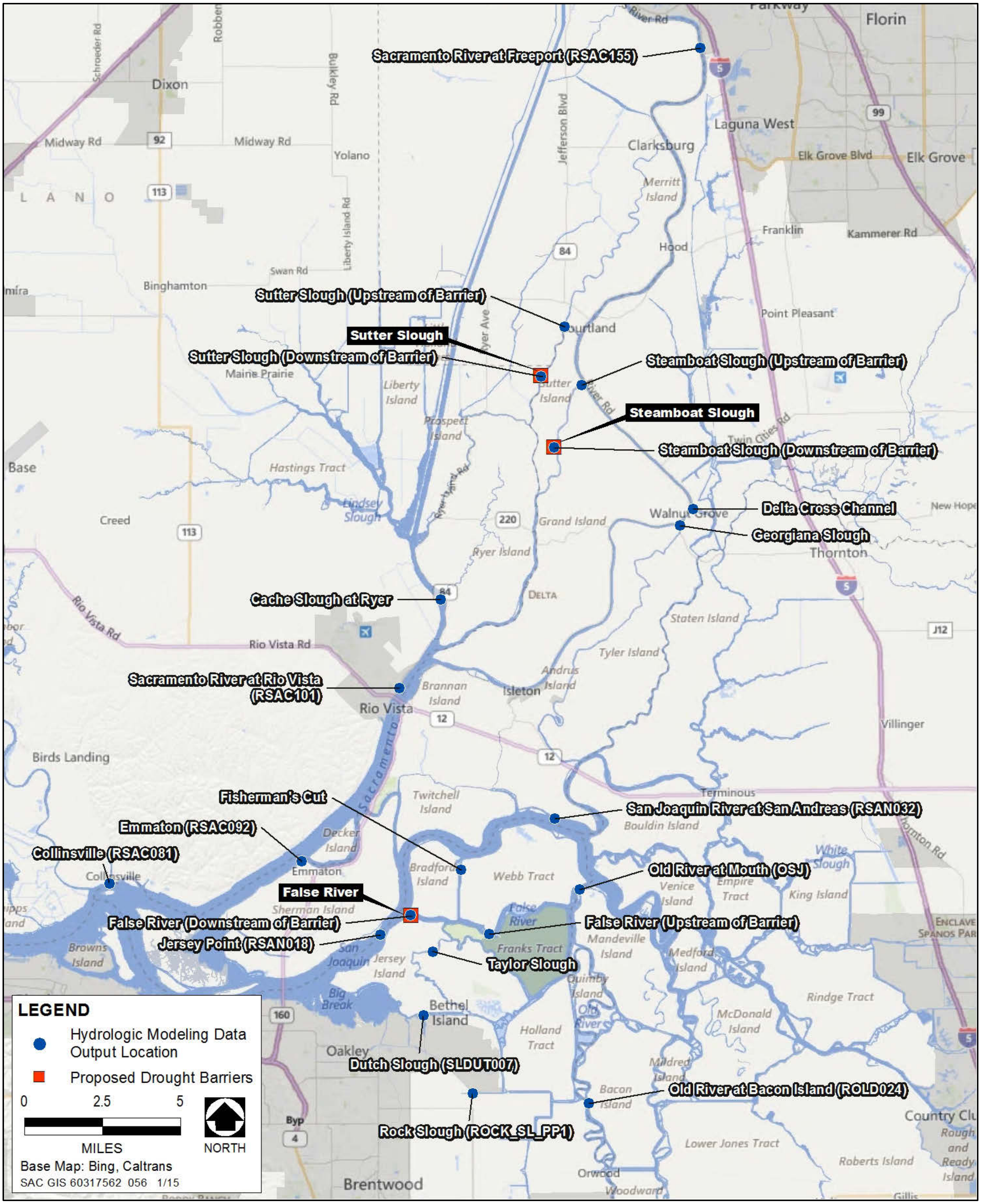
This appendix discusses the effects of the Emergency Drought Barriers (EDB) Project (proposed project) on tidal flows and salinity in the Delta in comparison to a scenario with no EDB, for the same simulated hydrology. Delta inflow, Delta diversions (including South Delta exports, in-Delta diversions for agriculture, etc.), and Delta outflow are the same for the EDB and no-EDB scenarios described herein. Therefore, the modeling shown here illustrates only the effects that the proposed project would have on conditions within the Delta for a given operational scenario, and not changes in CVP/SWP operations that could result from implementing the proposed project. Potential changes in CVP/SWP operations would be considered in the broader context of the drought operations planning (including features such as temporary D-1641 criteria changes, modifications to CVP/SWP BO criteria, and the operations of the proposed project). A map of the hydrologic modeling data output locations is provided in Figure C-1.

METHODS

Tidal elevations, tidal flows, and electrical conductivity (EC) in the Delta channels for this assessment were derived from the DSM2 model runs based on simulated hydrology. The DSM2 model has undergone extensive calibration (e.g., Liu and Sandhu 2013), so DSM2 modeling results provided an accurate comparison of the effects of the barriers on tidal elevations, tidal flows, and salinity in the Delta channels.

The DSM2-HYDRO (i.e., for tidal flows and elevations) and DSM2-QUAL (for EC) modeling used for this assessment included a 24-month period (January in Year 1 to December of Year 2). Year 1 was the modeling warm-up period and was based on the historic 2014 conditions from January through August, with projected conditions for September through December (Table C-1). The simulated hydrology in Year 2 was adapted from an initial operational forecast from February 9, 2014, that included minimum reservoir releases to meet instream flow requirements upstream of the Delta (Smith pers. comm.). The three barriers proposed were assumed to be installed on June 1 and removed on October 31. Two EDB scenarios were run, one with one culvert open on each of the Sutter and Steamboat slough barriers, and one with all (four) culverts open on each of the Sutter and Steamboat slough barriers. The discussion herein primarily focuses on the results from the one-culvert-open scenario, because this is what is anticipated to be the most common operational scenario, and because little difference exists in the modeling results from having one or four culverts open. These scenarios were compared to a no-EDB scenario, which had the same simulated hydrology but no barriers installed. The adaptation of the February 9, 2014, forecast for the simulated hydrology included these steps:

- In-Delta consumptive use was revised to reflect more appropriate values (Suits, pers. comm., 2014);
- CVP/SWP exports were reduced to health and safety requirements (i.e., combined exports of around 1,500 cfs) from March through November;



Source: ICF 2014

Figure C-1. Hydrologic Modeling Data Output Locations

- Sacramento River inflow was adjusted to result in Delta outflow that generally fell within criteria specified in the 2014 Drought Operations Plan, as follows:
  - At least 3,000 cfs Delta outflow in April and May;
  - At least 2,000 cfs Delta outflow from June through November[3]

The simulated hydrology included operation of the Delta Cross Channel per D-1641 (with a short opening period in February, as may occur during drought conditions based on 2014), operation of the Suisun Marsh Salinity Control Gates (from around January to June, and from September to December), and implementation of the South Delta Temporary Barriers Project based on the following installation and removal dates:

- Head of Old River: Installed April 19, removed June 8;
- Middle River: Installed May 16, removed November 29;
- Old River at Tracy: Installed June 2, removed November 29;
- Grant Line Canal: Installed June 10, removed November 29.

Table C-1
Mean Monthly Flow (Cubic Feet Per Second) at Several Key Locations for Year 1 (Model Warm Up Year) of the DSM2 Modeling Associated with the Emergency Drought Barriers Project

Month	Sacramento River at Freeport (cfs)	San Joaquin River at Vernalis (cfs)	Delta Consumptive Use (cfs)	SWP Exports (cfs)	CVP Exports (cfs)	Delta Outflow (cfs)
January	6,514	856	449	1,035	435	6,005
February	10,785	822	1,731	1,243	1,292	8,250
March	14,777	844	2,935	2,013	2,206	11,476
April	9,599	1,768	3,524	628	3,031	6,307
May	5,549	1,530	3,660	331	1,015	3,089
June	8,731	322	4,430	564	244	4,506
July	8,749	254	4,607	1,133	582	3,773
August	8,380	307	2,938	1,669	540	3,980
September	8,147	450	1,731	872	744	5,292
October	8,167	638	1,403	748	751	5,257
November	8,178	694	1,127	735	755	6,161
December	8,807	623	1,096	2,388	1,545	4,678

Notes: Mean monthly flows were for DSM2 channels labeled RSAC155 (Sacramento River), RSAN112 (San Joaquin River), CLIFTON_COURT (SWP exports), CVP (CVP exports), and the sum of channels 437, 442, and 511 (Delta outflow).

Source: Liu, pers. comm., 2014; Suits, pers. comm., 2014

Mean monthly flows for the simulated hydrology are summarized in Table C-2. The simulated hydrology shows the effects of the three barriers during low inflow, low exports, and low outflow conditions, representative of drought conditions. Changes in tidal elevations and tidal flows caused by the barriers for the above simulated hydrology were examined for July in the year of project implementation. Changes in salinity (EC) caused by the barriers were examined for June through November.

[3] The 2014 Drought Operations Plan specified at least 2,000 cfs in June through November for the situation wherein the EDB was installed, compared to 3,000 cfs if the EDB was not installed. The simulated hydrology for this analysis used the ≥2,000-cfs criterion to illustrate the effects of the EDB at relatively low outflow.

Table C-2 Mean Monthly Flow (Cubic Feet Per Second) at Several Key Locations for Year 2 (Simulated Hydrology, Used for The Impacts Assessment) of the DSM2 Modeling Associated with the Emergency Drought Barriers Project						
Month	Sacramento River at Freeport (cfs)	San Joaquin River at Vernalis (cfs)	Delta Consumptive Use (cfs)	SWP Exports (cfs)	CVP Exports (cfs)	Delta Outflow (cfs)
January	6,068	862	449	1,163	439	5,536
February	10,324	828	1,731	1,320	1,296	6,679
March	5,272	1,667	2,935	800	733	2,988
April	6,476	1,721	3,524	799	756	2,997
May	6,797	1,713	3,660	916	748	2,994
June	7,195	1,083	4,430	868	807	2,177
July	6,938	933	4,607	874	797	2,671
August	6,192	807	2,938	847	719	3,623
September	5,059	811	1,731	780	744	2,905
October	5,149	638	1,403	753	751	2,459
November	4,964	694	1,127	735	755	2,867
December	8,804	623	1,096	2,385	1,545	3,969

Notes: Mean monthly flows were for DSM2 channels labeled RSAC155 (Sacramento River), RSAN112 (San Joaquin River), CLIFTON_COURT (SWP exports), CVP (CVP exports), and the sum of channels 437, 442, and 511 (Delta outflow).

Source: Liu, pers. comm., 2015; Suits pers. comm., 2014

RESULTS

EFFECTS OF THE BARRIERS ON DELTA TIDAL FLOWS

Figure C-2 presents DSM2 modeling results of tidal flows and elevations in False River (downstream of the barrier) for July. False River is the major connection between the San Joaquin River and Franks Tract. The EDB would have substantial effects on Delta tidal flows. Figure C-2a shows the maximum ebb-tide (positive, downstream) tidal flows without the EDB range from about 30,000 cubic feet per second (cfs) to 50,000 cfs during the month (i.e., spring-neap variation) and the maximum flood-tide tidal flows (negative, upstream) range from about -35,000 cfs to nearly -60,000 cfs. The net flow (indicated by the one-day running average in Figure C-2a) was just under 1,000 cfs from Franks Tract to the San Joaquin River. The False River barrier would block this large tidal flow and would have substantial effects on tidal flows in many portions of the Delta. Figure C-2b shows the tidal elevations downstream of the False River barrier, with and without the EDB. The False River barrier would force the flood-tide water entering Franks Tract and Old River channels to be re-routed to Dutch Slough, Fisherman's Cut, or the mouth of Old River, located about 10 miles upstream on the San Joaquin River. This would cause a slight reduction (0.1 feet) in the tidal elevation range (maximum minus minimum) in Franks Tract, but would delay the tides in Franks Tract by about 15 minutes during both flood-tide and ebb-tide.

Figure C-3 shows the results from DSM2 modeling of tidal flows and elevations in the San Joaquin River at Jersey Point, just downstream of False River, for July. Figure C-3a shows the maximum ebb-tide (positive, downstream) tidal flows without the EDB range from about 70,000 cfs to 150,000 cfs during the month, and the maximum flood-tide tidal flows (negative, upstream) range from about -100,000 cfs to -170,000 cfs. The mean monthly net flow was around 640 cfs downstream. Because the False River barrier would block (re-route) a substantial portion of the tidal flow (about 20 percent of the Jersey Point tidal flow), the EDB would reduce tidal flows in the San Joaquin River at Jersey Point (by about 10 percent) and redirect some of this tidal flow to the Sacramento River (see Rio Vista results below). Figure C-3b shows that the tidal elevation range in the San Joaquin River at Jersey Point would not change; but the model indicates that the elevations at Jersey Point rise and fall earlier than without the EDB.

Figure C-4 shows the results from DSM2 modeling of tidal flows and elevations at the mouth of Old River for July. Figure C-4a shows the maximum ebb-tide (positive, downstream) tidal flows without the EDB range from about 6,000 cfs to over 14,000 cfs during the month, and the flood-tide tidal flows (negative, upstream) range from about -12,000 cfs to below -20,000 cfs. The net flow was about -2,500 cfs upstream into Franks Tract, and would not change appreciably with the EDB. Because the False River barrier would block and re-route a substantial portion of the San Joaquin River tidal flow, the tidal flow at the mouth of Old River with the EDB would increase substantially. The maximum ebb-tide flows with the EDB would range from just over 20,000 cfs to around 40,000 cfs, and the maximum flood-tide flows would range from just under -30,000 cfs to nearly -55,000 cfs. The tidal flows at the mouth of Old River would be increased by about the same amount as the False River tidal flows (blocked by the barrier). Figure C-4b shows that the tidal elevation range (i.e., maximum minus minimum) at the mouth of Old River would be reduced by about 0.25 feet.

Figure C-5 shows the results from DSM2 modeling of tidal flows and elevations in Old River at Bacon Island for July. Figure C-5a shows the maximum ebb-tide (positive, downstream) tidal flows without the EDB range from about 6,000 cfs to over 10,000 cfs during the month, and the flood-tide tidal flows (negative, upstream) range from just over -10,000 cfs to nearly -15,000 cfs. The net flow was about -2,600 cfs upstream towards the export pumps with and without the EDB. The tidal flows in Old River at Bacon Island with the EDB were reduced slightly (about 1,000 cfs). Figure C-5b shows that the tidal elevation range in Old River at Bacon Island would be reduced by about 0.25 feet.

Figure C-6 shows the results from DSM2 modeling of tidal flows and elevations in the Sacramento River at Rio Vista for July. Figure C-6a shows the maximum ebb-tide (positive, downstream) tidal flows without the EDB range from about 60,000 cfs to nearly 120,000 cfs during the month, and the flood-tide tidal flows (negative, upstream) range from about -75,000 cfs to below -125,000 cfs. The tidal flows at Rio Vista would be slightly increased by the barriers. As described above, the False River barrier would cause a reduction in the magnitude of the San Joaquin River tidal flows, and these tidal flows would be re-directed to the Sacramento River channel. Because Rio Vista is farther upstream than Jersey Point from the Sacramento–San Joaquin confluence, the reduction in tidal flows at Jersey Point would cause a smaller increase in tidal flows at Rio Vista: for example, the maximum flood-tide flow at Jersey Point was around 12 percent less with the EDB compared to no EDB, whereas the maximum flood-tide flow at Rio Vista was only 2 percent more with the EDB compared to no EDB. The net flow at Rio Vista was about 2,700 cfs for July, with no EDB. The net flow would be reduced by 1,200 cfs to about 1,500 cfs by the Sutter Slough and Steamboat Slough barriers, which would increase diversions from the Sacramento River to the San Joaquin River through the DCC and Georgiana Slough. Figure C-6b shows that the tidal elevation range in the Sacramento River at Rio Vista would be increased by about 0.1 feet by the EDB.

Figure C-7 shows the results from DSM2 modeling of tidal flows and elevations in Cache Slough at Ryer Island, just upstream of Miner Slough, which connects with Sutter Slough, for July. Figure C-7a shows the maximum ebb-tide (positive, downstream) tidal flows without the EDB range from around 40,000 cfs to 85,000 cfs during the month, and the maximum flood-tide tidal flows (negative, upstream) range from about -60,000 cfs to -100,000 cfs. About 80 percent of the tidal flows in the Sacramento River at Rio Vista would move into Cache Slough past Ryer Island. The tidal flows in Cache Slough would be slightly increased by the EDB. Figure C-7b shows that the tidal elevation range in Cache Slough at Ryer Island would be increased by about 0.1 feet by the EDB.

Figure C-8 shows the results from DSM2 modeling of tidal flows and elevations in Sutter Slough at the proposed barrier location for July. Figure C-8a shows the maximum ebb-tide (positive, downstream) tidal flows without the EDB range from about 3,000 cfs to 5,000 cfs during the month, and the maximum flood-tide tidal flows (negative, upstream) range from about -1,100 cfs to -4,000 cfs. The net flow in Sutter Slough downstream of the barrier was about 1,200 cfs without the EDB and around 20 cfs with the EDB and one culvert open; with all culverts open, the net flow was just over 100 cfs. Figure C-8b shows that the tidal elevations downstream of the Sutter Slough barrier without the EDB (green line) ranged from 3 feet to over 6 feet North American Vertical Datum (NAVD). The minimum elevations were about 1 to 1.5 feet higher than the minimum elevations at Rio Vista, because of the effects of the Sacramento River flow on tidal elevations. With the barrier, the minimum elevations upstream of the barrier would be increased (purple line) by about 0.5 feet compared to no EDB, and the maximum elevations would be about 0.2 feet lower than without the barrier. With the barrier, the minimum elevations downstream of the barrier would be reduced by 1 to 1.5 feet, and would be similar to the minimum elevations at Rio Vista and at Cache Slough. The high tides below the barrier would be increased slightly with the EDB, because the effects of the Sacramento River diversions to Sutter Slough counteracting the flood-tide flows would be greatly reduced.

Figure C-9 shows the results from DSM2 modeling of tidal flows and elevations in Steamboat Slough at the proposed barrier location for July. Figure C-9a shows the maximum ebb-tide (positive, downstream) tidal flows without the EDB range from about 2,500 cfs to 4,500 cfs during the month, and the maximum flood-tide tidal flows (negative, upstream) range from about -1,500 cfs to -4,000 cfs. The tidal flows in Steamboat and Sutter sloughs without the barriers are similar, but the flood tide flows in Steamboat are more sustained, and the resulting net flow is less. The net flow in Steamboat Slough was about 800 cfs without the EDB and would be reduced to 15 cfs (EDB, with one culvert open) to 90 cfs (EDB, with four culverts open). Figure C-9b shows that the tidal elevations without the barrier (green line) ranged from 2.5 feet to nearly 6.5 feet NAVD. The minimum elevations were about 1 to 1.5 feet higher than the minimum elevations at Rio Vista, because of the effects of the Sacramento River flow on tidal elevations. With the barrier, the minimum elevations upstream of the barrier would be increased (purple line) by about 0.5 to 1 foot, and the maximum elevations would be about the same or slightly lower as without the barrier. With the barrier, the minimum elevations below the barrier would be reduced by 1 to 1.5 feet, and would be similar to the minimum elevations at Rio Vista and at Cache Slough. The high tides below the barrier would be increased slightly with the barrier, because the effects of the Sacramento River diversions to Steamboat Slough counteracting the flood-tide flows would be eliminated.

Figure C-10 shows the results from DSM2 modeling of tidal flows and elevations in the Sacramento River at Freeport for July. Figure C-10a shows the maximum ebb-tide (positive, downstream) tidal flows without the EDB range from about 10,000 cfs to 14,000 cfs during the month, while the maximum flood-tide (increasing elevations) flows range from about -5,500 cfs to 3,000 cfs. The ebb-tide flows in the Sacramento River at Freeport with the EDB would be reduced (e.g., by around 2,200 cfs for the maximum ebb tide), and the flood-tide flows would be increased (e.g., by about 2,300 cfs for the maximum flood tide). The net downstream flow in the Sacramento River at Freeport was just over 6,900 cfs and would not change with the EDB (see also Table C-2). The EDB would reduce the strength of the tidal flows reaching Freeport. Figure C-10b shows that the tidal elevations in the Sacramento River at Freeport without the barrier (green line) ranged from around 3.5 feet to 7 feet NAVD. The minimum elevations were about 2 feet higher than the minimum elevations at Rio Vista, because of the effects of the Sacramento River flow on tidal elevations. With the EDB, the minimum elevations at Freeport would be increased (red line) by nearly 0.5 feet, and the maximum elevations would be reduced by just over 0.2 feet. The tidal elevations in the Sacramento River at Freeport would be increased with the EDB, because almost the entire Sacramento River flow would remain in the Sacramento River channel to Walnut Grove. This higher channel flow would require a slightly larger water elevation gradient (slope).

The higher Sacramento River flows at Walnut Grove would increase the diversions to the San Joaquin River through the DCC (Figure C-11) and Georgiana Slough (Figure C-12). Although the tidal flows in the DCC and Georgiana Slough would be complex (depending on both Sacramento River and Mokelumne River tidal elevations and flows), the net flow in the DCC would increase from about 2,000 cfs to nearly 3,000 cfs, and the Georgiana Slough flows would increase from about 1,300 cfs to over 1,600 cfs. This total increase of 1,200 cfs entering the DCC and Georgiana Slough would reduce the Rio Vista flow accordingly, as previously described.

The largest effects on tidal elevations of the EDB would be observed immediately downstream of the Sutter Slough and Steamboat Slough barriers. Tidal elevations would be slightly increased in the Sacramento River between Freeport and Walnut Grove. Much smaller changes in tidal elevations would be observed in the lower Sacramento River and in the SJR upstream of False River. The largest changes in tidal flows would be caused by the False River barrier, and would be observed in the SJR channel from the confluence with the Sacramento River (near Antioch) to the mouth of Old River. The tidal flows entering Franks Tract through False River would be re-routed upstream to the mouth of Old River; tidal flows upstream of Franks Tract in Old River and in Middle River would not change appreciably with the barriers. About 10 percent of the SJR tidal flows would be shifted to the Sacramento River channel, also increasing the tidal flows in Cache Slough.

EFFECTS OF THE BARRIERS ON DELTA SALINITY

Results from the DSM2 modeling of salinity (EC) at several western Delta locations shown here demonstrate that changes from the EDB generally would be small, although with some noteworthy effects. As noted in the Introduction to this appendix, the results shown here are specific to the particular simulated hydrology conducted for this analysis; potential changes in CVP/SWP operations in the broader context of the drought operations planning (including features such as temporary D-1641 criteria changes, modifications to CVP/SWP BO criteria, and the operations of the EDB) would be examined separately by DWR and Reclamation, as was done for the 2014 Drought Operations Plan. Changes in tidal elevations and tidal flows in the Delta channels are not expected to cause any significant impact on water quality; tidal flows (controlling water exchange and residence time) with the barriers would remain very similar to tidal flows without barriers at most locations. Salinity (EC) would be reduced in the South Delta channels by the EDB, and salinity (EC) in the Sacramento River at Emmaton and at Rio Vista would increase slightly with the drought barriers. Because salinity (EC) in the western Delta is controlled by Delta outflow, the drought barriers would result in a less-than-significant impact on EC in the western Delta channels.

Figure C-13 shows the mean daily EC at Jersey Point with and without the EDB for June through November. The daily average EC for this period without the EDB ranged from 2,400 to 4,500 microsiemens per centimeter (μS/cm), with an overall average of about 3,300 μS/cm. The major within-month EC variations were caused by the spring-neap tidal cycle, with higher average elevations causing higher average EC values because the salinity gradient moved slightly upstream. The EC at Jersey Point was greater than the D-1641 EC objective for critical years (2,200 μS/cm until the end of August) under all scenarios; however, the EC at Jersey Point would be less if

Delta outflow was increased from the outflow assumed for these DSM2-simulated conditions. The EDB would cause a 100-200 µS/cm reduction in the daily EC, because the net flows in the San Joaquin River at Jersey Point would increase with the EDB.

Figure C-14 shows the mean daily EC at the Contra Costa Water District's intake at Rock Slough with and without the EDB for June through November. The daily average EC for this period without the EDB was just over 1,300 µS/cm. The EDB would cause an almost 500 µS/cm reduction (37 percent reduction) in the mean daily EC in this period, because the flood-tide flows from the San Joaquin River at Jersey Point to Franks Tract through False River would be eliminated. The EC of the tidal flows at the mouth of Old River were considerably lower than the False River EC, and the reduction in Old River EC (and Rock Slough EC) were substantial. This illustrates the major beneficial effect of the EDB on South Delta EC.

Figure C-15 shows the daily EC in the Sacramento River at Emmaton with and without the EDB for June through November. The daily average EC for this period without the EDB ranged from 3,600 to 6,500 µS/cm, with an overall average of about 5,400 µS/cm. The EC at Emmaton was more than the D-1641 EC objective for critical years (2,780 µS/cm); however, the EC at Emmaton would be controlled (by adjusting outflow) to satisfy the applicable Emmaton EC objectives, which could be modified by the State Water Resources Control Board as part of drought operations planning. The EDB would cause a 300 µS/cm increase in the mean daily EC over June through November, because the net flow in the Sacramento River at Rio Vista would be reduced by the EDB.

Figure C-16 shows the daily EC in the Sacramento River at Rio Vista with and without the EDB for June through November. The daily average EC for this period without the EDB ranged from 500 to 1,400 µS/cm, with an overall average of just over 900 µS/cm. The EDB would cause a 300 µS/cm increase in the mean daily EC over June through November, because the net flows in the Sacramento River at Rio Vista would be reduced by the EDB.

Figure C-17 shows the daily EC in Cache Slough at Ryer Island with and without the EDB for June through November. The daily average EC for this period without the EDB was about 230 µS/cm. The EDB would cause a moderate increase in the Cache Slough EC (daily mean EC would be 200 µS/cm higher in June through November), because the Sutter Slough and Steamboat Slough barriers would largely eliminate the diversions from the Sacramento River upstream from Rio Vista; all the tidal flows would not originate at Rio Vista, and the slightly increased seawater intrusion at Emmaton and at Rio Vista also would increase the EC in Cache Slough. Changes in daily mean EC because of the EDB for other locations in the North Delta included little difference in EC in Sutter Slough (152 µS/cm for no EDB and EDB scenarios), approximately 20 µS/cm greater under the EDB (173 µS/cm) than no EDB (153 µS/cm) in Steamboat Slough, and approximately 90 µS/cm greater under the EDB (243 µS/cm) than no EDB (153 µS/cm) in Miner Slough.

Figure C-18 shows the daily EC in the Sacramento River at Collinsville with and without the EDB for June through November. The daily average EC for this period without the EDB ranged from 10,500 to 13,000 µS/cm. Because the EDB would not change Delta outflow, the EC downstream from the San Joaquin River confluence with the Sacramento River would not be changed, which is reflected in the Collinsville EC being very similar between the no-EDB and EDB scenarios.

Salinity (EC) in the western Delta and seawater intrusion in the central and South Delta are controlled by Delta outflow. The major effects of the barriers would be substantially reduced EC in the South Delta (Franks Tract and Old River); relatively small increases in EC would be observed in the Sacramento River between Emmaton and

Rio Vista, and in Cache Slough and in Steamboat, Sutter, and Miner sloughs (Figures C-17, C-19, and C-20). The number of open culverts on the Sutter and Steamboat slough barriers would have very little effect on EC at most locations. The largest relative effects of the culverts would be at the locations nearest to the barriers, as illustrated with the EC modeling results for Steamboat Slough and Miner Slough (Figures C-19 and C-20). However, the EC is expected to be relatively low under any scenario at these locations, whether the proposed project is implemented and whether one or four culverts are open.

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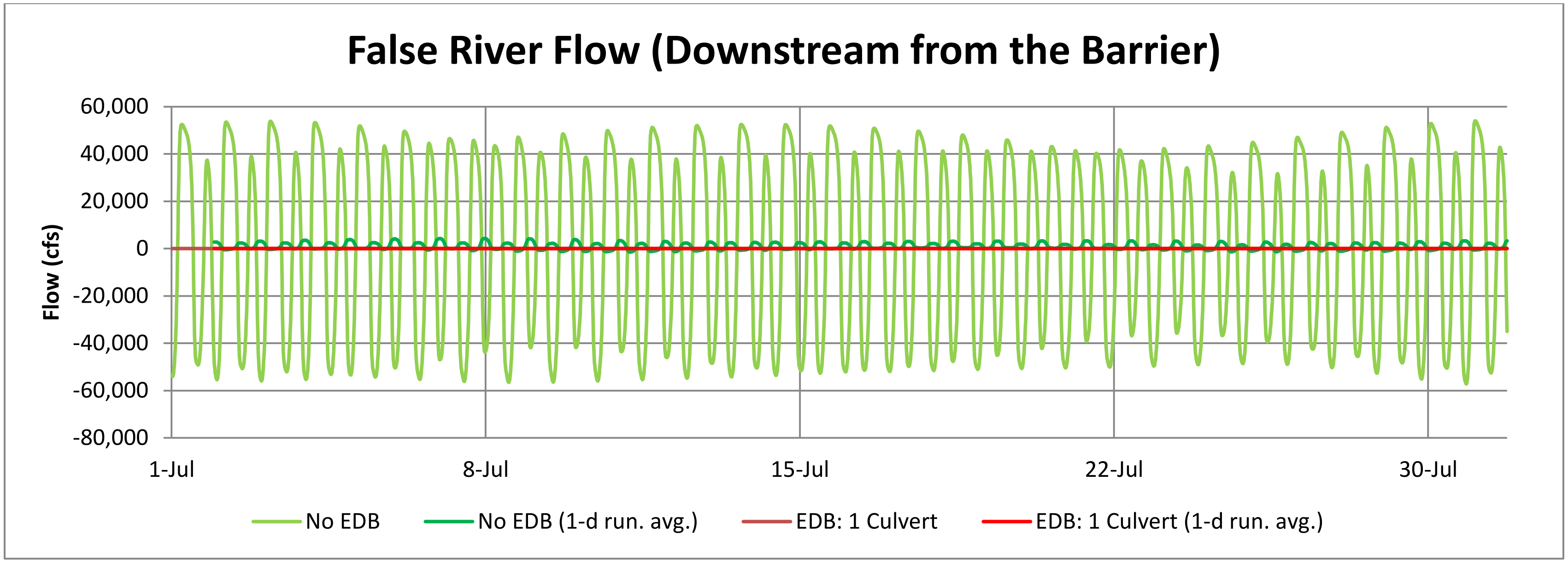

Figure C-2a. **DSM2-simulated Tidal Flows in False River with and without the EDB for July**

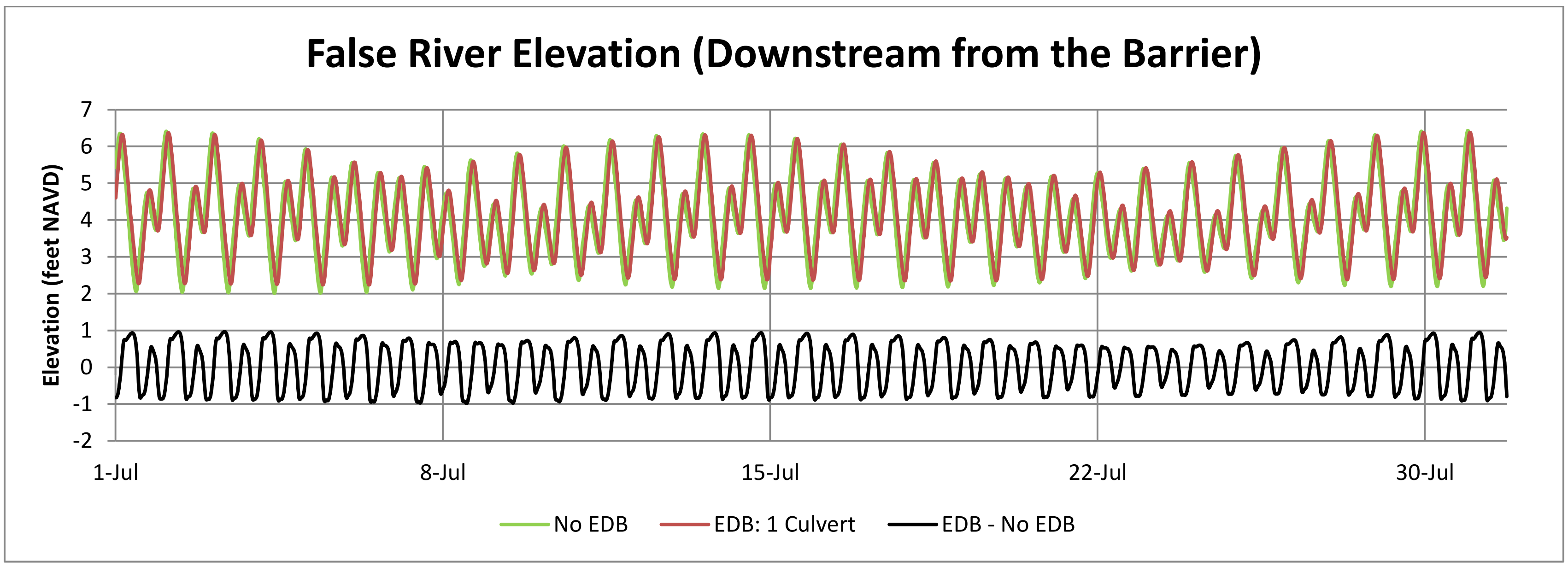

Figure C-2b. **DSM2-simulated Tidal Elevations in False River with and without the EDB for July**

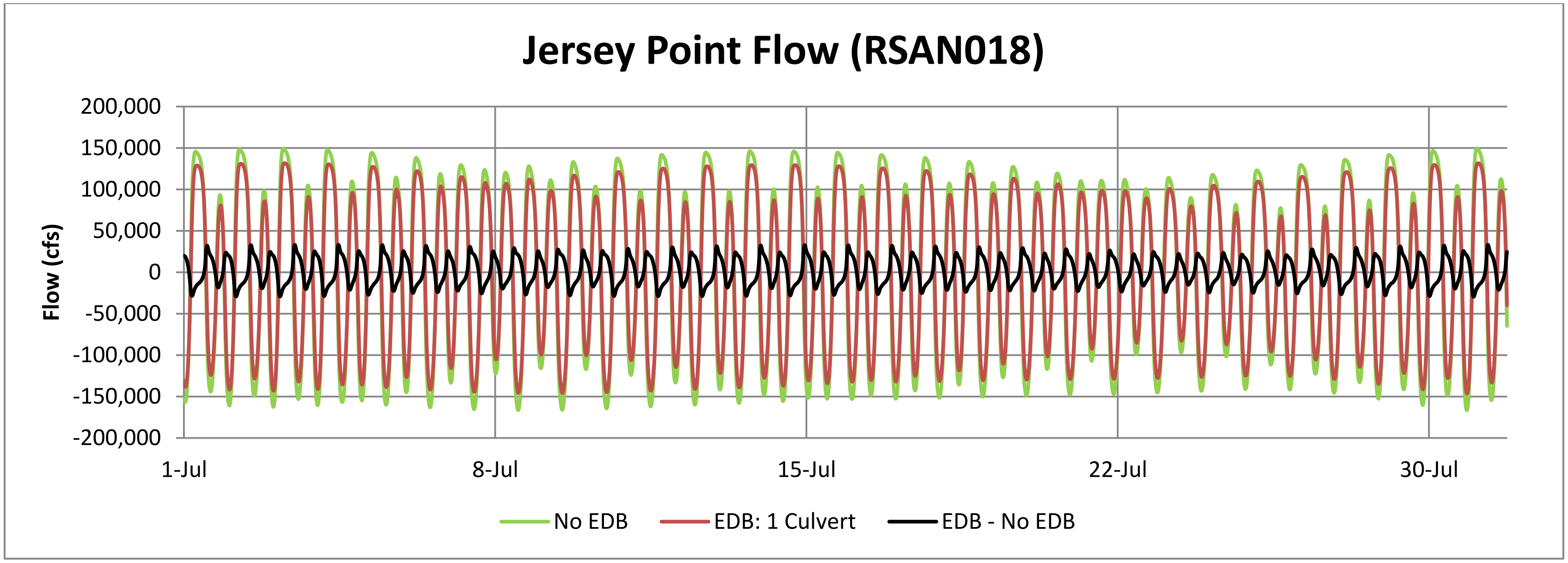

Figure C-3a. **DSM2-simulated Tidal Flows in the SJR at Jersey Point with and without the EDB for July**

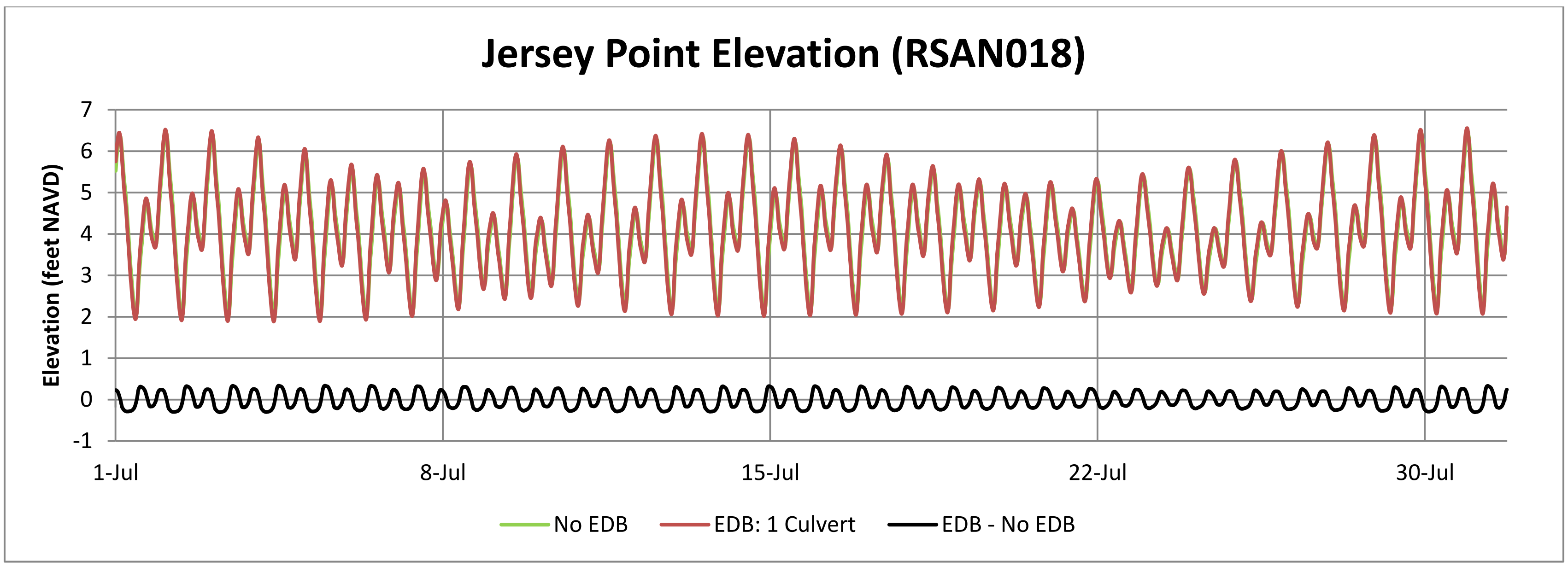

Figure C-3b. **DSM2-simulated Tidal Elevations in the SJR at Jersey Point with and without the EDB for July**

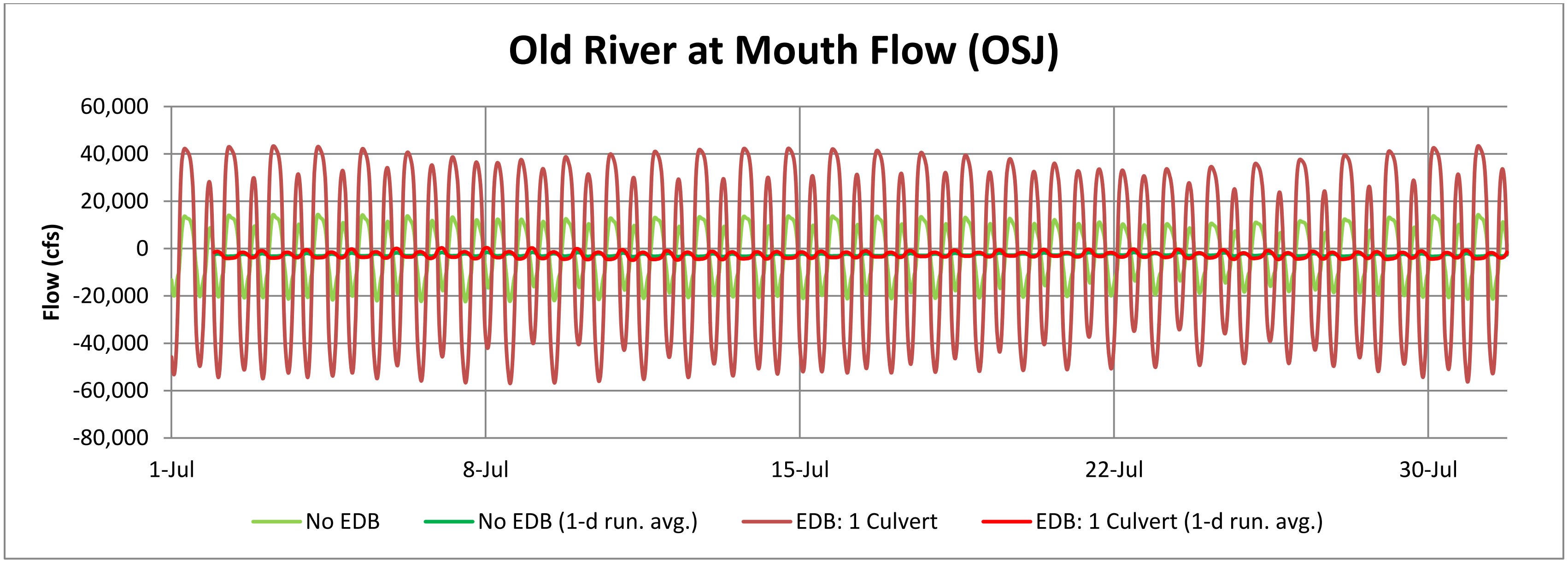

Figure C-4a. **DSM2-simulated Tidal Flows at the Mouth of Old River with and without the EDB for July**

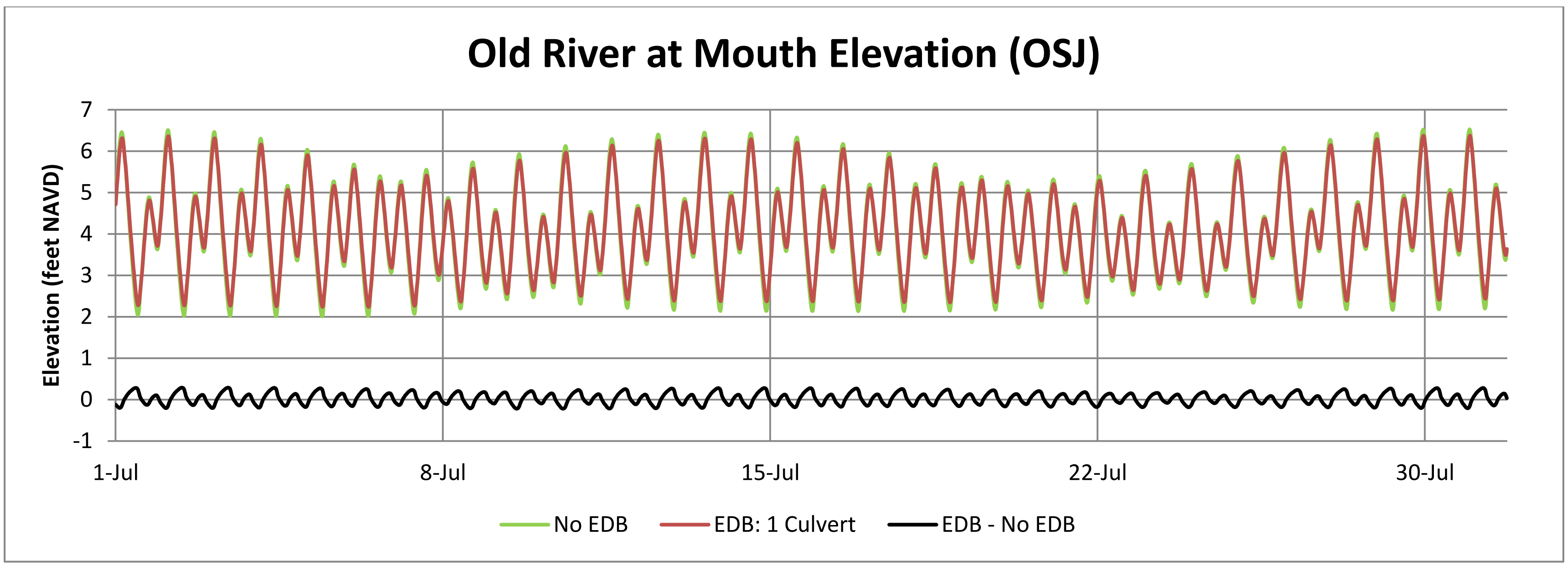

Figure C-4b. **DSM2-simulated Tidal Elevations at the Mouth of Old River with and without the EDB for July**

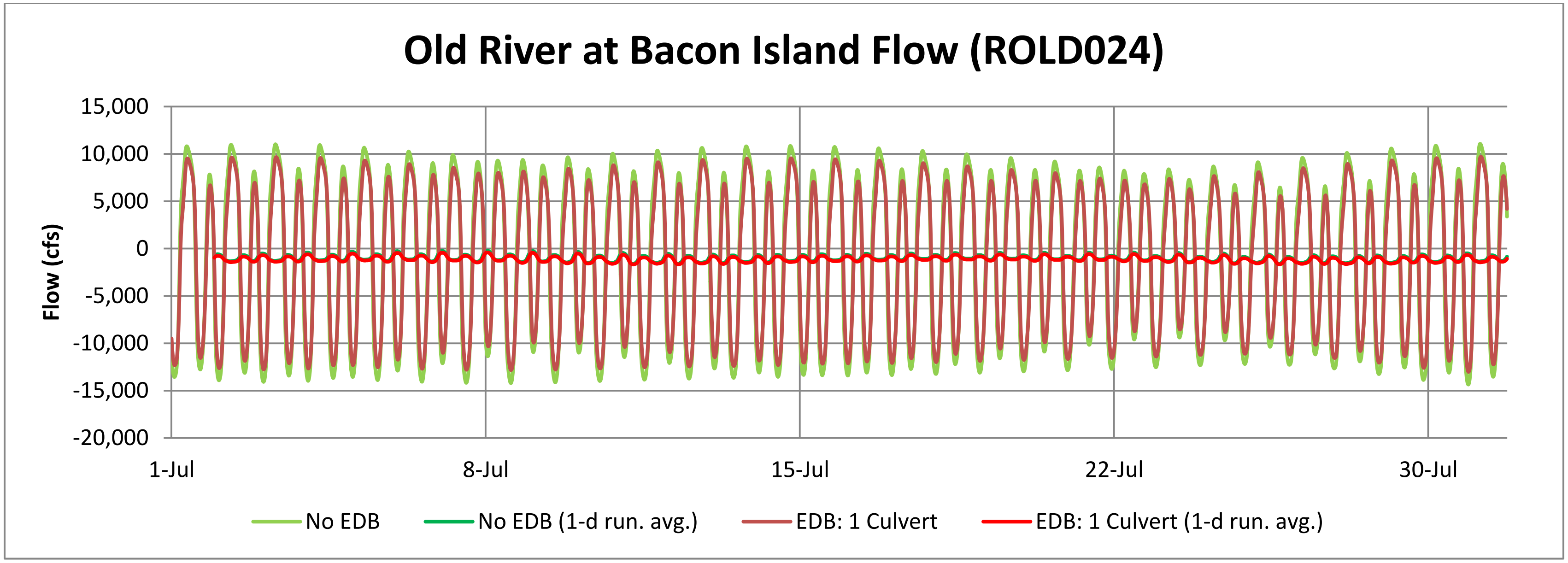

Figure C-5a. **DSM2-simulated Tidal Flows in Old River at Bacon Island with and without the EDB for July**

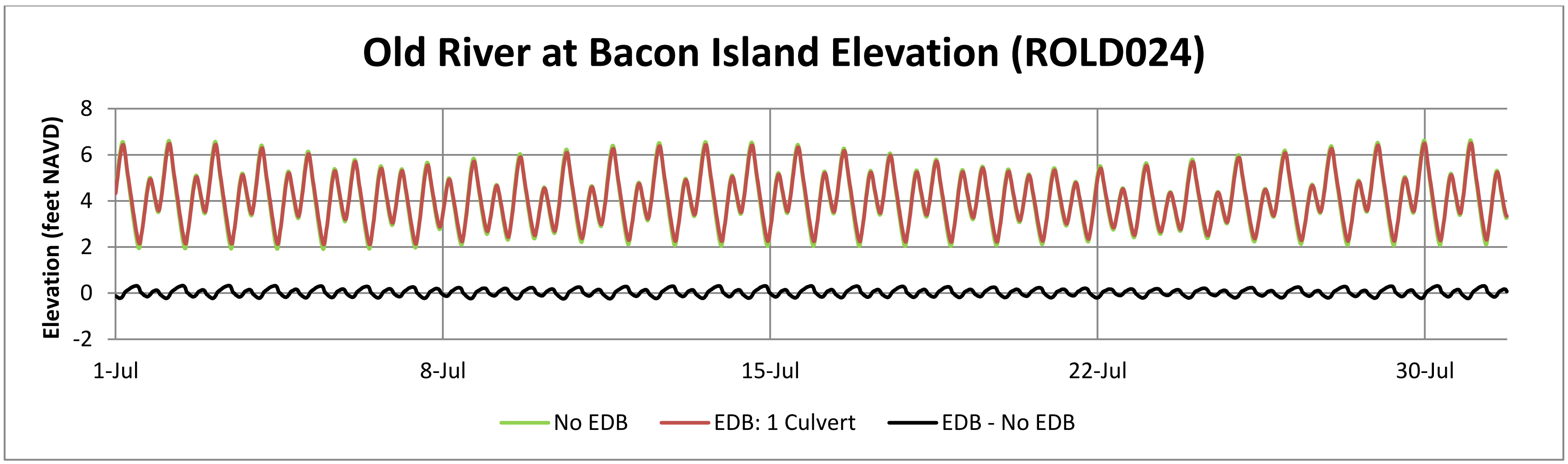

Figure C-5b. **DSM2-simulated Tidal Elevations in Old River at Bacon Island with and without the EDB for July**

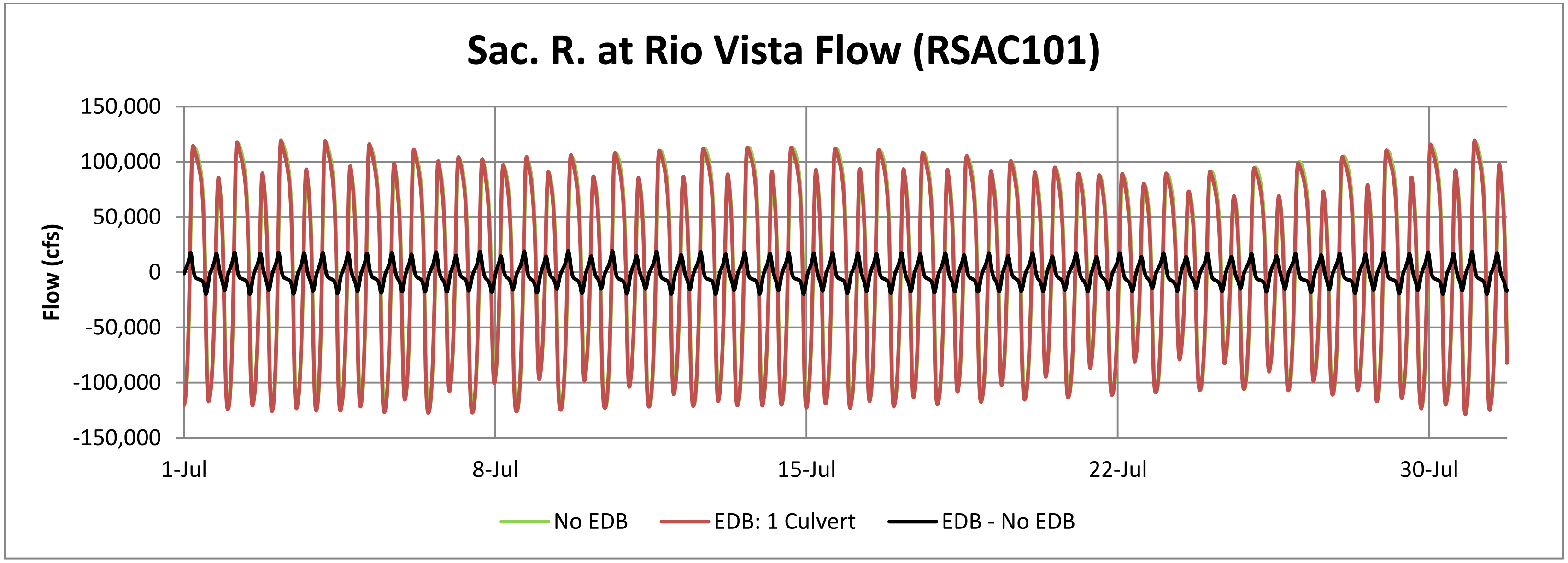

Figure C-6a. **DSM2-simulated Tidal Flows in Sacramento River at Rio Vista with and without the EDB for July**

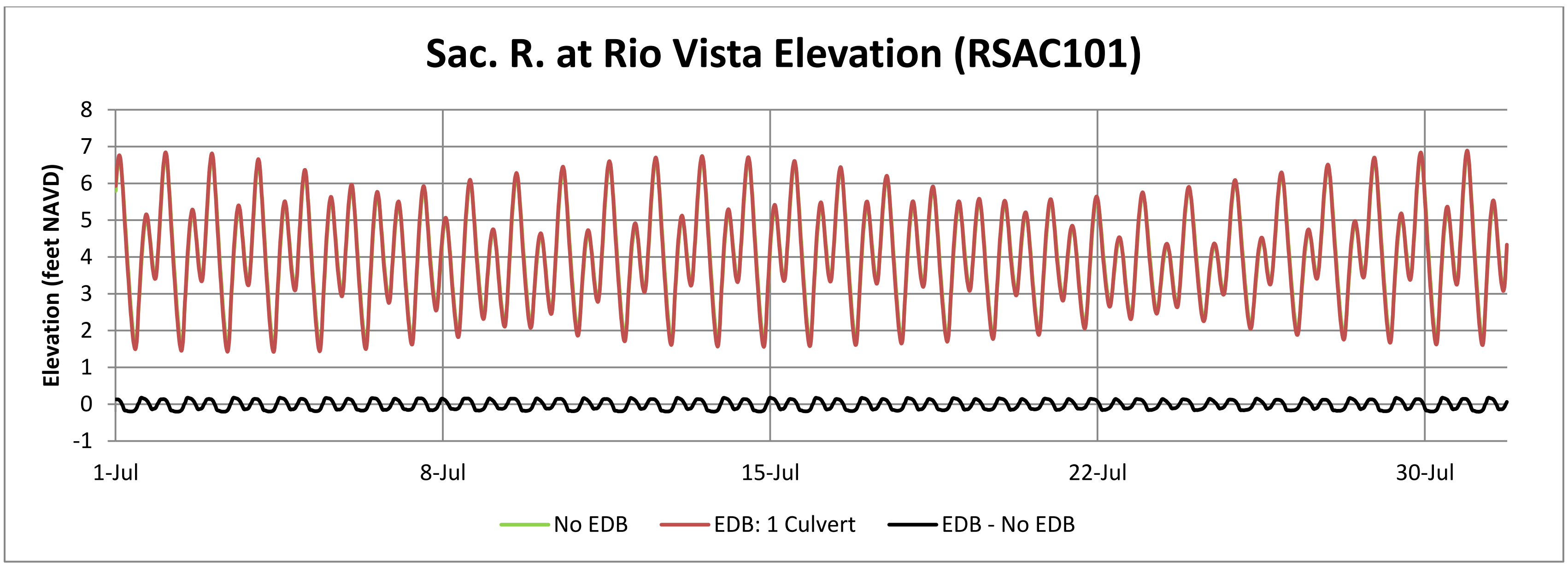

Figure C-6b. **DSM2-simulated Tidal Elevations in Sacramento River at Rio Vista with and without the EDB for July**

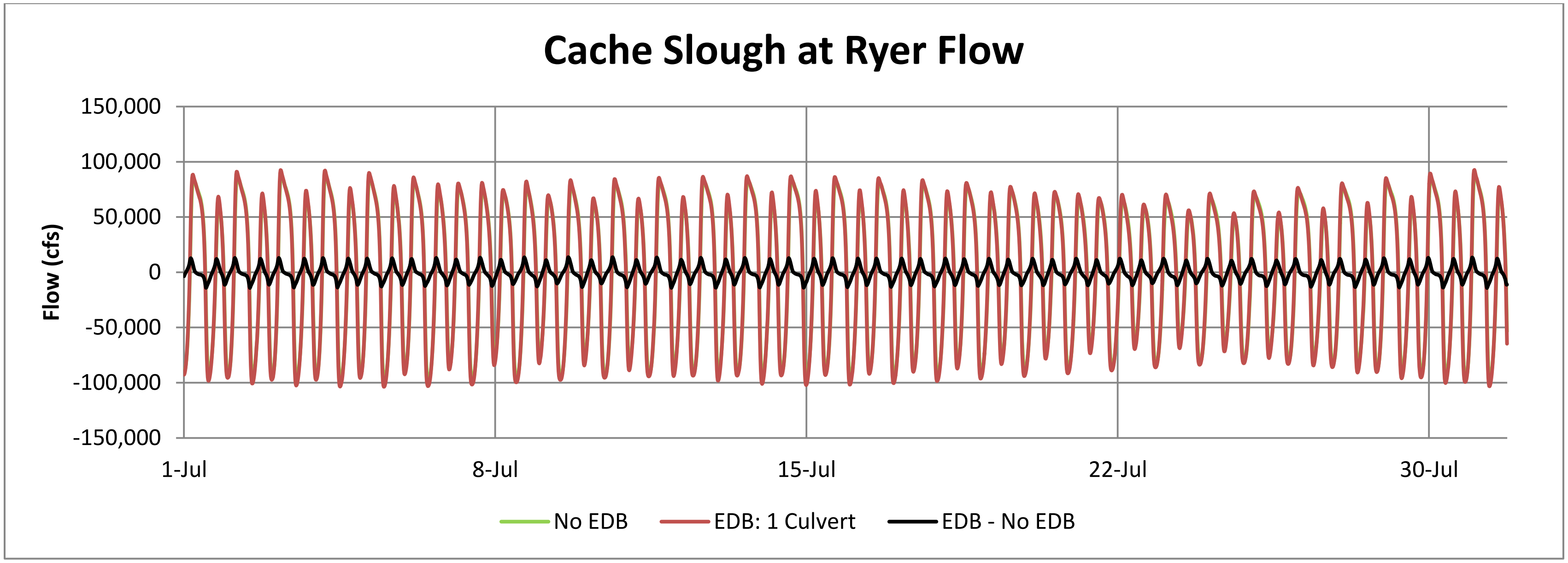

Figure C-7a. **DSM2-simulated Tidal Flows in Cache Slough at Ryer with and without the EDB for July**

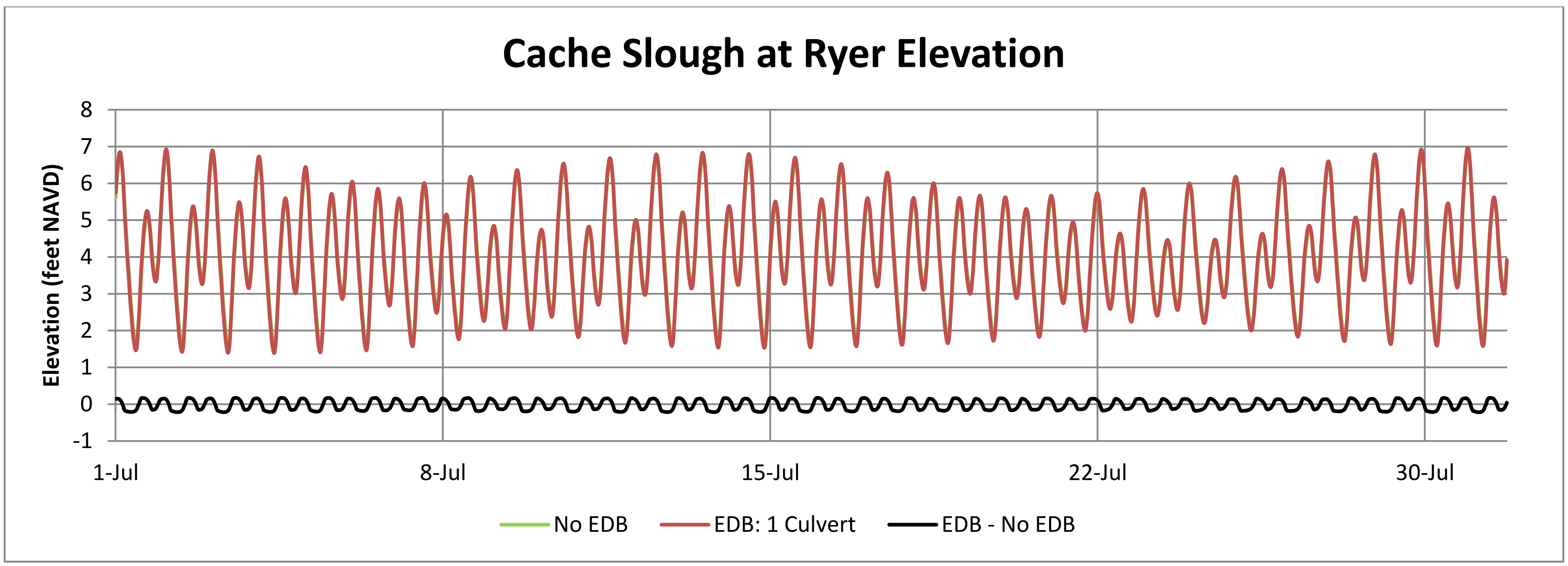

Figure C-7b. **DSM2-simulated Tidal Elevations in Cache Slough at Ryer with and without the EDB for July**

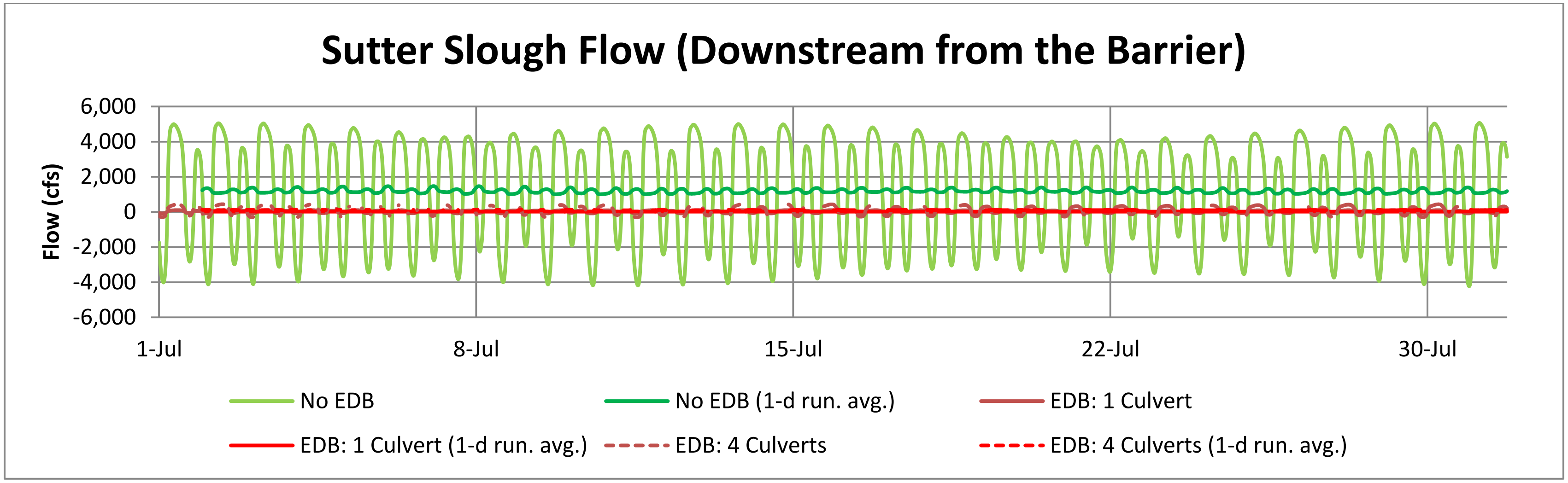

Figure C-8a. **DSM2-simulated Tidal Flows at Sutter Slough Barrier with and without the EDB for July**

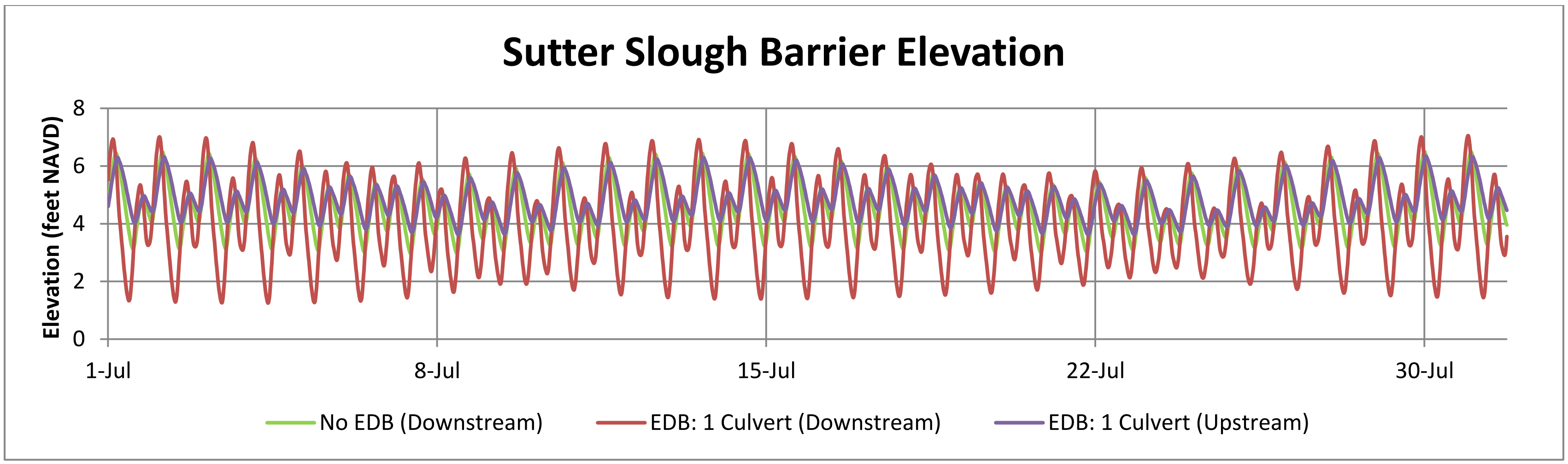

Figure C-8b. **DSM2-simulated Tidal Elevations at Sutter Slough Barrier with and without the EDB for July**

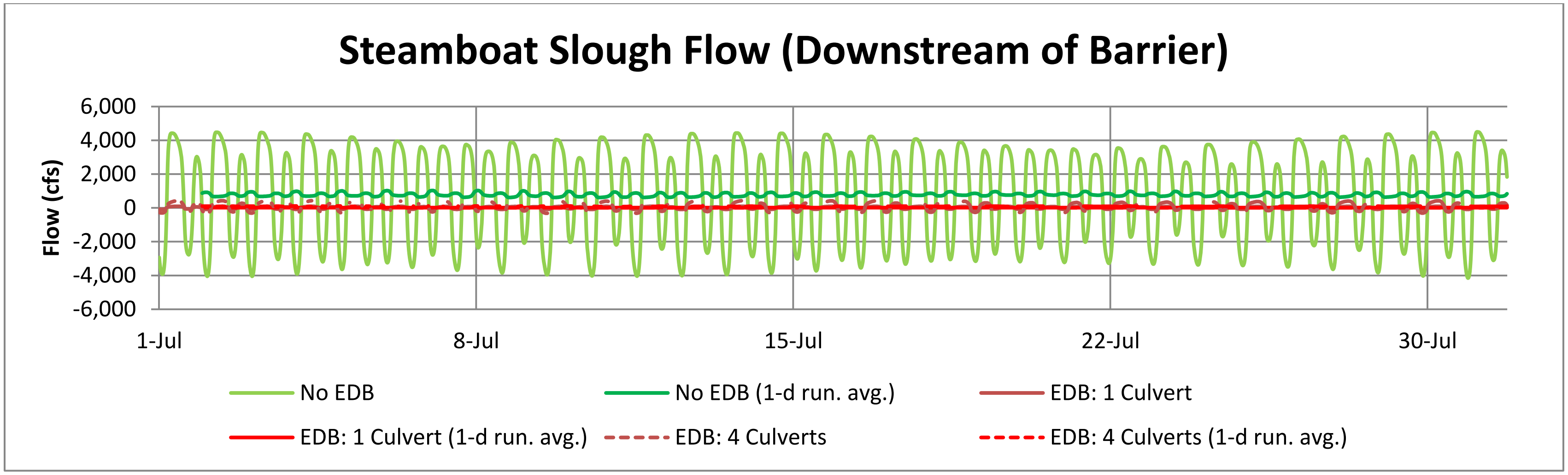

Figure C-9a. **DSM2-simulated Tidal Flows at Steamboat Slough Barrier with and without the EDB for July**

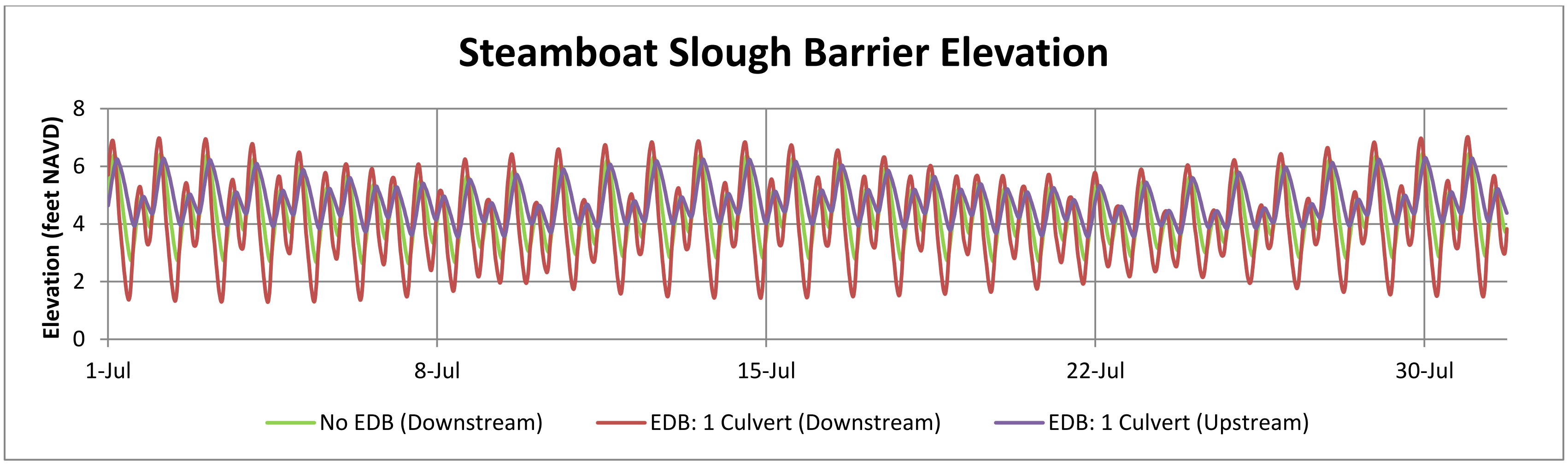

Figure C-9b. **DSM2-simulated Tidal Flows at Steamboat Slough Barrier with and without the EDB for July**

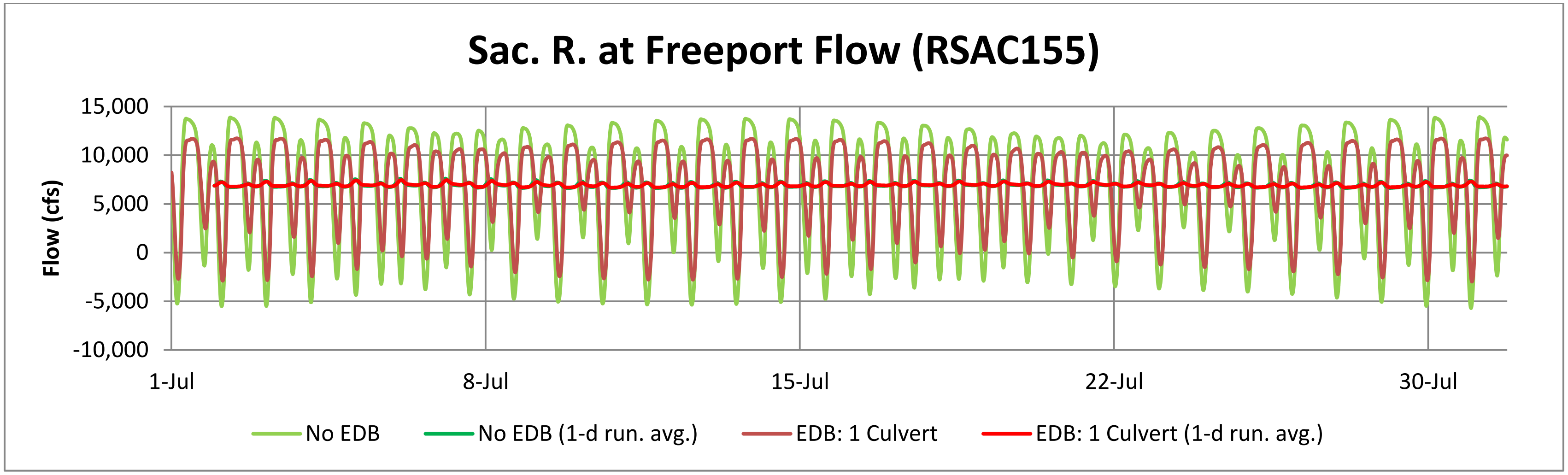

Figure C-10a. **DSM2-simulated Tidal Flows in the Sacramento River at Freeport with and without the EDB for July**

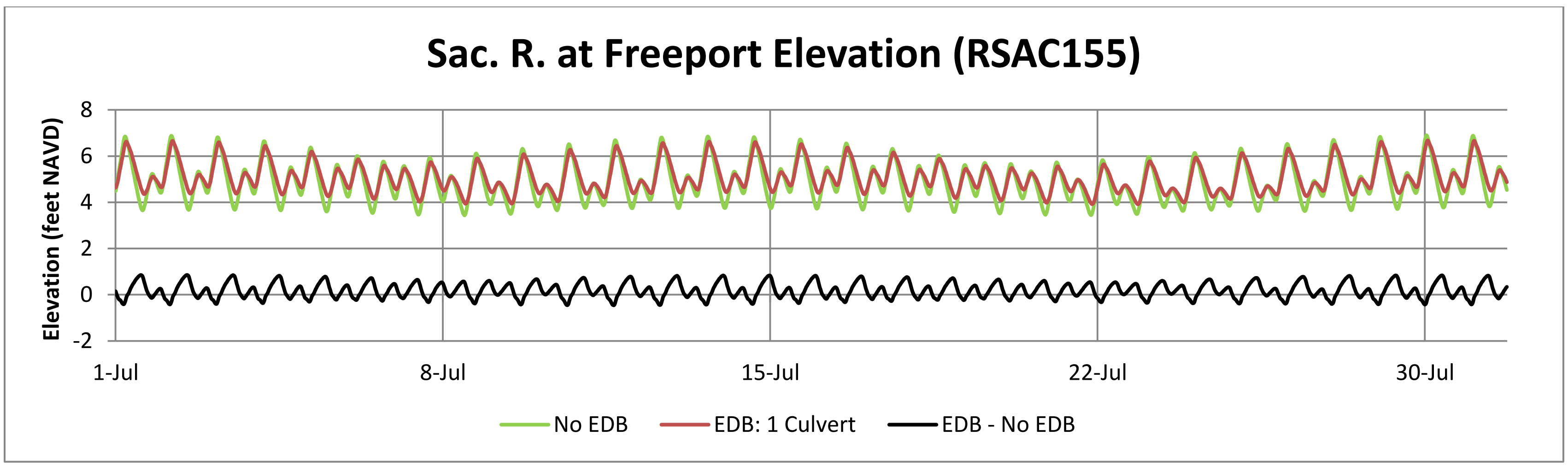

Figure C-10b. **DSM2-simulated Tidal Flows in the Sacramento River at Freeport with and without the EDB for July**

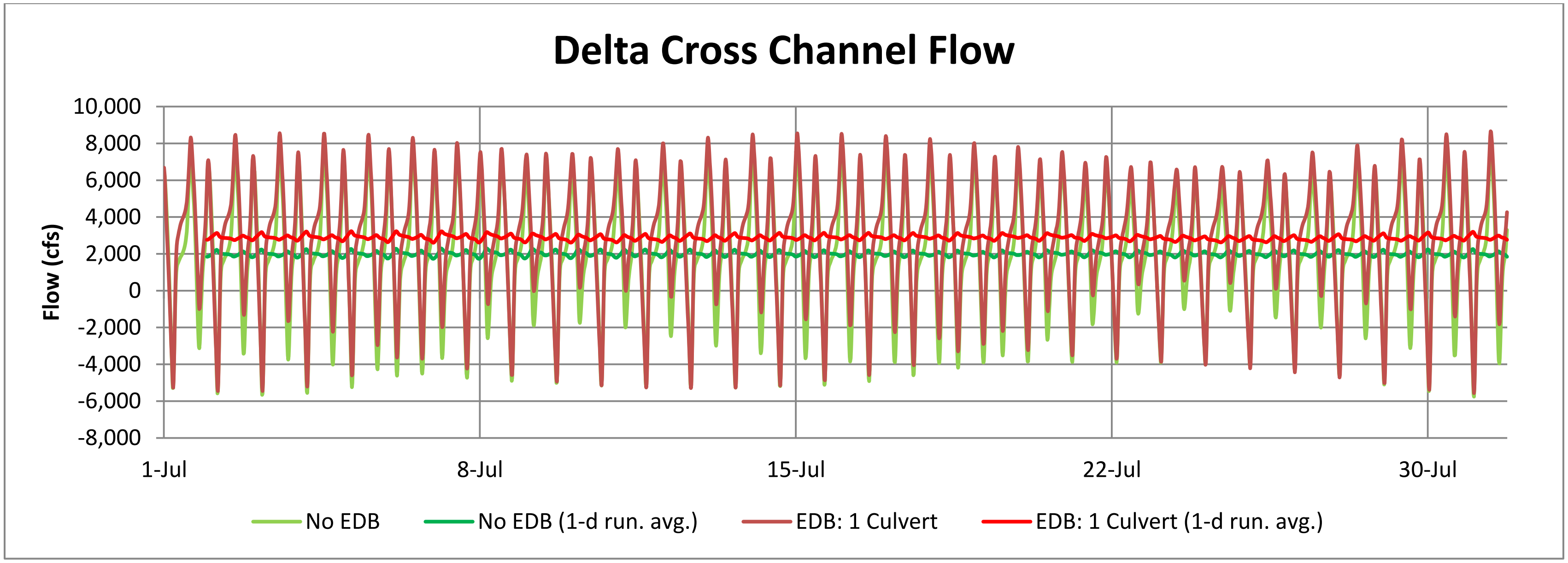

Figure C-11a. **DSM2-simulated Tidal Flows in the Delta Cross Channel with and without the EDB for July**

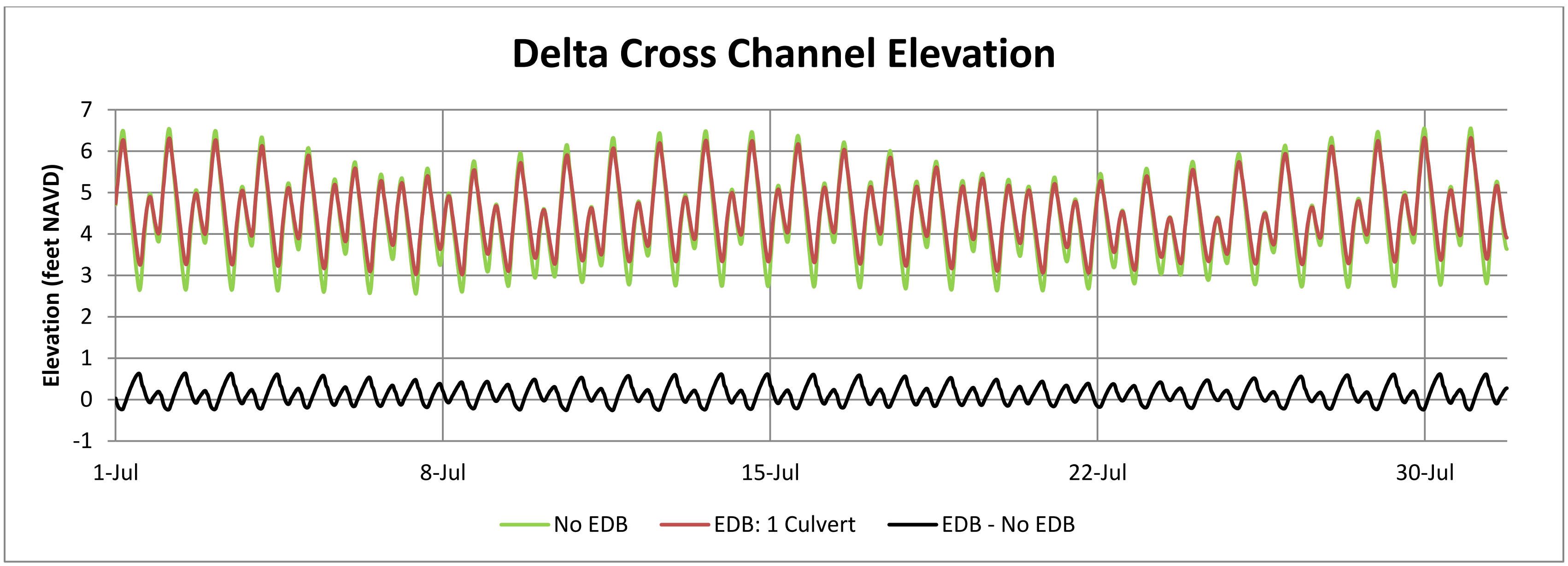

Figure C-11b. **DSM2-simulated Tidal Elevations in the Delta Cross Channel with and without the EDB for July**

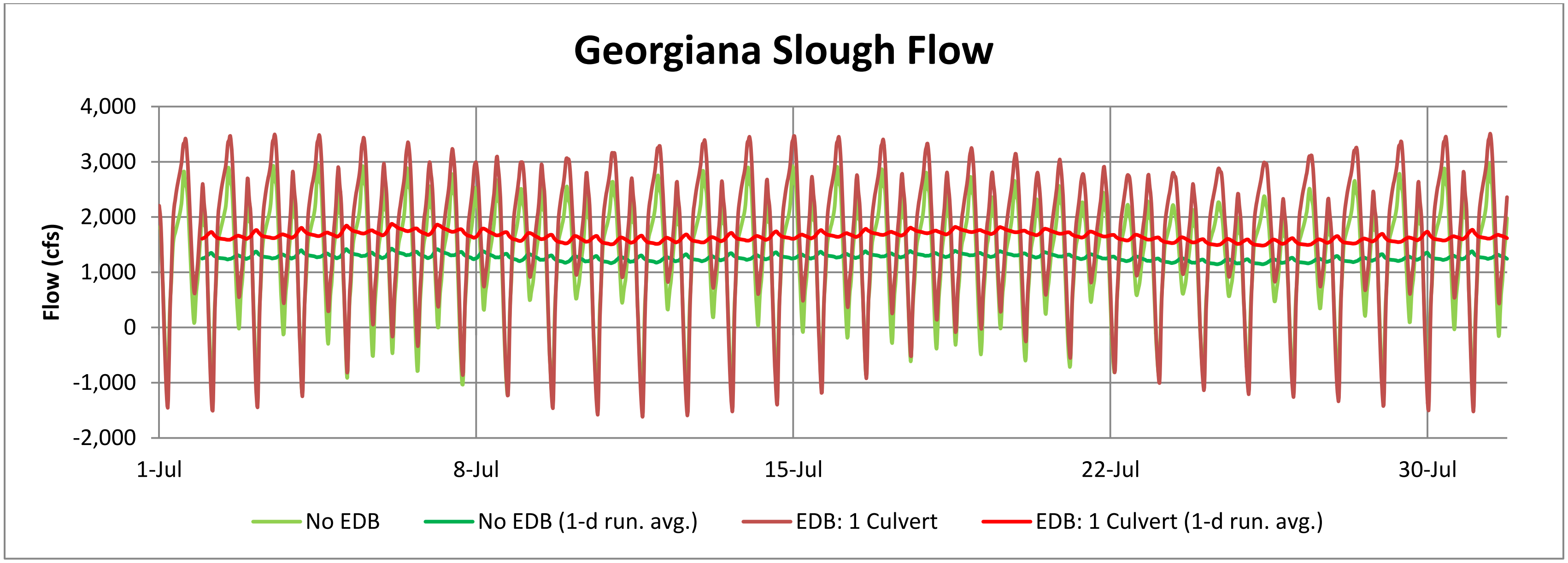

Figure C-12a. **DSM2-simulated Tidal Flows in Georgiana Slough with and without the EDB for July**

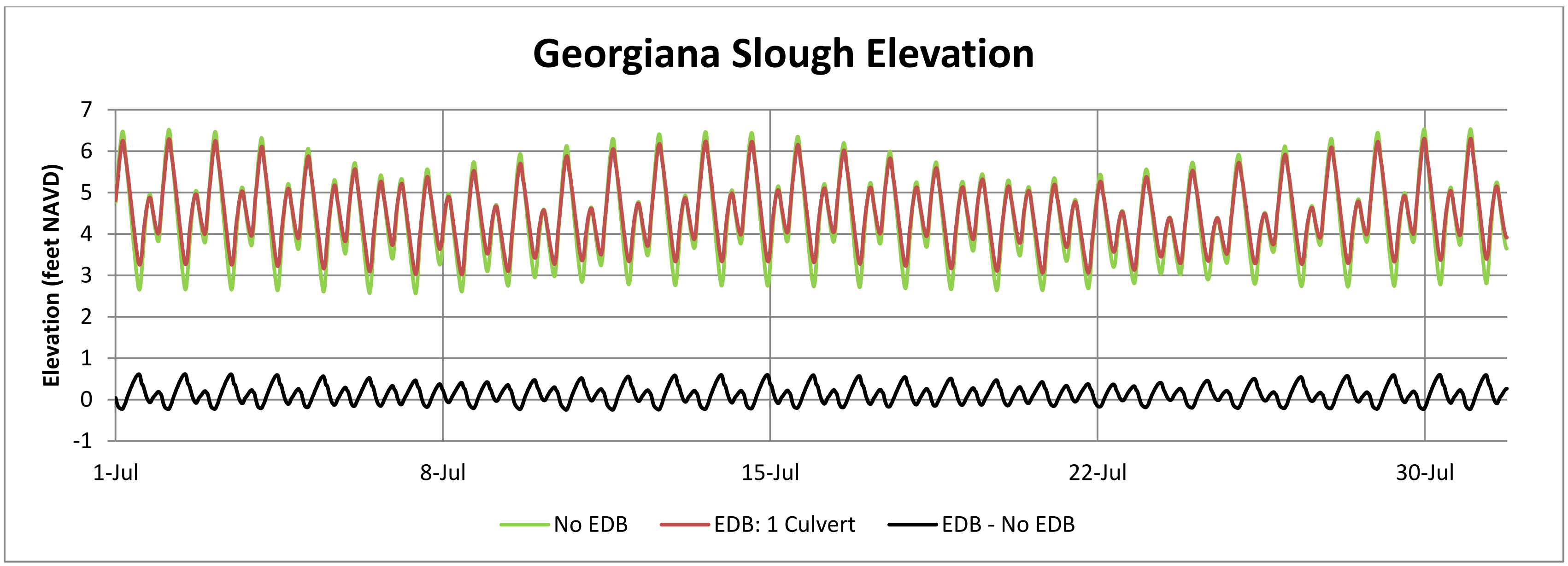

Figure C-12b. **DSM2-simulated Tidal Elevations in Georgiana Slough with and without the EDB for July**

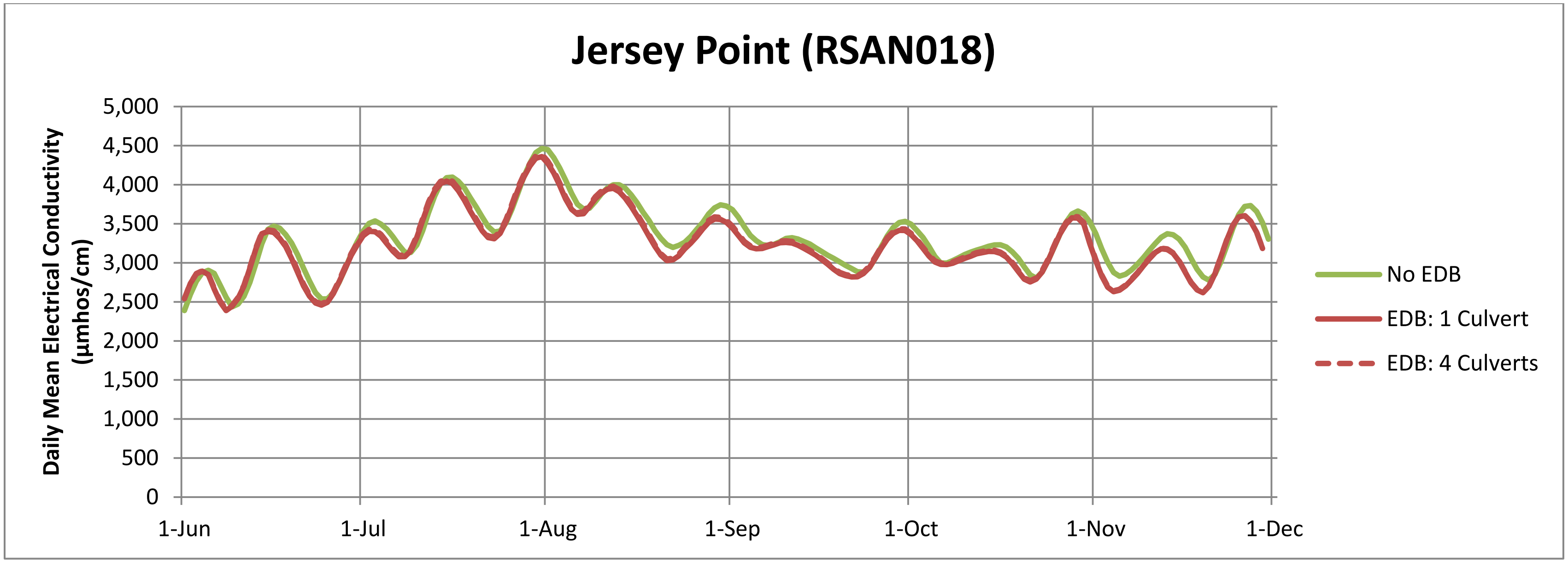

Figure C-13. DSM2-simulated Mean Daily Electrical Conductivity at Jersey Point with and without the EDB for June–November

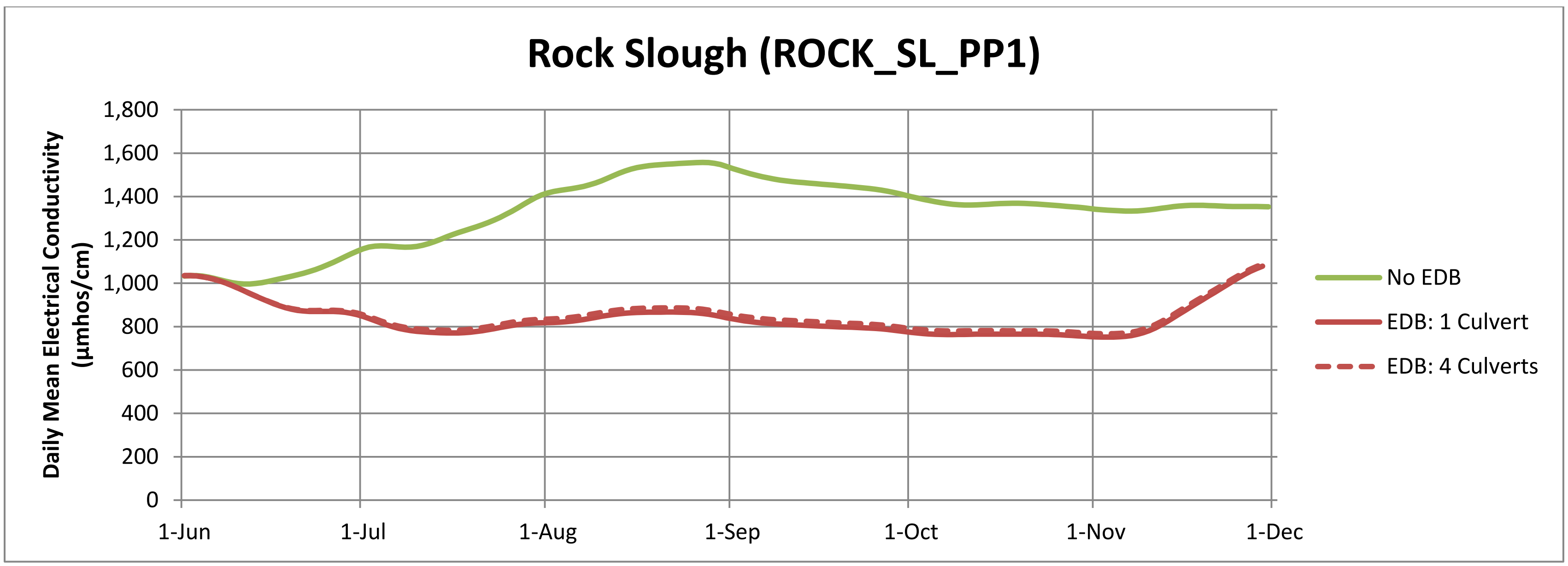

Figure C-14. DSM2-simulated Mean Daily Electrical Conductivity at Rock Slough with and without the EDB for June–November

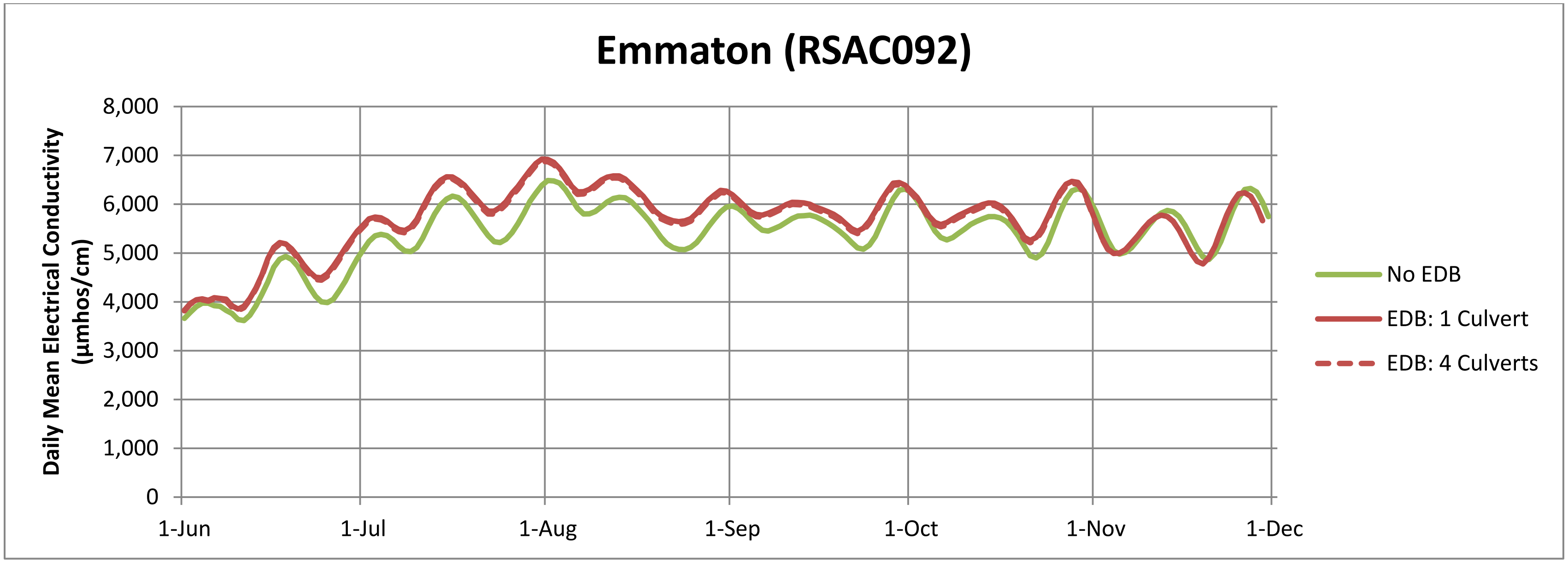

Figure C-15. **DSM2-simulated Mean Daily Electrical Conductivity at Emmaton with and without the EDB for June–November**

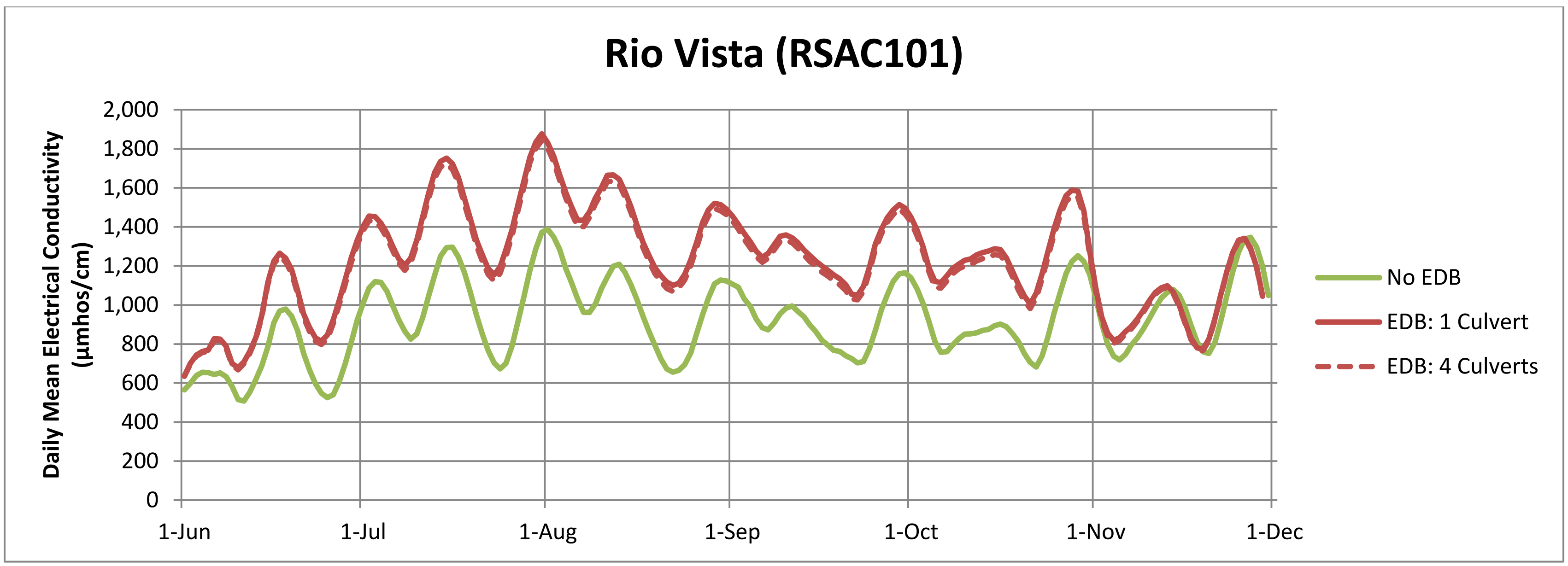

Figure C-16. **DSM2-simulated Mean Daily Electrical Conductivity at Rio Vista with and without the EDB for June–November**

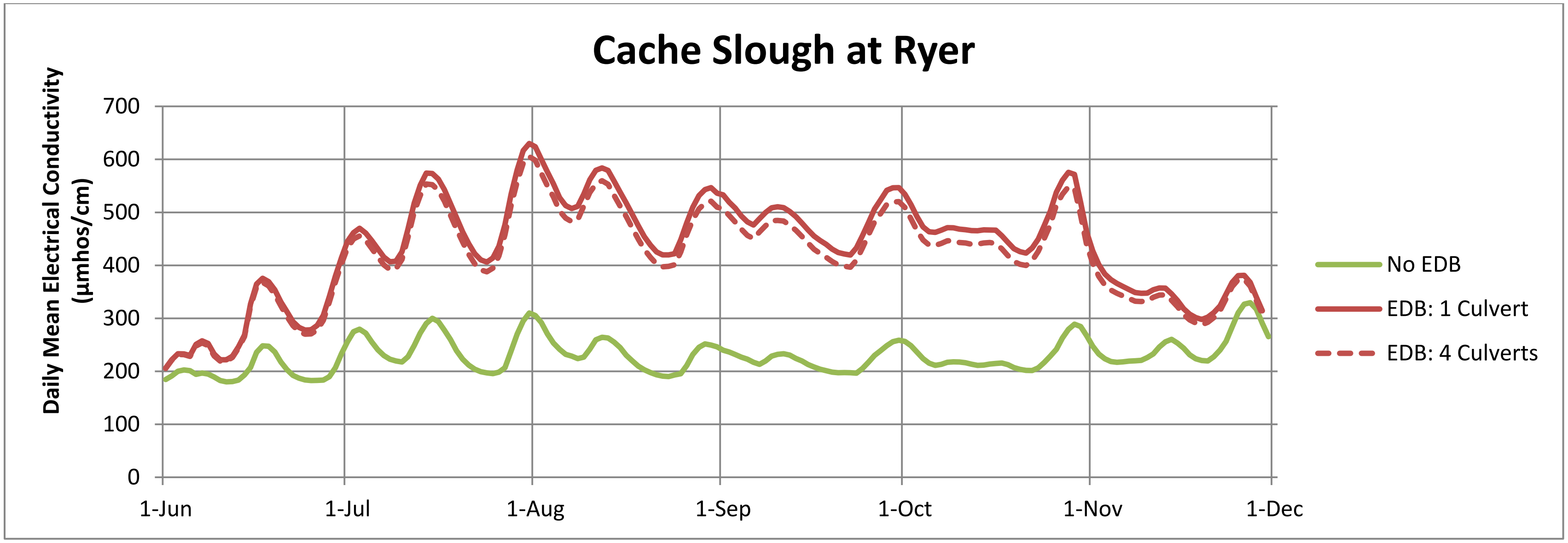

Figure C-17. DSM2-simulated Mean Daily Electrical Conductivity in Cache Slough at Ryer with and without the EDB for June–November

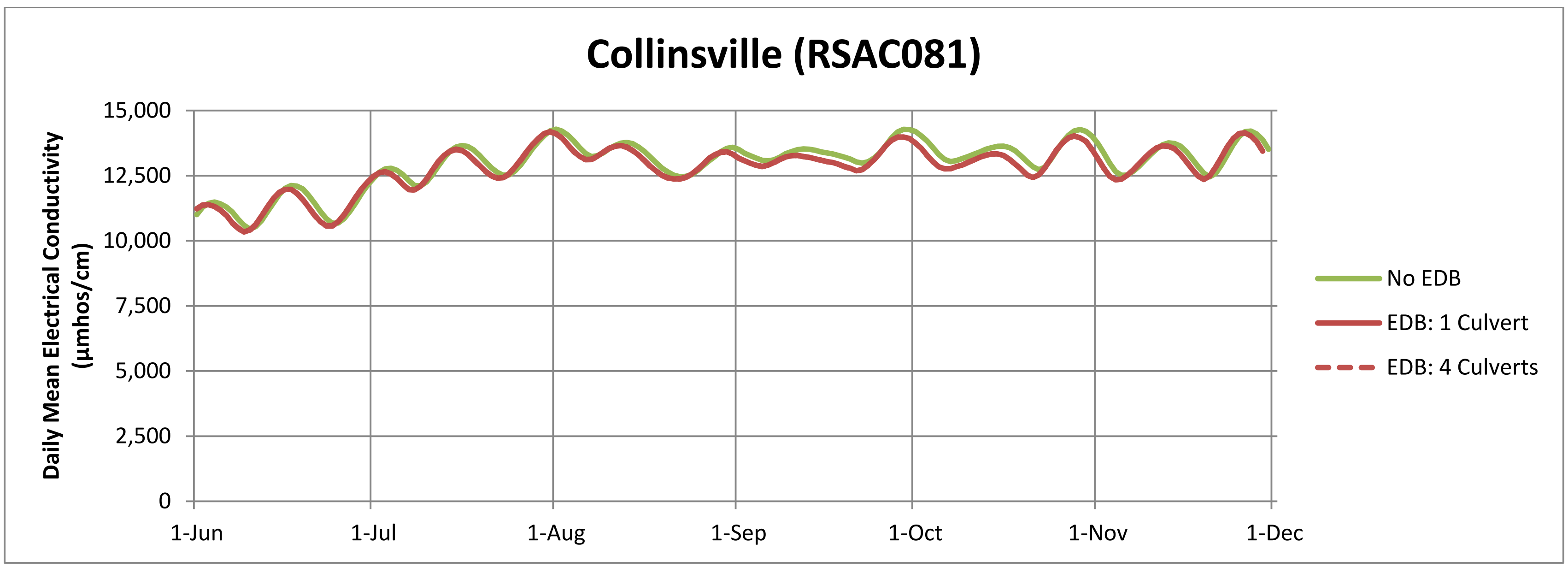

Figure C-18. DSM2-simulated Mean Daily Electrical Conductivity at Collinsville with and without the EDB for June–November

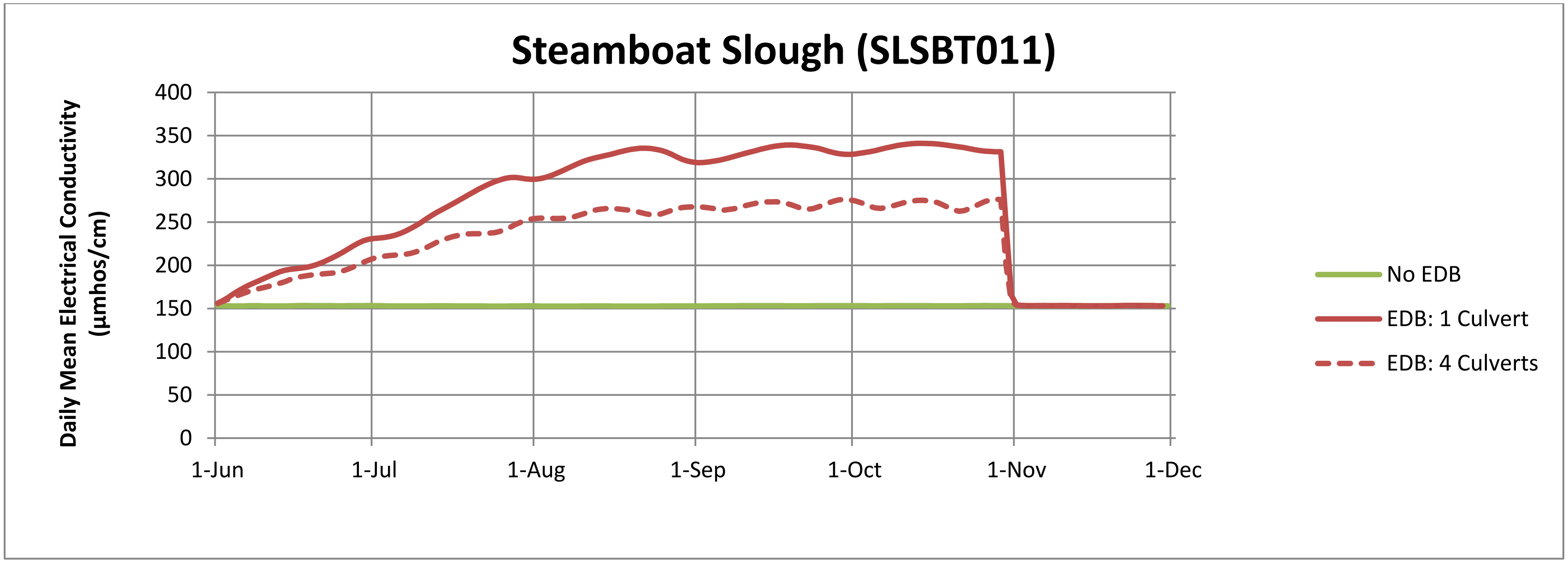

Figure C-19. **DSM2-simulated Mean Daily Electrical Conductivity at Steamboat Slough with and without the EDB for June–November**

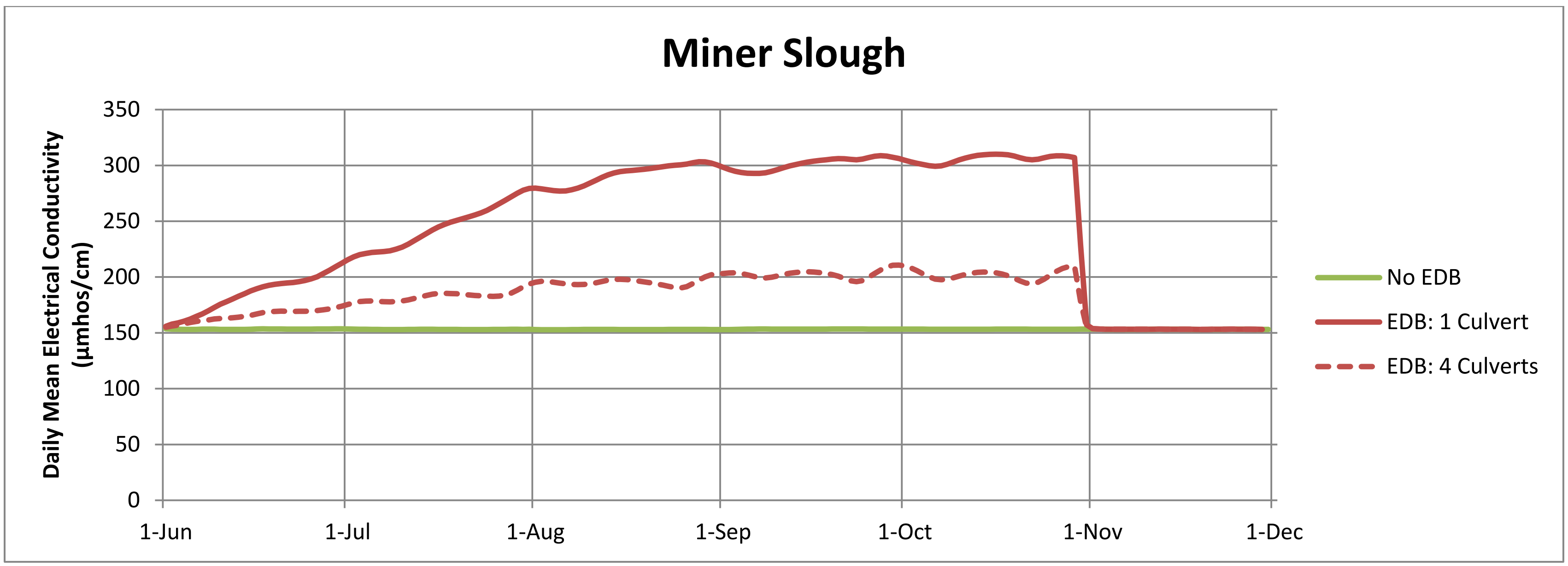

Figure C-20. **DSM2-simulated Mean Daily Electrical Conductivity at Miner Slough with and without the EDB for June–November**