CESA Incidental Take Permit Application for the Emergency Drought Barrier Project

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April 20, 2015

ICF International and AECOM. 2015. CESA Incidental Take Permit Application for the Emergency Drought Barrier Project. April 20. Sacramento, CA. Prepared for California Department of Water Resources, Sacramento, CA.

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Acronyms and Abbreviations

APNs	Assessor Parcel Numbers
BAAQMD	Bay Area Air Quality Management District
Basin Plan	Water Quality Control Plan
BMPs	Best Management Practices
BOs	Biological Opinions
Cal Boating	California Department of Parks and Recreation Division of Boating and Waterways
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CMP	Carl Moyer Program
CNDDB	California Natural Diversity Database
CPTs	cone penetrometer tests
CVP	Central Valley Project
dB re: $1\mu Pa^2$-s	1 micropascal squared per second
DCC	Delta Cross Channel
Delta	Sacramento-San Joaquin River Delta
DWR	Department of Water Resources
EC	electrical conductivity
EDB	Emergency Drought Barrier Project
HAS	hollow stem auger
ITP	Incidental Take Permit
LMA	Local Maintaining Agency
mg/L	milligrams per liter
mm	millimeter
NMFS	National Marine Fisheries Service
NO_X	oxides of nitrogen
NTUs	Nephelometric Turbidity Units
OMR	Old and Middle River
RMS	root mean square
RSTs	rotary screw traps
SEL	sound exposure level
SFBAAB	San Francisco Bay Area Air Basin
SWP	State Water Project
TUCP	Temporary Urgency Change Petition
USFWS	U.S. Fish and Wildlife Service
μPa	micropascal

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CESA Incidental Take Permit Application

The California Department of Water Resources (DWR) is submitting this application for a California Endangered Species Act (CESA) Incidental Take Permit (ITP) for the Emergency Drought Barrier Project to the California Department of Fish and Wildlife (CDFW), pursuant to Fish and Game Code Section 2081(b) and Section 2081(c), and California Code of Regulations, Title 14, Subdivision 3, Chapter 6, Article 1, commencing with Section 783.

1. Applicant

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2. Covered Species

2.1 Listed Fishes

The species covered in this ITP application, and their listing status, are presented in Table 1. Among the listed fishes, only discussion of longfin smelt is included in this document, whereas the remaining fish species are discussed in the Biological Assessment of Potential Effects on Listed Fishes from the project, prepared for the Federal Endangered Species Action Section 7 consultation with the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). Please refer to the biological assessment for the necessary analysis of impacts and potential for incidental take of delta smelt, winter-run chinook salmon, and spring-run chinook salmon.

Table 1. Covered Species

Name	Status
Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*)	Threatened
Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*)	Endangered
Delta smelt (Hypomesus transpacificus)	Endangered
Longfin smelt (Spirinchus thaleichthys)	Threatened

2.2 Other Species Considered

Potential for the project to result in take of other state-listed species was evaluated based on review of various information sources regarding the status of the species in the Sacramento-San Joaquin River Delta (Delta) and observations made during visits to the proposed barrier location conducted on March 14, 2014 and March 30, 2015. Mason's lilaeopsis (*Lilaeopsis masonii*), giant garter snake (*Thamnophis gigas*), California black rail (*Laterallus jamaicensis coturniculus*), and Swainson's hawk (*Buteo swansoni*) were considered for inclusion as covered species but rejected because they are unlikely to occur at the project site and/or take of them can be avoided with implementation of environmental commitments. A brief evaluation of potential for take of each of these species is provided below.

2.2.1 Mason's Lilaeopsis

Mason's lilaeopsis occurs along the edge of rivers and sloughs throughout the Delta, particularly the central and west Delta (DWR 2013). Extensive surveys for the species were conducted in the Delta in 2009, and information on documented occurrences was submitted to the California Natural Diversity Database (CNDDB). No occurrences of the species were documented in the immediate vicinity of the project site during these surveys (CNDDB 2015). The nearest documented occurrences of Mason's lilaeopsis are approximately 0.5 mile east and west of the proposed barrier location (CNDDB 2015). Observations made during the March 2014 field survey confirmed habitat at the project site is of poor quality and not likely to support the species. In addition, the Rio Vista stockpile sight does not provide suitable habitat for the species. In the unlikely event that Mason's lilaeopsis becomes established at the project site, implementation of the environmental commitment described in section 3.8.26 of this application would ensure that potential for adverse effects is minimized and take of Mason's lilaeopsis is avoided.

2.2.2 Giant Garter Snake

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 extant population clusters in the region (Hansen 1986; Patterson 2003, 2005; Patterson and Hansen 2004), including during DWR surveys of various Delta locations in 2009. However, individuals have been trapped at White Slough Wildlife Area and several photographed near Little Connection Slough (USFWS 2012). More recent observations have been made at additional locations in the vicinity of Little Connection Slough and farther south in the Delta. These suggest viable populations of giant garter snake may persist in the eastern portion of the Delta. The nearest of these occurrences was over 9 miles east of the West False River project site.

The California Natural Diversity Database (CNDDB) includes three recent observations of giant garter snakes closer to the West False River site: a 2002 observation near the ferry dock at the southwestern corner of Webb Tract, approximately 1.5 miles east of the site; a 2010 observation on the south side of Sherman Island, approximately 5 miles southwest of the site; and a 2014 observation on the landside slope of the south levee of Webb Tract, approximately 2.5 miles east 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 2010 observation.

In 2003 and 2004, focused surveys for giant garter snake were conducted on the Webb Tract, but no individuals were documented. The surveyors concluded that though the island provided habitat and had the potential to support a giant garter snake population, such a population didn't appear to exist (USFWS 2006). The origin of giant garter snakes documented in the vicinity of the project site is uncertain, and observations in the central Delta have typically been considered to be of snakes that occasionally move into the region by 'washing-down' from known populations and that these occurrences do not represent local breeding populations (USFWS 2006; Hansen, pers. comm., in DWR 2013). Little Connection Slough has been thought to represent the most western Delta location where the species regularly exists (USFWS 2012). However, the frequency of observations in the area appears to have increased in recent years, potentially indicating a small permanent population may be present, despite previous negative survey results. Therefore, there is low potential for giant garter snake to occur on or adjacent to the project site, though likely in very small numbers.

West False River provides only marginally suitable aquatic habitat, because giant garter snakes are generally absent from large rivers, but it could be used as a movement corridor between areas of suitable habitat on the islands. Although the barrier would temporarily reduce the amount of aquatic habitat in the river, the potential effect on giant garter snake movement would be minimal, because individuals could use the barrier or adjacent portions of the river to move between islands. It is unlikely take would result from in-water barrier installation or removal activities, because individuals would be able to leave and/or avoid the area of disturbance.

Upland areas that would be subject to construction disturbance at the project site are limited to the crown of both levees and a seepage berm that was constructed landside of the Jersey Island levee in 2014 (see Figure 3). Because soils on the project site were recently graded and compacted during the seepage berm construction, they are very unlikely to support burrows and crevices that could provide underground refuge for giant garter snake. Therefore potential for take of giant garter snake in upland portions of the project site would likely be limited to individuals that may move through the site in transit to more suitable adjacent habitat.

Because potential for giant garter snake to occur on the project site is low and would be limited to individuals moving through the area in transit to more suitable habitat elsewhere, implementation of the environmental commitment described in section 3.8.21 of this application would ensure that potential for adverse effects is minimized and take is avoided. Avoidance and minimization measures that would be implemented include: initiating barrier installation and removal activities during the giant garter snake active season; implementing worker awareness training, biological monitoring, pre-construction surveys, and vehicle speed limits; and installing and maintaining exclusion fencing to minimize potential for snakes to enter the project site.

The stockpile site does not support suitable aquatic habitat for giant garter snake, and no suitable aquatic habitat is anticipated to occur within 200 feet. Therefore, the species is unlikely to occur on the site and take would not result from placement and stockpile of the barrier rock.

2.2.3 California Black Rail

Suitable habitat for California black rail in the Delta is restricted to remnant wetland sites that are generally unavailable for agricultural uses. Surveys conducted by CDFW in the early 1990s found small numbers of black rails at several locations in the central Delta and at the lower reach of the Sacramento River (DWR 2013). DWR conducted focused surveys for black rails in the Delta in 2009 and 2010 and found nesting pairs at White Slough Wildlife Area and on several mid-channel islands (DWR 2013). Black rails were detected throughout the interior Delta, primarily on large in-stream islands with dense vegetative cover. They were also found in an irrigated pasture with wetland vegetation at the DWR Dutch Slough restoration site and in the tidal marsh fringing the south side of Big Break. More recently, black rails were observed in fall 2014 through March 2015 along Lindsey Slough, approximately 15 miles northwest of the project site (Estrella, pers. comm., 2015; Tsao, pers. comm., 2015). However, based on habitat preferences documented during these surveys and observations made during the March 2014 and March 2015 field surveys, California black rail is unlikely to occur at or in the immediate vicinity of the project site. In addition, the Rio Vista stockpile site does not provide suitable habitat for these rails.

2.2.4 Swainson's Hawk

Swainson's hawks are known to nest in the Delta, with pairs typically beginning to establish nesting territories in March and egg-laying generally occurring in early April to early May (CDFG 1994). No suitable nest trees are present on the project site, and there are few suitable nest trees in the immediate vicinity of the site. However, one nest has been documented at the southeastern corner of Bradford Island, approximately 0.35 mile east of the project site (CDFW 2015), and a Swainson's hawk pair was observed and likely nested in trees approximately 400 feet east of the site (DWR 2013; Tsao, pers. comm., 2015).

Based on documented occurrences of past Swainson's hawk nests in the vicinity of the project site, an active nest could be present near the site during barrier installation. Implementation of the environmental commitment described in section 3.8.22 of this application would ensure that potential for adverse effects is minimized and take is avoided. Avoidance and minimization measures that would be implemented include: preconstruction surveys, preconstruction monitoring, construction monitoring, and restrictions on activities that can occur in close proximity to the nest tree.

Removal of the barrier and placement of rock at the stockpile site would occur after the nesting season has ended and does not have potential to result in take of Swainson's hawk.

3. Project Description

3.1 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, Solano, 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 the California Environmental Quality Act (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.

An Executive Order issued on April 1, 2015 extended the orders and provisions in the January 17, 2014 and April 25, 2014 Proclamations and Executive Orders B-26-14 and B-28-14 and added several modifications, discussed in the following paragraph. 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 2015 Executive Order suspends Division 13 (commencing with Section 21000) of the Public Resources Code (related to the CEQA) and regulations adopted pursuant to that Division, as well as Section 13247 (related to compliance with approved or adopted water quality control plans) and Chapter 3 of Part 3 (commencing with Section 85225 related to preparing a written certification of consistency with the Delta Plan) of the Water Code. The

Executive Order also calls for DWR to exercise any authority vested in the Central Valley Flood Protection Board to enable the quick installation of the emergency drought barriers, and authorizes the Director of DWR to request that the Secretary of the Army, on the recommendation of the Chief of Engineers of the Army Corps of Engineers, grant permission required pursuant to Section 14 of the Rivers and Harbors Act of 1899.

The proposed project would include installation of one temporary rock barrier at West False River, near its confluence with the San Joaquin River, 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 barrier would be installed in the spring or summer of 2015. 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 barrier will be considered in 2015 only when necessary to lessen water quality impacts if 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. In the absence of a significant storm, reservoir level, snow pack, and forecasts currently indicate that the need to construct the barriers is likely.

Operation of the drought barrier 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).

3.2 Purpose of and Need for the Project

3.2.1 Basic Project Purpose

The purpose of the emergency drought barrier (EDB) is to control saltwater intrusion into the Delta with reduced reservoir releases while continuing to meet federal and state regulatory requirements.

3.2.2 Overall Project Purpose

Constructing the emergency temporary rock barrier provides a method of controlling saltwater intrusion into the Delta and conserving cold water reservoir storage to protect habitat for sensitive aquatic species. In addition, the EDB purpose would maintain water quality standards set by the State Water Resources Control Board which would ensure water is drinkable by 25 million Californians and usable by farms that are reliant upon this source.

3.3 Project Location

The temporary rock barrier would be installed at West False River. The general location of this site is shown in Figures 1 and 2, and the specific location is shown in Figure 3. Photographs of the levee banks at the project site are presented in Figure 4.

The project 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 site are rock-lined levees (Figure 4).

3.4 Geologic Exploration

Geologic exploration would potentially occur in 2015 or 2016. A total of up to 24 cone penetrometer tests (CPTs), 12 drill holes, and nine overwater drill holes would be completed. Geotechnical exploration is required to reduce uncertainty associated with the underlying ground that would support the barrier, locate poor foundation soils like peat, and better estimate engineering design parameters.

3.4.1 Cone Penetrometer Test Soundings

A total of eight CPT soundings would be conducted at the barrier site, on each side of the channel, on the crown and 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 and to be abandoned by backfilling the boreholes using cement/bentonite grout through a tremie pipe.

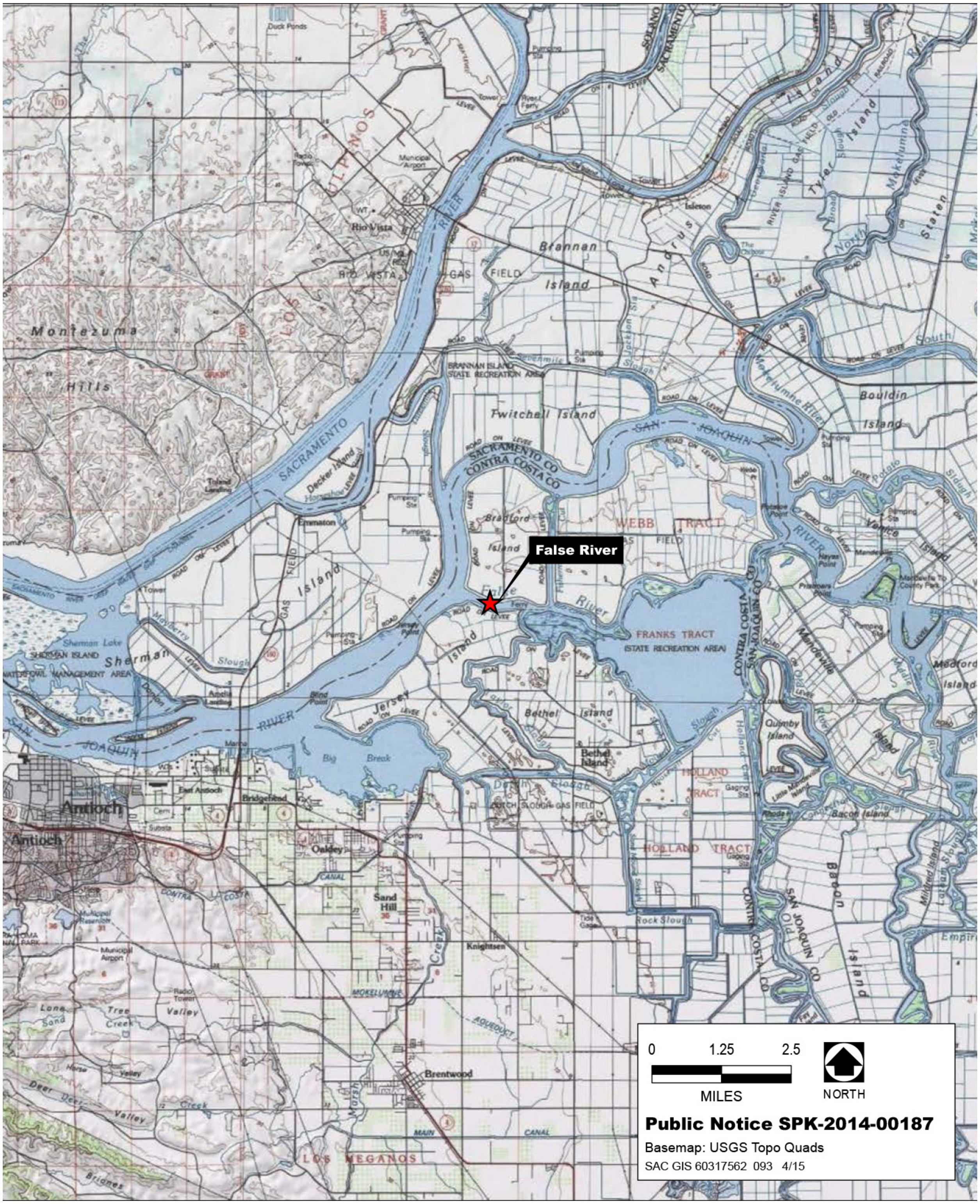
3.4.2 Land Drill Holes

A total of four hollow stem auger (HSA)/mud rotary drill holes 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 and to be abandoned using the same method described above for the CPT soundings.

3.4.3 Optional Overwater Exploration

Three overwater geotechnical drill holes may be completed in the channel 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

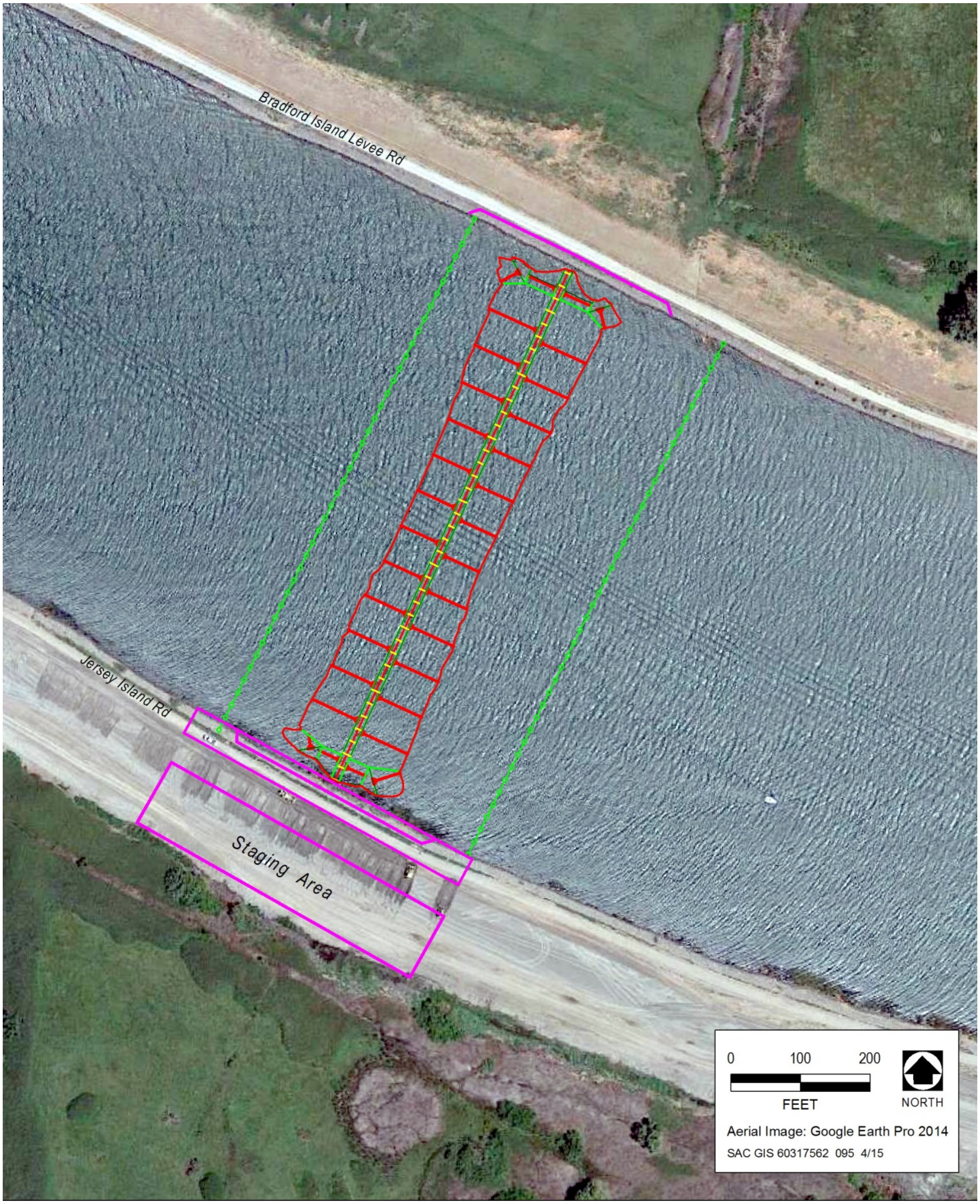


Source: DWR 2015, AECOM 2015

Figure 1. Location of Proposed Emergency Drought Barrier

Source: DWR 2015, AECOM 2015

Figure 2. Aerial View of Proposed Emergency Drought Barrier Location



Source: DWR 2015, AECOM 2015

Figure 3. Aerial View of the Project Site

Figure 4. West False River South Levee (top), North Levee (middle), and North Levee at USGS Gaging Station East of the Barrier Site (bottom)

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.

3.5 General Design and Installation Concepts

A rock (rip-rap) barrier weir structure would be installed at the West False River site. The structure would be a trapezoid-shaped rock barrier with a wide base tapering up to a 12-foot-wide top width set perpendicular to the channel alignment. It 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 weak due to peat soil foundations. As needed, DWR may place additional rock fill up 100 feet beyond the upstream and downstream extents of the sheet pile wall (piping preventer) that runs down the levee center-line to address existing erosion of the waterside levee toe. Additional rock necessary to address levee toe erosion is within the rock quantity contingency and does not increase the total volume or area of fill.

Construction of the barrier may include land-based staging of equipment and materials. Temporary rights for construction of the 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 (Contra Costa County)
- APN 026-040-005-6 (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 (Contra Costa County)
- APN 026-050-006-1 (Contra Costa County)
- APN 026-050-018-6 (Contra Costa County)
- APN 026-050-024-4 (Contra Costa County)

The rock barrier may be installed in spring or summer, beginning no sooner than May 7. The construction period would be approximately 30 to 60 days. Barrier removal may require approximately 45 to 60 days, with removal commencing on or near October 1. The barrier would be removed entirely no later than November 15, before the rainy season when freshwater runoff typically occurs and flood risk increases.

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 the barrier site, but 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 of the site and would monitor parameters like dissolved oxygen, turbidity, salinity as measured by electrical conductivity (EC), river stage, and flow velocity.

Appropriate navigation signage would be installed at the site 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 closure. 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 barrier, 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 is provided in Section 3.6, "Structural Components."

3.6 Structural Components

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 3). 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.[1] 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 weak 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 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)
- Twelve 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. The 12-inch steel pipe piles proposed for monitoring equipment will remain in place for future use. The coordinates of the proposed 12-inch steel pipe piles are listed in Table 2 and shown in Figure 5.

No boat passage is provided around the 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 is provided because migrating fish would use the adjacent San Joaquin River, Fisherman's Cut, or Dutch Slough and their access would not be restricted.

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

Table 2. Coordinates of the Proposed 12-Inch Steel Pipe Piles

No.	Station Name	Latitude	Longitude
1	Fisherman's Cut near Franks Tract	38.065600°	-121.647900°
2	Franks Tract (Mid Tract)	38.046417°	-121.598100°
3	Steamboat Slough	38.184550°	-121.648067°
4	Sacramento River near Steamboat Slough	38.172167°	-121.647350°
5	San Joaquin River at Twitchell Island	38.096900°	-121.669100°
6	Miner Slough near Cache Slough	38.236033°	-121.666072°
7	Liberty Island	38.243183°	-121.684600°
8	Sacramento River near Sherman Lake[1]	38.068933°	-121.770250°
9	Old River	37.968600°	-121.574236°
10	Middle River	37.942967°	-121.532266°
11a	Cutoff Slough near Ryer Island[2]	38.085783°	-121.995833°
11b	Grizzly Bay[2]	38.124250°	-122.038117°
12	Honker Bay	38.072400°	-121.939200°

Notes:

1. This location is an approximation and may be moved slightly.
2. DWR will need only one station at either Cutoff Slough near Ryer Island or Grizzly Bay but not both.

Source: DWR 2015

3.7 Project Construction

3.7.1 Construction Schedule

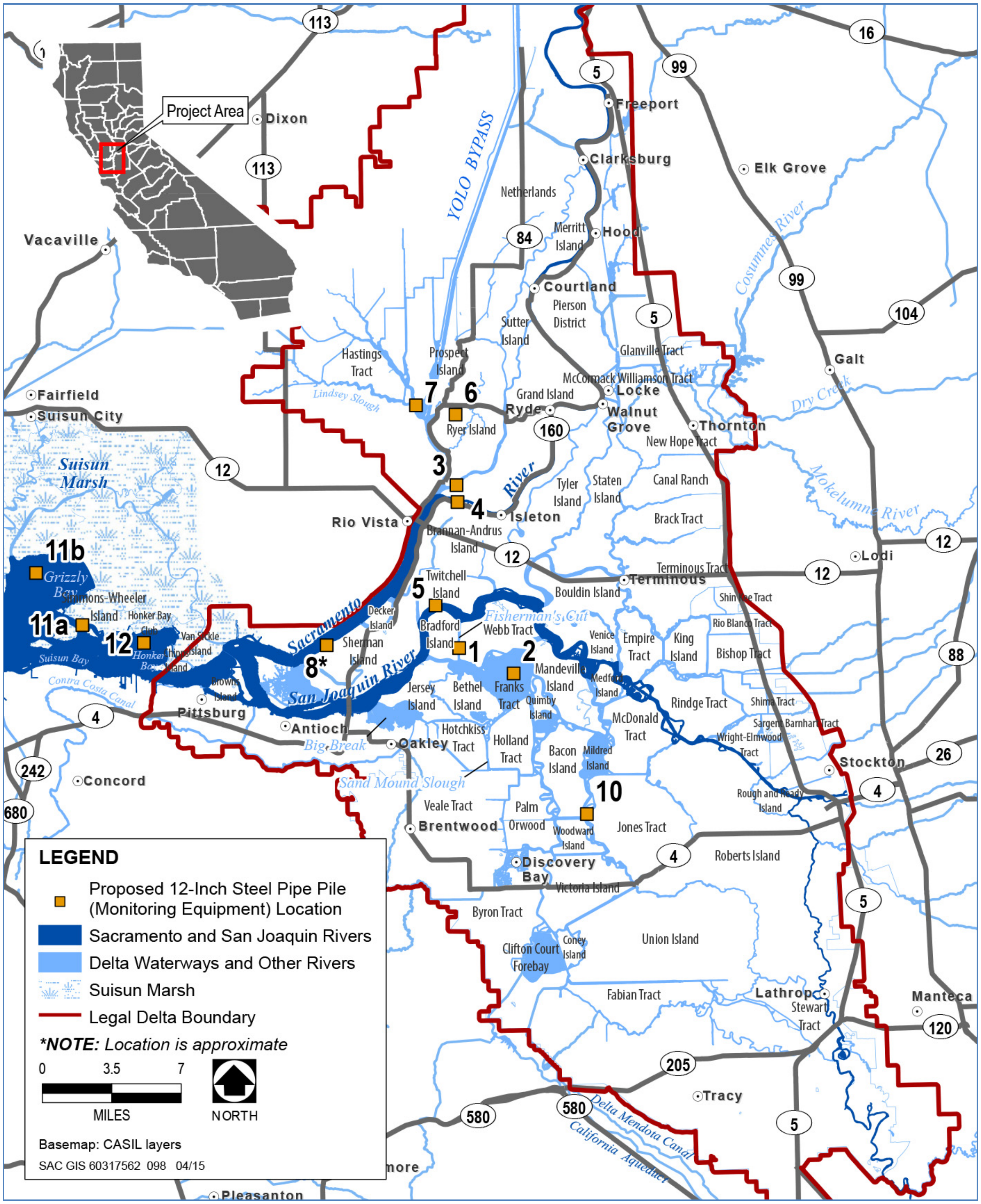
In-water construction would begin no sooner than May 7, with full barrier closure on or near approximately 30 to 60 days after starting work. Landside work would begin no sooner than May 1. Removal would take approximately 45 to 60 days, with full removal by November 15. Removal activities would begin prior to October 1. Construction would require approximately 10 to 30 workers.

3.7.2 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. 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 92,500 cubic yards of rock would be required to construct the West False River barrier (including approximately 21,000 cubic yards that would remain around the 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. All rock, gravel, and structures would be transported to and constructed at the project site in spring or summer of 2015. The methodology described herein is general. Although construction activities would primarily be situated in water, the contractors would also work from the levees.



Source: DWR, adapted by AECOM 2015

Figure 5. Locations of the Proposed 12-Inch Steel Pipe Piles

The contractors would mobilize construction equipment and crew. DWR would utilize multiple barges with excavators and work boats which would be transported on water to the project site. An excavator or other small earthwork equipment would be needed on each side of the levee to aid with the installation of the sheet pile walls. The contractors would install construction trailers on the levee nearby.

Barges powered by tugs would be used to transport rock from quarries and/or other loading bulkheads or material transfer points to the barrier site. The barge would be appropriately sized based on the depth of the channel where the rock would be placed. The contractors would use excavators, dozers, and loaders to move/push the rock from transportation barges into the channel. The contractors would shape/contour the rock barrier by using a barge-mounted crane with a clamshell or barge-mounted excavator from material barges. The contractors may use a dump scow to transport the rock and place it in the channel. Some of the existing rock slope protection would need to be temporarily removed in order to construct the abutments; however, no channel dredging or excavation in the levee profiles would be required. To prevent riverbed scour, the contractor would be required to place rock in horizontal layers and to prevent levee scour and the final lifts of rock would be placed on the barrier starting from the levees toward the center of the channel. During final rock placements and closure, excavators would be place rock from the top of the barrier.

Minimal vegetation and clearing would be required on the levees prior to the installation of sheet piles. This would be accomplished by a dozer or backhoe and hand clearing.

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 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.

Construction equipment would be placed within the staging area (approximately 1.03 acres) adjacent to Jersey Island Road (i.e., left bank). A complete list of construction equipment anticipated to be used is provided in Table 3.

3.7.3 Facilities Removal

All rock, gravel, and structures would be removed from the project site in fall, with the exception of the sheet pile abutments. The methodology described herein is general. Although removal activities would primarily be situated in water, the contractors would also work from the levees.

Table 3. Anticipated Construction Equipment

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				
Place Culverts					
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		

First, the contractors would mobilize construction equipment and crew. DWR would utilize multiple barges with excavators and work boats which would be transported on water to the barrier site. In water work would occur on one side of the barrier–either upstream or downstream of the barrier–in the direction of where the contractors would ship the rock.

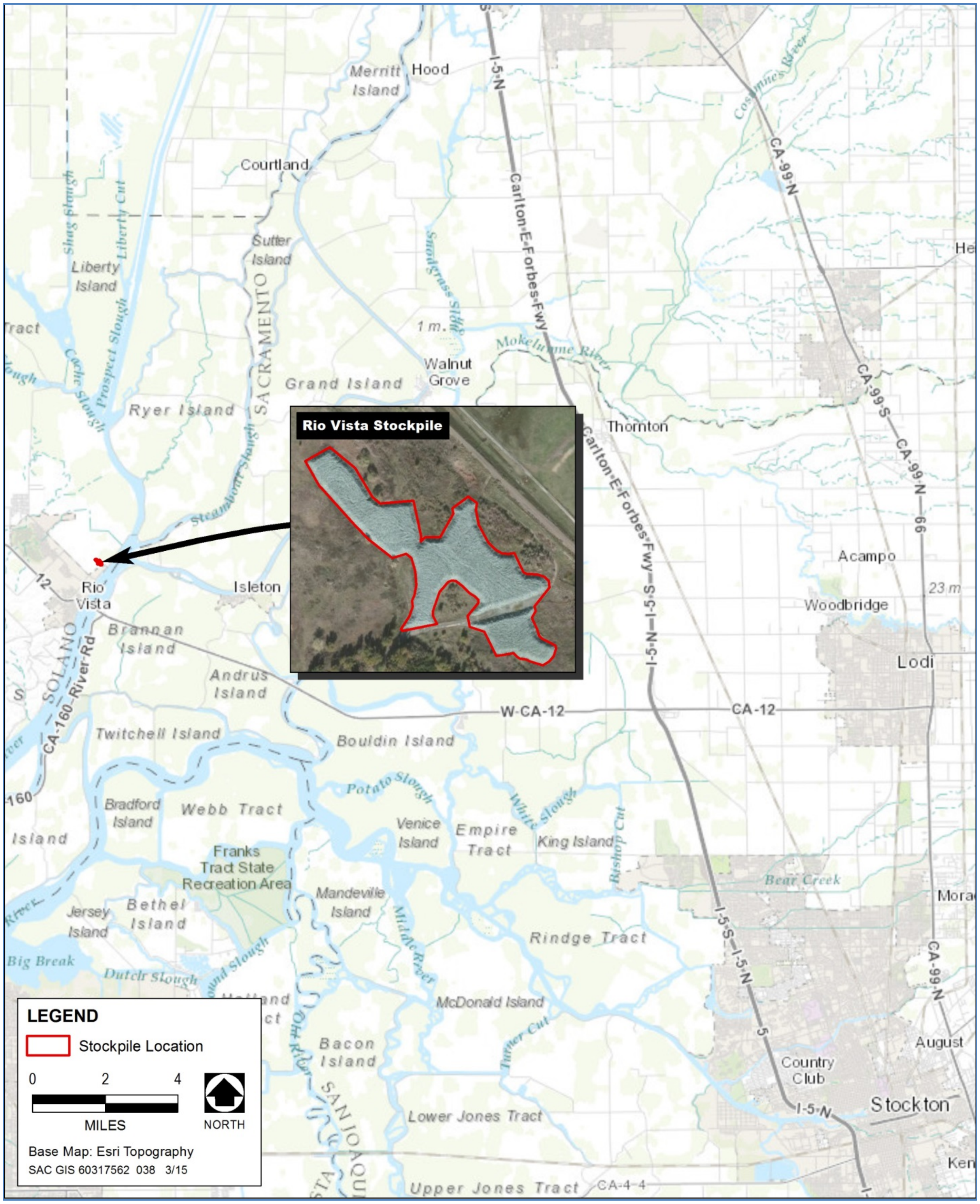
Next, the contractors would strategically place the barges adjacent to the barrier in order to excavate the rock. Rock would be excavated using cranes with clam-shell buckets, and/or excavators from one barge and placed onto another barge where it would be transported to an approved off-loading site. Given the volume of rock, DWR anticipates that excavation would occur continuously (i.e., 24 hours per day, 7 days per week). To prevent levee scour, rock removal will start from the center of the channel and work outward. Excavation would occur from the top of the barrier down to the streambed to approximate pre-project contours. DWR would restore the levee geometry to ensure compliance with any local maintaining agency, Central Valley Flood Protection Board, or U.S. Army Corps of Engineers requirements.

Lastly, the rock would be shipped on a barge from the project site to an off-loading site which would serve as a temporary transfer station. Contractors would use excavators and loaders to off-load the rock from the barge onto dump trucks. The contractors would haul the rock to the Rio Vista stockpile location (outside of waters of the U.S.) which is depicted in Figure 6.

DWR would monitor downstream water quality for parameters, including turbidity, identified in the Emergency Drought Barrier Water Quality Monitoring Plan, during the excavation process. Bathymetric surveys would be completed after rock fill removal to confirm that the rock is removed.

3.7.4 Site Restoration

Disturbed areas would be restored after initial construction and after the EDB are removed. The affected areas would be restored to approximate pre-project conditions.



Source: DWR adapted by AECOM 2014

Figure 6. Stockpile Location

3.7.5 Project Operations and Maintenance

There are no operational features associated with the proposed barrier. Given the temporary nature of the EDB, maintenance would be minimal or nonexistent. 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).

3.8 Environmental Commitments

DWR would implement a number of conservation measures as part of the proposed project to avoid and minimize potential effects on sensitive species and habitats. These include measures related to general construction practices and measures that focus specifically on sensitive biological resources.

3.8.1 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 site 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.

3.8.2 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 barrier during its operation. Spill control materials will be kept at the barrier site and at additional DWR-owned locations in the Delta. The barrier 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).

3.8.3 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.

3.8.4 Implement Bay Area 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 (BAAQMD) to reduce construction-related fugitive dust during grading at the West False River site (BAAQMD 2010):

- 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.

- In addition, the construction contractor will implement the following applicable enhanced measure 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.

3.8.5 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.

3.8.6 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, and incorporated into the final emissions and mitigation fee calculations.

3.8.7 Use Construction Monitoring and Bay Area Air Quality Management District Carl Moyer Program or Another Verifiable Offset Program to Offset Regional Off-Site Emissions

DWR and/or its contractor will monitor construction activities throughout construction of the barrier. Construction activities data will be collected, emissions associated with construction activities will be calculated, and these data will be reported to the 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
    - Distance traveled by tugboats/barges separated by "loaded" travel and "unloaded" travel
    - Horsepower of tugboats and auxiliary engines
    - Idling time of tugboats/barges
    - Fuel use and fuel type
2. Construction Equipment
    - Equipment type and number of pieces
    - Horsepower
    - Hours of actual operation
3. Haul Trucks (heavy-duty trucks)
    - Number of heavy-duty haul truck trips
    - Total trip distance for haul truck trips
4. Construction Workers
    - 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 the barrier) 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, 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.

3.8.8 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)

3.8.8.1 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 the site to off-peak traffic congestion hours.

3.8.8.2 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.

3.8.9 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, CESA, and/or Migratory Bird Treaty Act. 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 ITP, and other regulatory permits that include biological resource protection measures. Proof of this instruction will be submitted to the permitting agencies.

3.8.10 Conduct Biological Monitoring

A qualified biologist approved by the permitting agencies will be on-site while daytime construction is occurring to conduct compliance inspections for barrier installation and removal and monitor pile driving 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 site. 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.

3.8.11 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 site (i.e., Sacramento area beach seines and trawling [Sherwood Harbor and Chipps island] 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 site.

3.8.12 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.

3.8.13 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 barrier. 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.

3.8.14 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 EDB 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.

3.8.15 Install In-Water Navigational Buoys, Lights, and Signage

Navigational buoys, lights, and signage will be installed in 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.

3.8.16 Implement Turbidity Monitoring During Construction

DWR will monitor turbidity levels in 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 150 Nephelometric Turbidity Units (NTUs). 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 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.

3.8.17 Develop a Water Quality Plan to Monitor Water Quality

DWR will develop and implement a water quality monitoring plan to assess the effects of the proposed project on flow and water quality throughout the Delta by using solar-powered monitoring instruments.

DWR proposes to install twelve permanent water quality monitoring and/or flow monitoring stations. DWR would install the stations at strategic locations from Middle River in the south to Liberty Island in the north and Grizzly Bay or Cutoff Slough in the west. In addition to the new permanent water quality monitoring stations, DWR may assess monitoring data from existing and recently upgraded stations throughout the Delta.

The stations will be used to monitor flow, stage, water velocity, water temperature, specific conductance, turbidity, chlorophyll, nutrients, bromide, and organic carbon, pH, and dissolved oxygen. DWR staff will post weekly water quality data summaries of the continuous data. Chlorophyll and nutrient data will be posted online as soon as the results are available.

The water quality monitoring plan will document the procedures for producing the following elements:

- Water quality data from new monitoring sites and augmentation of existing sites;
- Weekly water quality summaries;
- Chlorophyll and nutrient data (discrete data) summaries as soon as the results are available;
- Final report on project effects on water quality.

3.8.18 Return Disturbed Areas to Pre-Project Conditions And Conserve Habitat

DWR and its construction contractors will strive to limit vegetation removal during project-related construction activities. Following barrier removal, DWR will restore habitat to approximate pre-project conditions using native vegetation only. 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.

3.8.19 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.

3.8.20 Implement Protocols for Valley Elderberry Longhorn Beetle

The following protocols will be implemented to determine if raptors other than Swainson's hawk and burrowing owl are nesting on or adjacent to the project site, and to avoid and minimize potential impacts if active nests are found.

3.8.20.1 Preconstruction Surveys

Before barrier construction and stockpile activities begin, a biological monitor will conduct a survey of the project site and the stockpile site, and areas adjacent to each site, to confirm no elderberry shrubs are present.

3.8.20.2 Impact Avoidance and Minimization

If any unanticipated elderberry shrubs are found, DWR will implement protective buffers. 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 and material storage to protect all elderberry shrubs located adjacent to the project site or stockpile area. 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.

3.8.21 Implement Protocols for Giant Garter Snake

The following protocols will be implemented to avoid and minimize potential impacts, if giant garter snakes are present on or adjacent to the project site.

- Initiation of project activities will be restricted to the giant garter snake active season (May 1 – October 1). Barrier installation activities (including staging and pile driving) will not begin before May 1, and barrier removal activities will begin before October 1.
- Before barrier installation and removal activities begin, exclusion fencing will be installed along the landside edge of the construction/staging areas. The appropriate location for the fencing will be determined by the biologist and indicated to the construction contractor. Fencing materials and installation specifications will be determined in coordination with USFWS and CDFW. The fencing will remain in place throughout the duration of barrier installation and removal, will be inspected daily when project activities are underway, and will be fully maintained. The fencing will be removed after barrier installation activities are complete and will be re-installed before barrier removal activities begin. After barrier removal activities are complete, all fencing materials will be removed and the area will be returned to pre-project conditions.
- The project site will be surveyed for giant garter snakes by a qualified biologist within 24 hours before barrier installation activities (including fencing installation, equipment and material

staging, and pile driving) begin. Surveys will be repeated before barrier removal activities begin and if a lapse in project activities of 2 weeks or greater occurs.

- No snakes will be harassed, harmed, or killed, and they will be allowed to leave the project site on their own volition. If a possible giant garter snake is encountered during construction, activities will cease until appropriate corrective measures have been completed or it has been determined that the snake will not be harmed.
- The biologist will notify USFWS and CDFW immediately if a giant garter snake is found onsite, and will submit a report, including date(s), location(s), habitat description, and any corrective measures taken to protect the snake.

3.8.22 Implement Protocols for Swainson's Hawk

The following protocols will be implemented to determine if Swainson's hawks are nesting within 0.5 mile of the project site, and to avoid, minimize, and mitigate for potential impacts if active nests are found.

3.8.22.1 Preconstruction Surveys

A biological monitor will survey all potential Swainson's hawk nesting trees within 0.5 mile of the project site no more than 5 days before the start of project activities. 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. 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.

3.8.22.2 Preconstruction Monitoring

During preconstruction surveys (described immediately above), a biological monitor will observe any nest(s) within 0.5 mile of the project site 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.

3.8.22.3 Construction Monitoring

All active Swainson's hawk nests within 0.25 mile of the project site (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 (approximately 655 to 1,310 feet) meters 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.

3.8.22.4 Approach Close to Active Nest Trees

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 (approximately165 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.

3.8.22.5 Authority to Stop Construction

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.

3.8.22.6 Salvage of Eggs and Young

If an abandonment of a nest with eggs or nestlings occurs during barrier 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.

3.8.22.7 Compensatory Mitigation

DWR will 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.

3.8.23 Implement Protocols for Burrowing Owls

The following protocols will be implemented to determine if burrowing owls are present in or adjacent to EDB activity areas that support potentially suitable habitat, and to avoid and minimize potential impacts if occupied burrows are found.

3.8.23.1 Habitat Assessment and Preconstruction Surveys

A qualified biologist will conduct an assessment of burrowing owl habitat suitability at the project site and the stockpile site. 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.

3.8.23.2 Impact Avoidance and Minimization

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.

3.8.24 Implement Protocols for Nesting Raptors other than Swainson's Hawk and Burrowing Owl

The following protocols will be implemented to determine if raptors other than Swainson's hawk and burrowing owl are nesting on or adjacent to the project site, and to avoid and minimize potential impacts if active nests are found.

3.8.24.1 Tree Removal

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.

3.8.24.2 Preconstruction Surveys

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 the project 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).

3.8.24.3 Impact Avoidance and Minimization

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.

3.8.25 Implement Protocols for Migratory Birds

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

3.8.25.1 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.

3.8.25.2 Preconstruction Surveys

Focused surveys for active nests of migratory birds will be conducted by a qualified biologist on and immediately adjacent to the project 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).

3.8.25.3 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.

3.8.26 Implement Protocols for Special-status Plants

The following protocols will be implemented to determine if special-status plants are present on or immediately adjacent to the project site, and to avoid and minimize potential impacts if target species are found.

3.8.26.1 Pre-construction Surveys

Each year in which barrier installation may be required, a focused survey for delta tule pea (*Lathyrus jepsonii* var. *jepsonii*), Mason's lilaeopsis, delta mudwort (*Limosella australis*), Sanford's arrowhead (*Sagittaria sanfordii*), woolly rose-mallow (*Hibiscus lasiocarpos* var. *occidentalis*), and any other special-status plant that may occur at the 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.

3.8.26.2 Impact Avoidance and Minimization

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.

3.8.27 Minimize Wildlife Attraction

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

3.8.28 Work with North Delta Water Agency to Minimize Salinity Changes for Water Users within the Agency's Boundaries

DWR will 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.

3.8.29 Conduct Scour Monitoring

Prior to installation of the emergency drought barrier, 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.

3.8.30 Maintain Sheet Piles and Rock Fill

DWR will assure that the sheet piles and rock fill are maintained. DWR will either contract with the Local Maintaining Agency (LMA) or use DWR resources or contractors to repair and or replace the transition rock as needed. If DWR determines that they are no longer functional or a safety issue is identified with the sheet piles that cannot be mitigated through other means, they will be removed either by cutting them off with a torch or driving them into the grade. If removal is needed, DWR will coordinate with the LMA on a removal plan.

An annual inspection of the sheet piles and rock will compare actual conditions with as constructed plans and/or bathymetric survey data. The results of the inspections and any bathymetric survey data collected will be made available to the LMAs. Any necessary repairs of the rock will 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.

3.8.31 Remove Invasive Species

DWR will coordinate with the California Department of Parks and Recreation Division of Boating and Waterways Aquatic Weed Control Program for the control of invasive water hyacinth, Brazilian elodea (*Egeria Densa*) or other invasive water weeds covered by the control program in the vicinity of the barrier while the barrier is in place. As needed, the California Division of Boating and Waterways will conduct herbicide treatments to control water hyacinth that may result from in changes flow from installation of the barrier. DWR will coordinate with the Division of Boating and Waterways on removal strategies for water hyacinth or other covered invasive water weeds as necessary to assure that the barrier does not exacerbate current aquatic invasive weed problems.

3.8.32 Coordinate Traffic Management Plans with Contra Costa County

DWR will coordinate a traffic management plan with Contra Costa County for construction traffic and haul routes. DWR will document pre- and post-construction haul route conditions, if applicable, and will repair any documented pavement damage from heavy equipment.

3.8.33 Minimize Impacts to Ferry Service

If needed, DWR will work with the Delta Ferry Authority to implement solutions to minimize impacts to ferry service as a result of installation of the barrier should changes in water flow or growth of aquatic weeds become an issue for normal ferry operations. Coordination will occur during construction, while the barrier is in place, and during removal activities.

4. Potential for Incidental Take of Covered Species

Incidental take of longfin smelt may occur during project construction and operation as a result of injury or mortality of individuals caused by pile driving and rock placement; substrate disturbance resulting in increased turbidity, suspended sediments, and water column contaminant levels; deterrence from migratory pathways; or increased predation in the vicinity of the rock barrier. Quantitative estimates of potential take are not possible because of lack of fish sampling or monitoring data in the immediate project area, and lack of appropriate analytical methods to quantify losses.

5. Impacts to Covered Species

5.1 Potential Occurrence in Project Area

During the construction period (beginning as early as May), longfin smelt could occur in the vicinity of the West False River site. Merz et al. (2013) summarized the occurrence of longfin smelt from different surveys undertaken in the San Francisco Estuary, including the Delta. They found that longfin smelt larvae were commonly collected in the lower San Joaquin River (i.e., in the vicinity of the West False River barrier site), i.e., in an annual average of 63% of San Francisco Bay Plankton Net samples

(January-June) from 1980 to 1989, in 31% of 20-mm survey samples (March-June) from 1995 to 2011, and in 92% of Smelt Larval Survey samples (January –March) from 2009 to 2011. Juveniles were collected in an average of only 1% of San Francisco Bay Study Otter Trawl samples (April-October) from the lower San Joaquin River, whereas juveniles were collected in 12% of 20-mm samples (April-July). The decrease in frequency of occurrence between the larval and juvenile stages of the life cycle reflects a general movement downstream that would be expected to result in fewer individuals being present during the bulk of the EDB operations period (which could last from mid-early June to October). Baxter et al. (2010) reviewed the factors affecting the species and noted that studies have shown that temperatures >22°C limit the species' distribution and cue emigration; such temperatures would be routinely expected in the vicinity of the West False River barrier during summer/early fall. As noted by Baxter et al. (2010), upstream migration occurs in winter. Sub-adult longfin smelt were found in an average of 8% of fall midwater trawl survey samples undertaken in the lower San Joaquin River in November-December of 1980-2011 (Merz et al. 2013).

Overall, the proportion of the total longfin smelt population near the EDB during EDB construction (beginning in May at the earliest), operation (mid-early June to October), and removal (September/October-November) is expected to be relatively small, but individuals occurring in the Project Area could be affected by the EDB. In addition, the abutments at the West False River site would be left in place and could have effects on longfin smelt occurring in the area after EDB removal, as discussed below in section 5.3.3 *Near-Field Predation Impacts.*

5.2 Construction and Removal Impacts

The potential for occurrence of longfin smelt during EDB construction and removal was discussed above in section 5.1 *Potential Occurrence in Project Area.* The installation of the EDB has the potential to harass and displace longfin smelt present in the general area of the construction activity, primarily because of in-water rock placement and any associated pile driving that would occur. Additionally, the increased turbidity levels associated with construction may negatively impact longfin smelt temporarily through reduced availability of food, reduced feeding efficiency, and exposure to toxic sediments released into the water column. Removal of the EDB in September/October/November may be less likely to affect longfin smelt because the timing of that action would not overlap with the general occurrence of the species in the locations of the barrier, although this is dependent on environmental conditions (e.g., water temperature, salinity, and turbidity).

Pile driving will be used in the construction of the West False River barrier, as noted in the Project Description. High levels of underwater noise from pile driving can adversely affect some fish species,[2] as discussed by NMFS and others (Hastings and Popper 2005; Popper et al. 2006; Carlson et al. 2007; NMFS 2008). To the extent possible, the EDB will use a vibratory hammer to install the sheet pile dikes and king piles (wall) at the West False River barrier; however, impact driving may be necessary for some pile driving. Vibratory hammers are generally much quieter than impact hammers and are routinely used on smaller piles (ICF Jones & Stokes and Illingworth & Rodkin 2009). Fish impacts from exposure to pile driving activities were reviewed by Hastings and Popper (2005), and they provided recommendations to protect fish from physical injury (see also Popper et al. 2006; Carlson et al. 2007). In 2008 NMFS, USFWS and CDFG adopted interim criteria of a peak sound pressure level of 206 dB referenced to 1 μPascal per second and a cumulative (SEL) of 187 dB referenced to 1μPascal per

[2] Three metrics are commonly used in evaluating hydroacoustic impacts on fish: peak sound pressure level, root mean square (RMS) sound pressure, and sound exposure level (SEL) (ICF Jones & Stokes and Illingworth & Rodkin 2009). SEL is defined as the constant sound level acting for one second, which has the same amount of acoustic energy as the original sound (Hastings and Popper 2005). Reference sound levels from pile driving normally are reported at a fixed distance of 10 meters. Underwater peak and RMS decibel levels are usually referenced to 1 micropascal (μPa), and the SEL is referenced to 1 micropascal squared per second (dB re: 1μPa^2-s) (Hastings and Popper 2005).

second for fish greater than or equal to 2 grams in weight and 183 dB referenced to 1μPascal per second for fish less than 2 grams in weight (Fisheries Hydroacoustic Working Group 2008, ICF Jones & Stokes and Illingworth & Rodkin 2009). Although these criteria were specific to impact or percussive pile driving, they have served as a general guideline for noise thresholds for the onset of physical injury in fish exposed to the impact sound associated with pile driving (NMFS 2008).00)...Pile driving at the West False River barrier site would occur over a several-day period in order to install the two sheet pile walls and associated eight king piles. It is anticipated that a vibratory hammer will be used for the sheet and king pile driving, which is quieter than impact driving (ICF Jones & Stokes and Illingworth & Rodkin 2009). Vibratory driving appears to be feasible given the anticipated ground conditions and modest pile penetration of 20-50 feet into the ground (Broadbaek, pers. comm.). 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 maximum vibration times per pile assuming normal driving conditions:

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

Because of uncertainties in ground conditions and the possibility of encountering dense soil layers or obstructions such as left-in-place rip-rap on the existing levee side slopes, a larger impact hammer would be used as a contingency measure, in the event that unexpected harder driving is encountered. The impact hammer would only be used if the vibratory hammer cannot reach the design tip elevation of the pilings.

Although peak sound levels of vibratory hammers can be substantially less than those produced by impact hammers, the total energy imparted can be comparable to impact driving because the vibratory hammer operates continuously and requires more time to install the pile (ICF Jones & Stokes and Illingworth & Rodkin 2009). Sound levels during vibratory pile driving were measured at the City of Stockton Downtown Marina (ENTRIX 2008). Peak sound pressure levels ranged from 184 to 202 dB, while accumulated SELs ranged from 181 to 195 dB, as measured at 10 m from the pile and mid-water depth (approximately 2 to 3 m below the water surface). The duration of pile driving ranged from approximately 6 to 12 minutes, with periods of 11 to 71 minutes between pile driving (Power Engineering and City of Stockton 2008). The peak sound pressure levels were below recommended levels, while the accumulated SELs slightly exceeded the recommended criteria by 8 dB. During the 5-week period of observing each pile installation at the City of Stockton Downtown Marina, technicians did not observe effects on fish species related to the pile installations.

Appendix A of the Biological Assessment for ESA-listed fishes presents an analysis for potential pile driving effects for the EDB, including barrier piles (i.e., king piles and sheet piles) at the West False River site, float line piles upstream and downstream of the West False River site, and water quality equipment monitoring piles. This analysis examined various potential scenarios for the duration of pile driving, given lack of exact knowledge about the number of piles to be driven per day. The analysis suggested that the potential zone of effect (i.e., the zone within which there is potential for take through physical injury or harassment causing displacement) for vibratory pile driving of barrier piles could extend almost 500 meters upstream and downstream from the site of pile driving at the West False River barrier;[3] the zone of effect for impact driving varied broadly depending on the number of strikes necessary for pile driving (maximum of 1,000 meters for many strikes per day). As described in section 3.8 *Environmental Commitments*, vibratory pile driving would be used whenever possible, and driving would be halted should daily cumulative SEL at 10 meters exceed the greatest values estimated from the pile driving effects analysis, i.e., 214 dB for vibratory driving and 218 dB for impact

[3] This distance is based on sound pressure criteria for effects on fishes that were adopted for impact driving; as noted in Appendix A of the Biological Assessment for ESA_listed fishes, suggested criteria for vibratory driving would give a shorter distance to sound pressure thresholds and therefore a smaller zone of impact.

driving. Pile driving for the float line piles at the West False River barrier would affect an area within the area of impact of the barrier piles. Pile driving for the water quality monitoring piles would be expected to affect a very small area (e.g., < 10 m distance to 183-dB physical injury threshold, for 720 seconds) at the various locations where the piles would be driven (see Figure 5).

The use of vibratory driving whenever possible, the adoption of attenuation measures for any impact driving (i.e., bubble curtains; see section 3.8 *Environmental Commitments*), combined with sound monitoring to limit pile driving should thresholds be exceeded, are intended to minimize the potential for take of listed fish species during pile driving.

Anticipated responses of any fish within the work area may be more likely to be behavioral in nature (e.g., startle response and avoidance), although these would diminish with distance from the construction site. Hastings and Popper (2005) concluded that data are lacking on behavioral responses to pile driving, such as a startle response to noise or movement away from highly utilized habitats impacted by sound. Carlson et al. (2001) reported migrating juvenile salmon reacting with startle behavior in response to routine channel maintenance activities in the Columbia River. Some of the fish that did not immediately recover from the disorientation of turbidity and noise from channel dredges and pile driving swam directly into the point of contact with predators. The total impact to aquatic habitat because of the footprint of the West False River barrier is around 2.65 acres, of which 0.75 acres is a permanent impact because of fill.

The construction of the EDB may take longfin smelt, however, take is anticipated to be limited because:

- construction and removal is spatially limited relative to the potential areas in which the species occurs, and removal would take place when relatively few longfin smelt would be expected to occur in the vicinity of the EDB;
- the effects would be temporary (total construction period of around 30-60 days and total removal period of around 45-60 days);
- pile driving on each day at the West False River barrier would be limited not to exceed NMFS-established thresholds for injury to fishes, and would be undertaken with a vibratory pile driver to the extent possible, with any necessary impact driving incorporating bubble curtains and other environmental commitments to attenuate noise effects (see section 3.8 *Environmental Commitments*);
- pile driving for water quality monitoring equipment would be very limited in duration and area affected and would be undertaken with a vibratory pile driver;
- sound data taken during the 2012 installation of rock barriers as part of the TBP showed that noise levels at 100 m from construction were below the NMFS criteria for adverse behavioral effects (Shields 2012),[4] suggesting that the area of construction effects from rock placement would be smaller than 100 m (recognizing that there remains the potential for much of the channel width to be affected by intense transient noises during construction[5]);

[4] For the TBP, the greatest measured peak sound pressure at 100 m was 149 dB for a single bucket drop of rock at the Old River near Tracy barrier. No measurements exceeded the NMFS 2012 South Delta Temporary Barriers Project BO ecological surrogate threshold of 150 dB at 100 m (Shields 2012). Applying the 149-dB peak value to equation 4-2 of ICF Jones and Stokes and Illingworth and Rodkin (2009; i.e., distance to threshold = distance to 149-dB measurement/(10$^{\text{[149dB – pressure threshold in dB]/15 (i.e., the assumed attenuation coefficient)}}$)) gives distances to peak thresholds of 86 m for a 150-dB threshold and less than a meter for a 206-dB threshold.

[5] In addition to rock placement during construction, rock placement may occur at the permanent abutments should annual inspections show displacement of rocks from these structures; however, there are expected to be no adverse effects from these rock placements on listed fishes because the work would be of limited extent and would occur during the summer in-water work window.

- the effects of noise on fish would likely be limited to avoidance behavior in response to movements, noises, and shadows caused by construction personnel and equipment operation in or adjacent to the river (recognizing that avoidance of the disturbed areas could make fish more susceptible to predation at other areas);
- juvenile and adult longfin smelt in the area are expected to move away from the area of disturbance (any larval longfin smelt in the area may move away more slowly because of their smaller size and weaker swimming ability, therefore resulting in more exposure to disturbance than adults and juveniles);
- DWR has included a number of environmental commitments to limit the potential for take (see section 3.8 *Environmental Commitments*).

5.3 Operations Impacts

5.3.1 Hydrodynamic Impacts

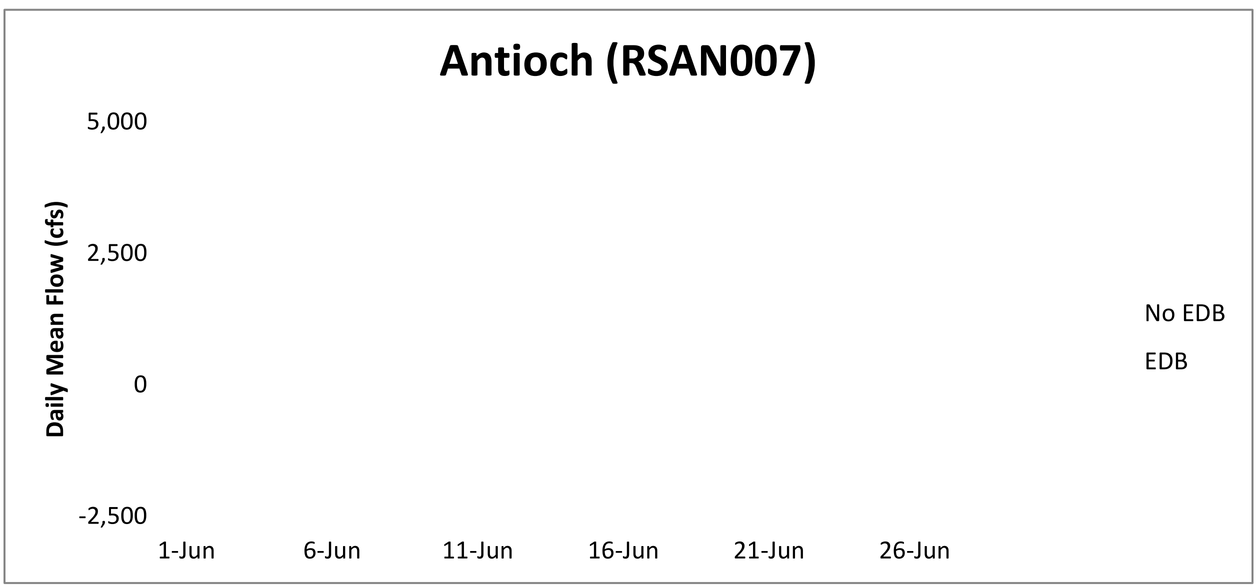
Operations of the EDB (i.e., the presence of the West False River barrier) have the potential to change the likelihood of entrainment toward the south Delta export facilities of longfin smelt larvae/juveniles occurring in the lower San Joaquin River compared to the situation without the EDB. The West False River barrier would essentially eliminate the potential for longfin smelt to move from the lower San Joaquin River through False River and Franks Tract into Old River. Modeling based on simulated hydrology[6] suggested that the net flows in the San Joaquin River at Jersey Point would not differ greatly between EDB and no-EDB scenarios: the tidally averaged daily mean flow for June with the EDB was 1,065 cfs, compared to 882 cfs without the EDB (Figure 7). Similarly, the operation (presence) of the West False River barrier would increase the net positive flow downstream in the lower San Joaquin River at Antioch (Figure 8).

As noted above, installation of the West False River barrier would have the potential to reduce entrainment of longfin smelt in the lower San Joaquin River into Franks Tract and Old River (and ultimately the SWP/CVP south Delta export facilities) by blocking off one of the main points of entry into the south Delta. However, seepage flow between the rocks of the barrier has the potential to result in impingement of small longfin smelt (e.g., larvae and early juveniles) occurring in the area. Analyses presented in Appendix B of the Biological Assessment for ESA-listed fishes based on DSM2-HYDRO modeling for the simulated hydrology were used to assess the potential for seepage flow through the West False River barrier. This suggested that the seepage flow would be very low (median of 0 cfs, range from -84 cfs to just under 370 cfs, for the June 1-30 period; Table B3 in Appendix B of the Biological Assessment for ESA-listed fishes) and that therefore there would be low risk to longfin smelt from impingement because this flow is very low compared to nearby tidal flow at Jersey Point (median of around 12,000 cfs, range -149,000 to 132,000 cfs). Without the EDB, median flow in False River was 5,600 cfs (range -37,500 to 36,000 cfs), indicating that a substantial portion of the San Joaquin River flood tide (upstream) flows are diverted into Franks Tract.

[6] The simulated hydrology discussed in the Biological Assessment for ESA-listed fishes assumed the EDB to be installed on June 1 and is useful for illustrating the general effects of the EDB in relation to a no-EDB scenario; the EDB and no-EDB scenarios were based on the 99% exceedance forecast and were consistent with the March 24, 2015, TUCP modification petition for Bay-Delta standards (Murillo and Cowin 2015). See Appendix C of the Biological Assessment for ESA-listed fishes for further description.

Source: Tu, pers. comm. Note: Scenarios include no EDB and EDB (West False River Barrier). Delta operations were based on the 99% exceedance forecast and were consistent with the March 24, 2015, TUCP modification petition for Bay-Delta standards (Murillo and Cowin 2015). EDB assumed installed June 1, removed October 31.

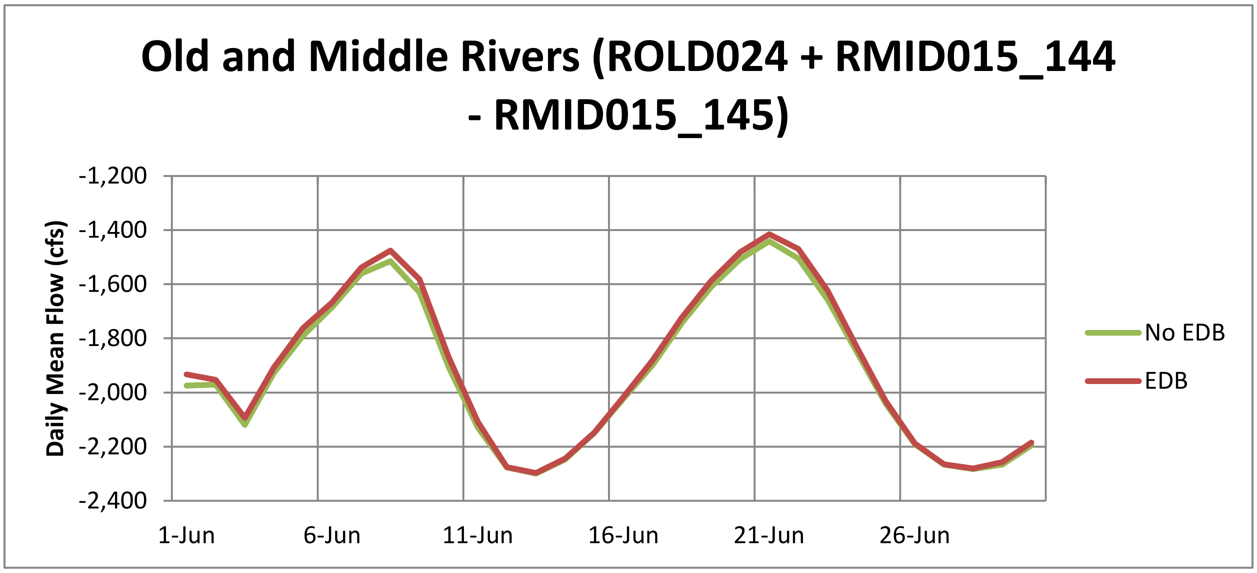
Figure 7. Tidally Averaged Mean Daily Flow at Jersey Point from June 1 to June 30, from DSM2-HYDRO Modeling, Based on Simulated Hydrology and Delta Cross Channel Operated Per D-1641.



Source: Tu, pers. comm. Note: Scenarios include no EDB and EDB (West False River Barrier). Delta operations were based on the 99% exceedance forecast and were consistent with the March 24, 2015, TUCP modification petition for Bay-Delta standards (Murillo and Cowin 2015). EDB assumed installed June 1, removed October 31.

Figure 8. Tidally Averaged Mean Daily Flow at Antioch from June 1 to June 30, from DSM2-HYDRO Modeling, Based on Simulated Hydrology and Delta Cross Channel Operated Per D-1641.

Operation of the West False River barrier could trap longfin smelt that are present upstream of the barrier (e.g., in the Franks Tract area). With the EDB changing hydrodynamics in the central and south Delta, OMR flows become slightly less negative in the modeling based on the simulated hydrology (Figure 9), which is a function of differences in hydrodynamics caused by the West False River barrier (and not because less exports occurred under the EDB scenario). The West False River barrier changes the San Joaquin River flood tide pathway into Franks Tract, and moves the tidal connection about 20 kilometers upstream to the mouth of Old River. These hydrodynamic changes in the tidal elevations and corresponding tidal flows in the San Joaquin River, Franks Tract, and Old and Middle River channels also would slightly shift the distribution of the OMR flows. The tidally averaged mean daily flows for June of the simulated hydrology were 1,922 cfs for the no-EDB scenario and 1,903 cfs for the EDB scenario (Figure 9). Regardless of whether the West False River barrier is installed or not, the potential for entrainment would be closely monitored by the Smelt Working Group (as a requirement of the SWP/CVP BiOp) and exports would be adjusted accordingly, so there would be likely to be little difference in entrainment loss between EDB and no-EDB scenarios.



Source: Tu, pers. comm. Note: Scenarios include no EDB and EDB (West False River Barrier). Delta operations were based on the 99% exceedance forecast and were consistent with the March 24, 2015, TUCP modification petition for Bay-Delta standards (Murillo and Cowin 2015). EDB assumed installed June 1, removed October 31.

Figure 9. Tidally Averaged Mean Daily Flow at Old and Middle Rivers from June 1 to June 30, from DSM2-HYDRO Modeling, Based on Simulated Hydrology and Delta Cross Channel Operated Per D-1641.

The fate of longfin 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 barrier, based on simulated fates of neutrally buoyant particles (Kimmerer and Nobriga 2008).

5.3.2 Water Quality Impacts

Water quality impacts of the EDB on longfin smelt would be limited because, as noted above in the section 5.1 *Potential Occurrence in the Project Area*, the species is largely downstream during the main period of barrier operation (summer/early fall) that could be affected by changed water quality. Most of the longfin smelt population would be expected to reside downstream of the Delta during the EDB operations period, and therefore would not be affected by water quality issues as there would be little difference in Delta outflow based on modeling of the 99% exceedance hydrology with Temporary Urgency Change Petition (TUCP) modifications (see Appendix C of the Biological Assessment for ESA_listed fishes; note, however, that more detailed analysis of potential effects would be undertaken by DWR/Reclamation as part of the ongoing TUCP process).

5.3.3 Near-Field Predation Impacts

Predatory fish may congregate below manmade barriers in rivers to feed on prey passing through the barriers. For example, Tucker et al. (1998) described the problem of relatively high predation of juvenile Chinook salmon below RBDD on the Sacramento River. Predatory fish (e.g., largemouth bass [*Micropterus salmoides*]) fitted with acoustic tags have been shown to associate with the head of Old River barrier that was installed in 2012 (DWR unpublished data), and predation rates of acoustically tagged Chinook salmon juveniles at or near the barrier were high. Also within the Delta, Sabal (2014) showed that striped bass congregated below Woodbridge Irrigation District Dam (Mokelumne River) at higher densities than at other anthropogenically altered sites in the lower Mokelumne River (which in turn had greater densities of striped bass than natural sites); the per capita consumption of juvenile Chinook salmon at the dam was also higher than at other areas. Whereas enhanced predation of juvenile salmonids in relation to artificial structures has been observed in the Central Valley and Delta (Tucker et al. 1998, Sabal 2014), there have not been observations of such predation on longfin smelt. The West False River barrier would not have culverts and therefore there would be no predation risk to fish passing through culverts. Near-field predation risk would be greater because of structure-associated predatory fishes. Predation at greater rates than normal may result should longfin smelt occur in close proximity to the West False River barrier. The barrier may provide perching habitat for predatory diving birds such as cormorants, which could increase predation risk for any longfin smelt occurring near the West False River barrier.

As described in section 3.8.31 above, DWR would coordinate with the California Department of Parks and Recreation Division of Boating and Waterways Aquatic Weed Control Program for the control of invasive water hyacinth, Brazilian elodea (*Egeria densa*) or other invasive water weeds covered by the control program in the vicinity of the barriers while the barriers are in place. This would prevent an increase in the risk of predation of longfin smelt occurring near the barriers by vegetation-associated predatory fishes such as largemouth bass.

The West False River barrier would be removed by November 15, except for the abutments (sheet piles and king piles), which would be left in place. As noted in section 3 *Project Description*, the sheet piles would extend approximately 75 feet from the levee into the river channel; installation of rock transitions would be done to limit the potential for creation of hydrodynamic eddies that could form ambush habitat for predatory fishes. However, some enhanced level of predation attributable to the presence of the remaining abutment structures could occur on longfin smelt (primarily adults moving into nearshore areas to spawn or to avoid ebb tides during upstream spawning migration).

5.4 Emergency Implementation Earlier Than Proposed Dates

The potential for effects on longfin smelt from the EDB generally would be expected to increase with emergency implementation of the project earlier than the dates proposed in the Project Description (i.e., construction beginning no earlier than May 7). 20-mm Survey data from 2013-2015 illustrate that the distribution of the early life stages generally moves downstream in early June (Table 4; Figure 10), whereas prior to this, appreciable numbers of larvae and early juveniles may be found in the vicinity of the EDB; this is shown with the most recent survey data from mid-April 2015, showing that densities are moderate near the West False River barrier (Figure 11). Therefore, implementation of the project earlier than May/June would have greater potential for the types of construction and operations impacts to longfin smelt that were discussed above in sections 5.2 *Construction and Removal Impacts* and 5.3 *Operations Impacts*.

Table 4. Center of Density of Longfin Smelt Collected in the 20-mm Survey, 2013-2015.

2013		**2014**		**2015**	
Survey Number (Dates)	**Center of Density[1]**	**Survey Number (Dates)**	**Center of Density[1]**	**Survey Number (Dates)**	**Center of Density[1]**
1 (Mar 11-14)	9.9	1 (Mar 3-17)	-1.9	1 (Mar 16-20)	7.0
2 (Mar 25-28)	4.2	2 (Apr 2-4)	3.3	2 (Mar 30-Apr 8)	-2.9
3 (Apr 8-11)	7.2	3 (Apr 14-17)	7.9	3 (Apr 13-Apr 16[2])	7.0
4 (Apr 22-25)	2.9	4 (Apr 28-May 1)	4.7		
5 (May 6-9)	-4.6	5 (May 12-15)	-0.9		
6 (May 20-23)	12.0	6 (May 27-Jun 2)	3.6		
7 (Jun 3-6)	10.8	7 (Jun 9-12)	20.4		
8 (Jun 17-20)	10.0	8 (Jun 23-26)	27.0		
9 (Jul 1-3)	13.6	9 (Jul 7-10)	None collected		

Source: http://www.dfg.ca.gov/delta/data/sls/CPUE_Map.asp and http://www.dfg.ca.gov/delta/data/20mm/CPUE_Map3.asp. Accessed: September 27, 2014; April 6, 2015; and April 20, 2015.

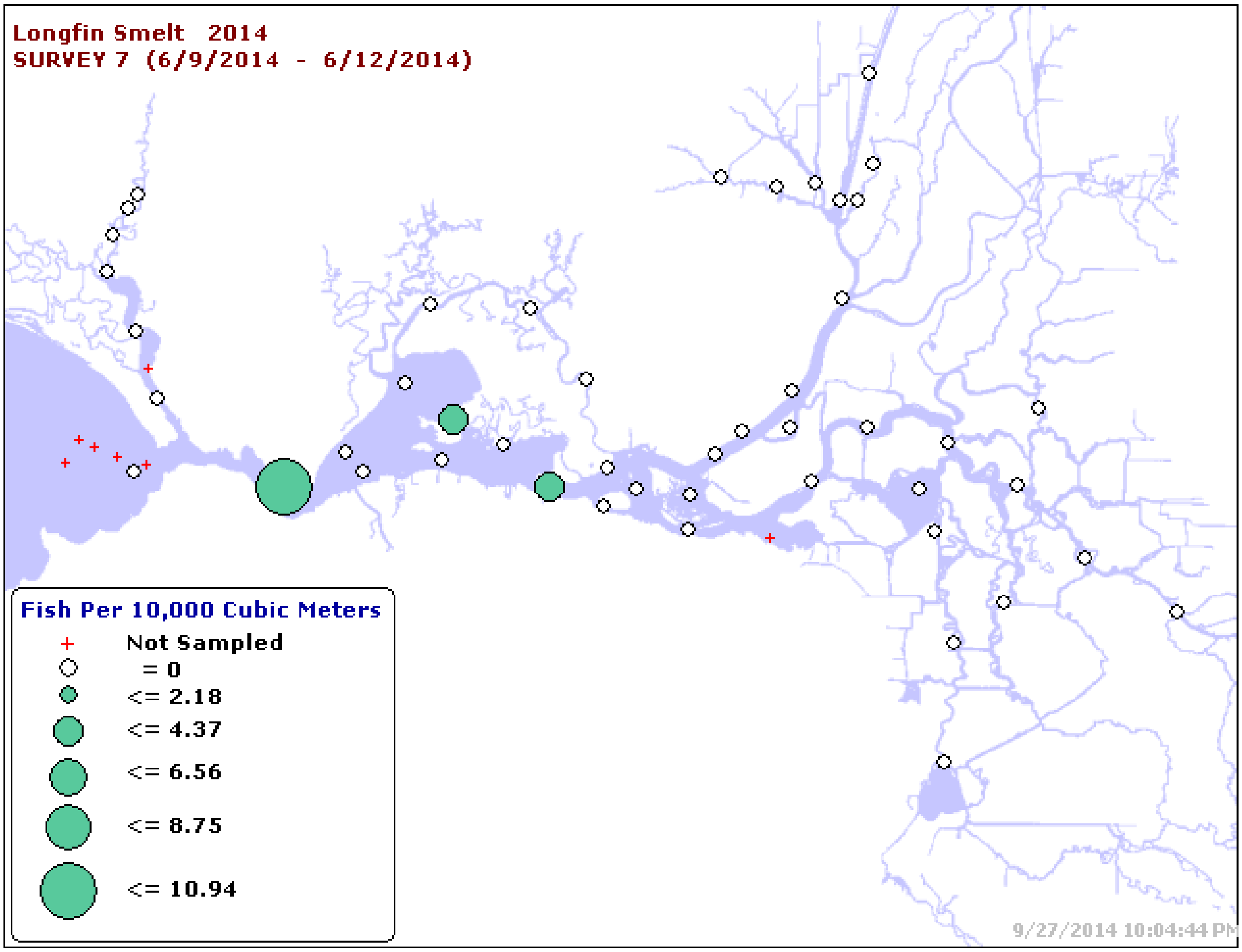
[1]Kilometers downstream (positive numbers) or upstream (negative numbers) from the confluence of the Sacramento and San Joaquin Rivers.

[2]Survey in progress at time of preparation of this document.

5.5 Removal of West False River Barrier Later Than Proposed Date

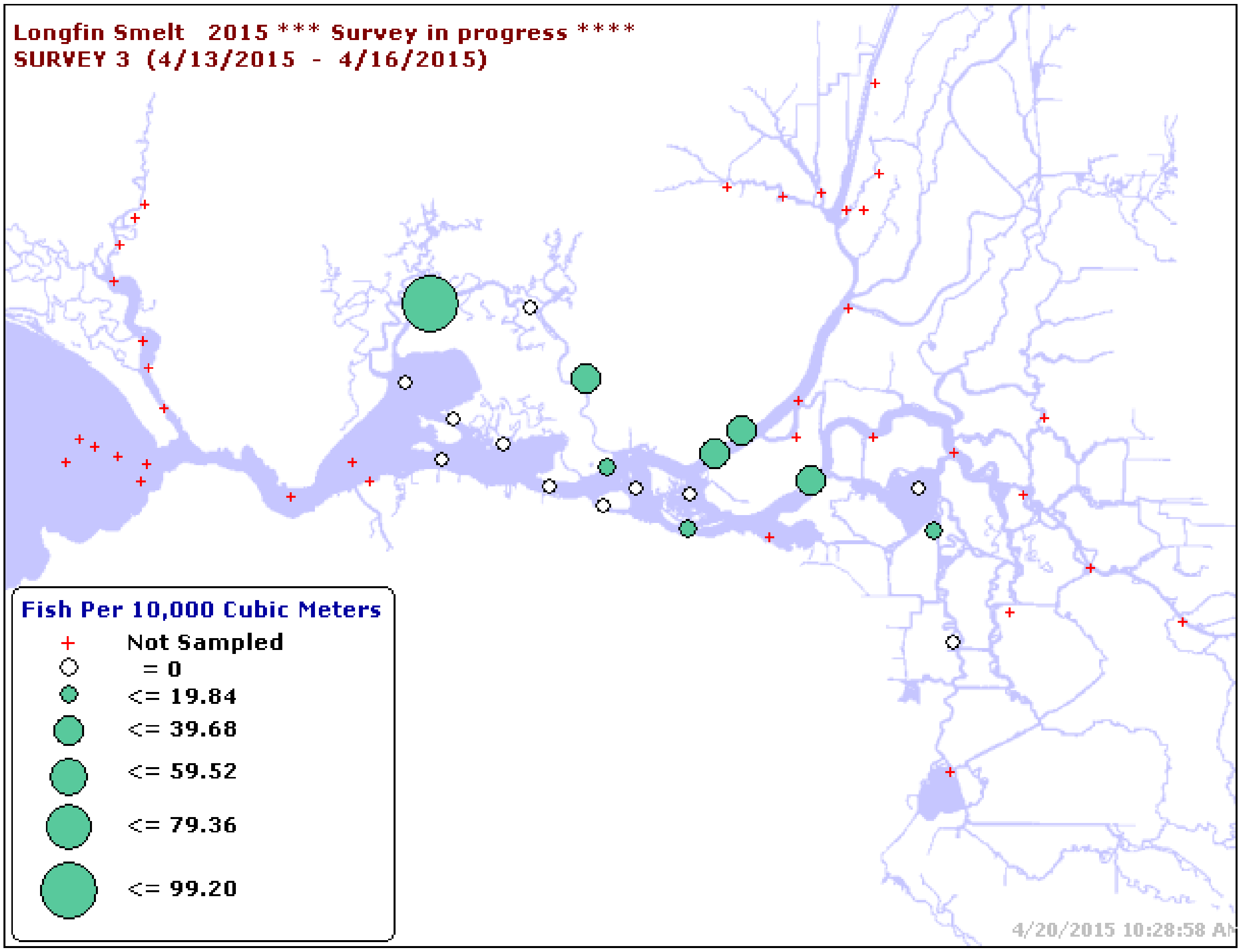
As noted in the Project Description, the West False River Barrier is proposed to be fully removed by November 15. However, the size of the barrier and the logistical challenges its removal presents could result in removal extending beyond November 15, up to November 30.

In general, the potential for effects on longfin smelt from removal of the West False River barrier generally would be expected to increase somewhat with removal by November 30 compared to removal by November 15. As the water in the Delta cools, it would be expected that a portion of the adult longfin smelt population would move upstream to spawn (Baxter et al. 2010) and therefore would have more potential to occur in the West False River barrier area. Full removal of the West False River barrier later than November 15 and as late as November 30 would increase the likelihood of overlapping upstream migration. In general, later removal therefore would somewhat increase the potential to affect longfin smelt by the mechanisms described above in the sections discussing Construction and Removal Impacts.



Source: http://www.dfg.ca.gov/delta/data/20mm/CPUE_Map3.asp. Accessed: September 27, 2014.

Figure 10. Longfin Smelt Density from 20-mm Survey 7 of 2014.



Source: http://www.dfg.ca.gov/delta/data/20mm/CPUE_Map3.asp. Accessed: April 20, 2015. Note: Survey was still in progress at the time this document was being prepared. Red '+' indicate stations not sampled.

Figure 11. Longfin Smelt Density from 20-mm Survey 3 of 2015.

6. Potential for Jeopardy

Considering the relatively small spatial and temporal scale of the EDB, coupled with the small proportion of the Covered Species' populations that would be likely to occur in the project area and potentially be impacted by the EDB, as well as the inclusion of many environmental commitments (see section 3.8 *Environmental Commitments*), issuance of an incidental take permit for EDB construction and operation would not jeopardize the continued existence of the Covered Species.

7. Funding

In the event there is take, DWR will ensure funding to complete the proposed environmental commitments/mitigation measures, including acquisition of mitigation lands or credits. The certification of this application by the DWR Principal Officer below provides this assurance.

8. Proposed Minimization and Mitigation Measures

Application of the measures described in section 3.8 *Environmental Commitments* would result in additional minimization and mitigation measures being unnecessary.

9. Monitoring and Reporting

DWR will submit to CDFW a Final Mitigation and Monitoring Report by December 31, 2015. This report will include: 1) a synthesis of the results and conclusions of the monitoring program; 2) an assessment of the effectiveness of all Conditions of Approval in minimizing and mitigating project impacts; and 3) recommendations on how environmental commitments/mitigation measures might be changed to more effectively minimize and mitigate impacts of similar future projects on the Covered Species.

10. Certification

I certify that the information submitted in this application is complete and accurate to the best of my knowledge and belief. I understand that any false statement herein may subject me to suspension or revocation of this permit and to civil and criminal penalties under the laws of the State of California.

By:	[signature]	Date:	April 21, 2015
Printed Name:	Paul A. Marshall	Title:	Chief, Bay-Delta Office

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