BIOLOGICAL AND CONFERENCE OPINION
for the Delta Conveyance Project

Service File No. 2024-0029957-S7-001

March 9, 2026

U.S. Fish and Wildlife Service
San Francisco Bay-Delta Fish and Wildlife Office
Sacramento, California

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TABLES

FIGURES

ACRONYM LIST

Act	Federal Endangered Species Act
BA	Biological Assessment
BiOp	Biological Opinion
Caltrans	California Department of Transportation
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
cfs	Cubic Feet per Second
CLSM	Controlled Low-strength Backfill Material
CMP	Compensatory Mitigation Plan
CNDDB	California Natural Diversity Database
Corps	U.S. Army Corps of Engineers
CPT	Cone Penetration Test
CVP	Central Valley Project
dBA	A-weighted Decibel
DCP	Delta Conveyance Project
DMM	Deep Mechanical Mixing
DWR	California Department of Water Resources
ESA	Federal Endangered Species Act
ERT	Electrical Resistivity Tomography
GIS	Geographic Information System
GPS	Global Positioning System
H:V	Horizontal to Vertical
I	Interstate
IEP	Interagency Ecological Program
Leq	equivalent continuous sound level
LTO BiOp	Biological & Conference Opinion for the Long-Term Operations of the CVP & SWP
NAVD88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NWS	National Weather Service
O&M	Operations and Maintenance
PA	Proposed Action
Reclamation	U.S. Bureau of Reclamation
RMS	Root Mean Square
RTM	Reusable Tunnel Material
SCADA	Supervisory Control and Data Acquisition
SEL	Cumulative sound exposure level
Service	U.S. Fish and Wildlife Service
SPL	Peak sound pressure level
SR	State Route
SWP	State Water Project
TBM	Tunnel Boring Machine

1. INTRODUCTION

This Biological and Conference Opinion (BiOp/consultation) is in response to the U.S. Army Corps of Engineers (Corps) August 22, 2025, request for initiation of formal consultation and conference with the U.S. Fish and Wildlife Service (Service) on their issuance of a Department of the Army permit application, Section 408 permission request, and real estate easement for the California Department of Water Resources' (DWR) proposed Delta Conveyance Project (DCP/Proposed Action [PA]). As described below and in Section 5. Consultation Approach, this consultation addresses the effects of construction DCP facilities and their maintenance activities on federally-listed species, their designated critical habitat, and federally-proposed species, while DCP operation and programmatic aspects related to operation will be addressed in a future consultation. Pursuant to 50 CFR 402.12(j), DWR and the Corps submitted a Biological Assessment (BA) to support the Corps' determinations (Table 1-0-1) and this consultation. This response is provided under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq*.) (ESA or Act), and in accordance with the implementing regulations pertaining to interagency cooperation (50 CFR 402).

DWR is proposing the construction and operation of new facilities, including new points of diversion. These proposed new facilities would work in conjunction with and modify the existing State Water Project (SWP). The modifications to and operation of the SWP would continue to be coordinated with the Central Valley Project (CVP) and are not within Corps jurisdiction. On November 8, 2024, the Service issued a Biological and Conference Opinion for the Long-Term Operations of the CVP and SWP (2024 LTO BiOp) (Service File No. 08FBDT00-2022-0059509) to the U.S. Bureau of Reclamation (Reclamation). The 2024 LTO BiOp included a framework programmatic consultation to evaluate the potential impacts of the proposed future operations of the DCP on federally listed species and designated critical habitat. As part of this framework, Reclamation committed to initiating additional consultations in the future to address both near-field and far-field effects of the DCP operations, providing detailed information at that time for site-specific analyses. This current consultation by the Service focuses specifically on these non-operational components, which were previously reviewed in the 2024 LTO BiOp under the broader programmatic approach.

Table 1-0-1. Federally Listed and Proposed Species and Critical Habitat Corps Determinations

Common Name	Scientific Name	Federal Status	Determination
California Least Tern	*Sterna antillarum browni*	E	May Affect, Not Likely to Adversely Affect
Least Bell's Vireo	*Vireo bellii pusillus*	E	May Affect, Likely to Adversely Affect
California Red-legged Frog & Critical Habitat	*Rana draytonii*	T	May Affect, Likely to Adversely Affect
Central California Distinct Population Segment of the California Tiger Salamander	*Ambystoma californiense*	T	May Affect, Likely to Adversely Affect

Delta Smelt & Critical Habitat	*Hypomesus transpacificus*	T	May Affect, Likely to Adversely Affect
Giant Garter Snake	*Thamnophis gigas*	T	May Affect, Likely to Adversely Affect
San Francisco Bay-Delta Distinct Population Segment of the Longfin Smelt	*Spirinchus thaleichthys*	E	May Affect, Likely to Adversely Affect
San Joaquin Kit Fox	*Vulpes macrotis mutica*	E	May Affect, Likely to Adversely Affect
Valley Elderberry Longhorn Beetle	*Desmocerus californicus dimorphus*	T	May Affect, Likely to Adversely Affect
Vernal Pool Fairy Shrimp & Critical Habitat	*Branchinecta lynchi*	T	May Affect, Likely to Adversely Affect
Vernal Pool Tadpole Shrimp	*Lepidurus packardi*	E	May Affect, Likely to Adversely Affect
Western Distinct Population Segment of the Yellow-billed Cuckoo	*Coccyzus americanus*	T	May Affect, Likely to Adversely Affect
Monarch Butterfly	*Danaus plexippus*	PT	May Affect, Likely to Adversely Affect
Northwestern Pond Turtle	*Emys marmorata*	PT	May Affect, Likely to Adversely Affect
Northern Distinct Population Segment of the Western Spadefoot	*Spea hammondii*	PT	May Affect, Likely to Adversely Affect

In reviewing the PA, the Service has relied upon: (1) the Corps' letter requesting consultation, dated August 22, 2025; (2) the August 2025 BA for the PA; (3) multi-agency meetings spanning 2020 to present; and (4) other information available to the Service.

2. SPECIES LIKELY TO BE ADVERSELY AFFECTED

The Service concurs with the Corps' determinations that the PA is likely to adversely affect certain listed and proposed species. Specifically, this consultation evaluates whether the PA is likely to jeopardize the continued existence of the federally endangered vernal pool tadpole shrimp (*Lepidurus packardi*), San Francisco Bay-Delta distinct population segment (DPS) of the longfin smelt (*Spirinchus thaleichthys*) (longfin smelt DPS), least Bell's vireo (*Vireo bellii pusillus*), and San Joaquin kit fox (*Vulpes macrotis mutica*); the federally threatened valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), vernal pool fairy shrimp (*Branchinecta lynchi*) and its critical habitat, delta smelt (*Hypomesus transpacificus*) and its critical habitat, giant garter snake (*Thamnophis gigas*), California red-legged frog (*Rana draytonii*) and its critical habitat, Central California DPS of the California tiger salamander *(Ambystoma californiense*) (California tiger salamander), Western DPS of the yellow-billed cuckoo (*Coccyzus americanus*) (yellow-billed cuckoo); and the federally proposed as threatened northwestern pond turtle (*Emys marmorata*), northern DPS of the western spadefoot (*Spea hammondii*), and monarch butterfly (*Danaus plexippus*).

3. SPECIES NOT LIKELY TO BE ADVERSELY AFFECTED

The Service concurs with the Corps' determination that the PA is not likely to adversely affect the California least tern. DWR has mapped foraging habitat throughout the Action Area and although some foraging habitat will be affected through construction of the DCP, foraging habitat is not a limited resource for the least tern and effects to foraging habitat are anticipated to be discountable. The closest distance between a known nesting location is approximately one mile from the DCP footprint. This occurs between the Bufferlands nesting site (Sacramento Wastewater Treatment Plant) and the supervisory control and data acquisition facilities northeast of the north Delta intakes. This nesting site will be avoided and construction activities are not anticipated to interfere with least tern nesting. Least tern will likely avoid areas of construction and have ample space to fly away from construction areas to where they would not likely be adversely affected by project activities. In the unlikely event foraging or nesting terns are in the vicinity of the DCP, DWR has proposed avoidance and minimizations measures articulated below in *6.4.2.2 California Least Tern Avoidance and Minimization Measures*.

4. CONSULTATION HISTORY

This consultation is the most recent in a series of efforts related to iterations of the Delta Conveyance Project. The Service completed a consultation on the California WaterFix Project (Service File No. 08FBDT00-2016-F-0247), a previous iteration of the Delta Conveyance Project, on June 23, 2017, which was withdrawn on May 6, 2019, per a May 2, 2019, request from Reclamation and DWR. More recently, on November 8, 2024, the Service issued a BiOp for the Long-Term Operations of the CVP and SWP and an amended incidental take statement on November 14, 2025 (Service File No. 08FBDT00-2022-0059509), which also evaluated the proposed future operations of the DCP using a framework programmatic consultation approach to assess potential effects on listed and proposed species and critical habitat. From January 2020 to the issuance of this consultation, DWR and the Corps convened a series of weekly and monthly multi-agency coordination and technical meetings to develop the final BA and National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) documents. Those meetings are incorporated by reference and will not be individually identified below. The following section outlines key milestones in the consultation history for the DCP.

- September 27, 2023: The Service participated in a multi-agency Delta tour of the DCP footprint.
- October 23, 2023: DWR transmitted the October 2023 draft DCP BA.
- December 8, 2023: The Service provided courtesy review comments on the draft DCP BA to DWR.
- May 15, 2024: The Corps requested formal consultation and conference for the effects associated with the PA and submitted the 2024 BA.
- June 14, 2024: The Service responded to the Corps' May 15, 2024, letter with a request to discuss a mutually agreeable extension of the consultation period with the Corps and DWR in order allow for the framework for the DCP operations be completed under the LTO BiOp first where operations can be referred to in this consultation on the construction of DCP.
- November 8, 2024: The Service issued the LTO BiOp to Reclamation (Service File No. 08FBDT00-2022-0059509).

- November 14, 2024: In response to the Service's June 14 request to discuss a mutually agreeable extension of the consultation period, the Corps sent a letter determining an extension of the consultation period is now warranted and requested a draft biological opinion by March 2, 2025. Subsequent meetings in December 2024 and January 2025 occurred regarding schedule for sufficiency review.
- February 25, 2025: The Service transmitted comments to the Corps and requested additional clarifying and additional information based on the sufficiency review of the BA.
- March 28, 2025: DWR provided responses to the Service's February 25, 2025, letter in a spreadsheet tracker.
- April 11, 2025: DWR provided supplemental material in response to sufficiency review requests and discussions.
- May 21, 2025: DWR provided updated responses to the Service's February 25, 2025, letter in a sufficiency review tracker spreadsheet.
- June 10, 2025: DWR and the Corps provided updated responses to the Service's February 25, 2025, letter in a spreadsheet tracker.
- August 5, 2025: In a meeting, the Service agreed the outstanding issues were addressed and requested a final revised BA and initiation letter.
- August 22, 2025: The Service received the Corps' revised request for consultation and August 2025 BA.
- January 14, 2026: The Service provided a draft biological opinion with cover letter to the Corps for review.
- January 23, 2026: The Corps and DWR provided edits and comments on the draft biological opinion.
- January 30, 2026: The Service provided responses to comments and edits within the draft biological opinion.
- February 2, 2026: The Corps responded to the Service stating they had completed review and had no further comments on the draft biological opinion. DWR responded to the Service stating they have a few outstanding items to discuss at the next meeting.
- February 3, 2026: The Service, Corps, and DWR met to discuss DWR's outstanding items.
- February 12, 2026: DWR provided additional information, comments, and suggested edits on the draft biological opinion.
- February 24, 2026: The Service responded to DWR's February 12, 2026, email.
- March 3, 2026: The Service, Corps, and DWR met to discuss DWR's outstanding item.
- March 4, 2026: DWR provided suggested edits to resolve their outstanding item per the March 3, 2026, meeting. The Corps and Service responded accepting the suggested edits.

5. CONSULTATION APPROACH

Endangered Species Act regulations require that all effects of the action including "all consequences to listed species or critical habitat that are caused by the PA, including the consequences of other activities that are caused by the PA but that are not part of the action" (50 CFR 402.02) are addressed in consultation. After reviewing the action as proposed by the Corps, the Service has determined that the PA presents a mixed programmatic action, as defined in 50 CFR 402.02. The Service's consultation includes a mix of standard consultation and refers to the

programmatic framework in the 2024 LTO BiOp. The 2024 LTO BiOp stated that the Corps would initiate a subsequent section 7 consultation for the construction of DCP. Actions related to DCP operations were addressed under a framework programmatic approach in the 2024 LTO BiOp and will not be addressed in this consultation. Those activities under the framework programmatic approach will be subject to a subsequent consultation in order to proceed.

The BA contains various levels of detail regarding facility and construction components and the effects on listed and proposed species and their habitats. Some PA elements and their effects may change as the Corps and DWR continue to develop the PA and may require reinitiation. Additionally, reinitiation of this consultation may be required when additional information becomes available for any PA elements that lack the necessary specificity at this time but do not require future Federal approvals. This approach is consistent with the requirement for the Action Agency to reinitiate consultation under certain circumstances. 50 CFR 402.16 outlines the circumstances that require reinitiation of consultation, which apply to the PA. Refer to the *Reinitiation - Closing Statement* for additional specific conditions under which consultation will need to be reinitiated.

5.1 Defining Consultation Types

The following consultation types were used for accounting how elements of the DCP are binned and referred to throughout this BiOp (Table 5-0-1) as noted in BA Table 1.7-1, Table 1.7-2, and Table 1.7-3.

5.1.1 Standard Consultation

For standard consultation activities, there is enough information available in the BA or elsewhere to address the specific effects without the need for subsequent or tiered consultations in the future. These activities do not require future Federal approvals and could be implemented at any point after the Federal action occurs. These activities pertain to the construction of the DCP and include pre-construction investigations, construction, maintenance during construction, and mitigation for terrestrial construction impacts.

5.1.2 LTO Programmatic Consultation

For framework programmatic actions, an ITS is not required at the program (framework) level for those actions falling within the definition of framework programmatic action (50 CFR 402.02). Framework programmatic actions establish a framework for the development of future actions that are authorized, funded, or carried out at a later time, and any take of a listed species would not occur unless and until those future actions are authorized, funded or carried out and subject to further section 7 consultation.

Future long-term operations of the DCP were addressed programmatically in the 2024 LTO BiOp, which include: (1) north Delta intake diversions, including resulting operating criteria and diversion criteria; (2) integration of the north Delta Intakes with the existing SWP south Delta intakes; (3) continued SWP coordination with CVP through the Coordinated Operations Agreement; (4) adaptive management and monitoring; and (5) conservation measures including compensatory mitigation. The LTO Effects Tracking Table provides additional detail regarding the 2024 LTO BiOp consultation approach and can be found in that document's Appendix 1 of

the 2024 LTO BiOp. In their 2024 LTO proposed action, Reclamation committed to initiating future consultations to address the near-field and far-field effects of operations of the DCP and at that time, would provide sufficient information to support the site-specific analysis of operations. More information, including the proposed framework for DCP, can also be found in Appendix 2 of the 2024 LTO BiOp. The Service anticipates the subsequent consultations will be initiated by Reclamation or where subject to Corps jurisdiction, the Corps could be the Federal agency with sufficient information provided as outlined in 50 CFR 402.12(f) and those components will not be addressed in this consultation.

Operations, maintenance, long-term aquatic studies, and adaptive management of the DCP will be fully analyzed in a subsequent consultation per the 2024 LTO BiOp framework but were included to a degree in the BA and appendices.

Near-term baseline studies are generally described in BA Appendix 5B with additional studies described in California Department of Fish and Wildlife's (CDFW) Incidental Take Permit. The general description of these studies appears to utilize existing monitoring studies/surveys or are augmentations of existing monitoring studies/surveys and are considered in the Environmental Baseline.

Table 5-0-1. Components of the Mixed Programmatic Approach

Activity	DCP Standard Consultation	No Effect or Environmental Baseline	LTO Framework Programmatic Consultation	Federal Action Agency
Preconstruction (field investigations)	X			Corps
Construction (north Delta intakes, tunnels, tunnel shaft sites, RTM sites, Bethany Complex, access roads, electrical facilities, SCADA facilities, fencing and lighting, park-and-ride lots, land reclamation, Contra Costa Water District settlement related facilities, and other construction support facilities)	X			Corps
Construction monitoring and on-site, post-construction mitigation and restoration under the PA	X			Corps
Maintenance activities anticipated to occur during the construction phase of the PA	X			Corps
Creation and enhancement at initial mitigation sites Bouldin Island and the Interstate 5 ponds and post-construction activities	X			Corps
New near-term baseline studies		X		Multiple *
Project operations: Real-time operational decision making and				Reclamation

Activity	DCP Standard Consultation	No Effect or Environmental Baseline	LTO Framework Programmatic Consultation	Federal Action Agency
adaptive management related to new facilities constructed under the PA			X	
Tidal restoration and channel margin enhancement mitigation sites: monitoring, mitigation, and restoration associated with construction and operations of new facilities developed under the PA			X	Reclamation/ Corps*
Long-term studies and monitoring associated with construction, mitigation, and operations activities			X	Reclamation/ Corps*
Maintenance activities anticipated to occur post-construction, during the operations phase of the PA			X	Reclamation/ Corps*

* Where subject to Corps jurisdiction, the Corps could be the Federal Action Agency

6. DESCRIPTION OF THE PROPOSED ACTION

This section summarizes the description of the DCP from the BA, including routine maintenance activities and long-term operational elements of the DCP by reference. In the 2024 LTO BiOp, Reclamation committed to initiating subsequent consultations to address the near-field and far-field effects of operations and mitigation of the DCP and at that time, would provide sufficient information to support the site-specific analysis of operations. Those elements included by reference are part of the BA but will be subject to subsequent consultations and will not be included in Section 12. Effects of the Proposed Action and the Incidental Take Statement of this document. Please refer to the BA for further details.

6.1 Summary of the Proposed Action

The DCP involves the construction and operation of new SWP water conveyance facilities in the Delta. However, the Corps PA involves the construction (not operation) and routine maintenance of Intakes B and C to convey up to a total of 6,000 cfs of water from the north Delta. From Intakes B and C, the alignment of the tunnel conveying water would then follow a route to Twin Cities Complex double launch shaft, New Hope Tract maintenance shaft, Canal Ranch Tract maintenance shaft, Terminous Tract reception shaft, King Island maintenance shaft, tunnel under Rindge Tract, Lower Roberts Island double launch shaft, Upper Jones Tract maintenance shaft, tunnel under Lower Jones Tract, tunnel under Victoria Island, Union Island maintenance shaft, tunnel under Coney Island, and Clifton Court Tract to the Bethany Complex's Surge Basin reception shaft. See Figures 7-1 and 7-2 in the *Description of the Action Area* section for the general footprint of the PA.

The PA includes constructing a new Bethany Reservoir Pumping Plant and Surge Basin located to the south of Clifton Court Forebay, and a new Bethany Reservoir Aqueduct that conveys

flows to a new Bethany Reservoir Discharge Structure on the shore of Bethany Reservoir. The aqueduct would consist of four pipelines including tunneled segments under the existing CVP C. W. “Bill” Jones Pumping Plant (Jones Pumping Plant) discharge pipelines and existing conservation easements adjacent to Bethany Reservoir. Collectively, these facilities are called the Bethany Complex.

The tunnel from the intakes to the Bethany Complex would have an inside diameter of 36 feet and outside diameter of 39 feet and extend approximately 45 miles from the intakes to the surge basin at the Bethany Reservoir Pumping Plant. The Twin Cities double shaft is used to bore one tunnel north to the intake shafts and one south to the Terminous Tract reception shaft. Lower Roberts Island would have a double launch shaft, which would allow one tunnel boring machine (TBM) to bore north to the Terminous Tract reception shaft and one to bore south toward the final reception shaft at the Bethany Reservoir Surge Basin. New shaft pads would be constructed of soil excavated from either the shaft site or nearby shaft sites. As examples, excess soil from excavation at the Twin Cities Complex would provide soil for the Twin Cities tunnel launch shaft pad and shaft pads at New Hope Tract, Canal Ranch Tract, Terminous Tract, and King Island. Similarly, soil from Lower Roberts Island would be used to construct Upper Jones Tract and Union Island shaft pads.

Delivery of tunnel segments, TBM machinery, other soil materials, and equipment would be by road. Rail would also be used to deliver tunnel segments to the Lower Roberts Island tunnel launch shaft site. For example, all deliveries to the Twin Cities Complex would be by road. Access roads would be modified to accommodate large construction vehicles.

The double launch shaft at Lower Roberts Island would require a shaft site to accommodate a double launch shaft with a figure eight configuration, reusable tunnel material (RTM) storage area, and corresponding access roads. Material excavated on-site would be used to construct the shaft pad. The RTM site would also house a rail-served materials depot. Rail access to Lower Roberts Island would be provided from existing Union Pacific Railroad or Burlington Northern and Santa Fe Railway tracks located on the Port of Stockton. Rail lines would be extended from one of the existing rail facilities in the Port of Stockton. Rail access would be extended over a new bridge over Burns Cutoff and continue to the tunnel segment storage area near the RTM storage area.

Construction would also include interconnection facilities for Contra Costa Water District (CCWD). The facilities would consist of an interconnection pump station with water intake from the Union Island maintenance shaft on the main tunnel, and a new 1.6-mile conveyance pipeline that would extend from the pump station and connect to the existing CCWD Victoria Island Pipeline just downstream of the CCWD’s existing Middle River Intake and Pumping Plant. The interconnection pipeline would be installed in a trench with open cut and cover construction along existing roadways and within agricultural fields. The pipeline construction easement would be 100 feet wide for the entire length of the trench, including a 30-foot temporary construction easement around the 70-foot permanent easement. Dewatering may occur along the open trench, with flows collected, treated, and reused on-site. The portion of the interconnection pipeline that crosses Victoria Canal would be microtunneled.

Launch and retrieval pits, approximately 35 feet wide by 50 feet long, would be placed within the 100-foot open trench construction easement on Union Island and Victoria Island to launch and receive microtunneling equipment. A permanent 70-foot wide easement would be maintained along the length of the pipeline in Union Island and Victoria Island. Air valves, blow offs, and access manways would be placed along the pipeline within the permanent easement. Pumped flow from the new Interconnection Pump Station would convey raw water from the Union Island shaft to CCWD's existing Transfer Pumping Station through the new conveyance pipeline and subsequently though CCWD's existing Victoria Island and Old River Pipelines. During periods when CCWD's existing Middle River and Old River Pumping Plants are in simultaneous operation with the Interconnection Pump Station, a maximum combined pumped flow of up to 250 cfs could be conveyed through the Victoria Island Pipeline and a maximum combined flow of up to 320 cfs could be conveyed through the Old River Pipeline.

Compensatory mitigation for construction of the DCP is proposed as restoration and enhancement on Bouldin Island and DWR's I-5 Ponds, credits from approved conservation banks, and site protection instruments. Future to-be-determined tidal restoration and channel margin enhancement mitigation is proposed for DCP construction and operational effects to listed fish per the 2024 LTO BiOp. As mentioned above, operational effects will not be analyzed in this specific consultation.

6.2 Conveyance Facility Construction

6.2.1 Field Investigations

Field investigations refer to data collection efforts to inform more detailed design and construction methods. Field investigations will occur during the preconstruction and construction periods and are related to geotechnical, hydrogeologic, agronomic testing, and construction test projects (geotechnical investigations). Geotechnical investigations and the installation of monitoring equipment would begin following completion of all required permits. These activities and installations are expected to be completed within approximately 2 years depending on availability of access to the project sites. Groundwater and other monitoring activities would be performed prior, during, and after intake construction completion and the tunneled undercrossing of the Stockton Deep Water Ship Channel.

Boat operations for geotechnical investigations would likely be conducted from a shallow-draft barge or ship, outfitted with the necessary equipment for the tasks. There would be two barge trips for the test-pile program (i.e., to and from a single intake site), two to six barge trips for the geotechnical investigations at the intakes (i.e., to and from each intake site), and up to 20 barge trips for the geotechnical investigations at bridges and tunnel crossings (i.e., to and from 10 sites).

6.2.1.1 Investigations to Support Section 408 Permitting

Soil Boring and Cone Penetration Tests

Soil borings and cone penetration tests (CPTs) would be conducted within the construction boundaries at the intakes and within the Stockton Deep Water Ship Channel and adjacent non-project levees at the location of the proposed tunnel undercrossing. Drilling techniques would generate an approximately 4- to 8-inch-diameter boring. For CPTs, a cone-tipped rod with a

diameter of 1 to 2 inches would be pushed through the ground. All CPT holes would be filled with grout following completion and prior to abandonment, and all soil borings not planned to function as a groundwater monitoring well would be completely grouted following boring. Groundwater monitoring wells would be constructed with casings, in accordance with state and local laws.

Groundwater Testing and Monitoring

At each intake, one 12-inch-diameter steel-cased test well would be installed in a 24-inch-diameter borehole to conduct pumping tests. It is also assumed that vibrating wire piezometers would be installed in several levee borings, and 4-inch groundwater monitoring wells would be installed in several site borings at each intake to permit measurements of groundwater head, monitoring of groundwater elevations during the pumping tests, and the collection of water quality samples at the intake locations. At each intake, a surface water gauge would be installed to track the elevation of the adjacent river for use in analysis of the results.

Pumping tests would be conducted in the test wells. Water levels before, during, and following the various tests would be monitored using automated data loggers, which would also record barometric pressure and the level of the river. It is assumed that the groundwater monitoring program would be conducted partially using remotely monitored instrumentation and partially by on-site personnel.

6.2.1.2 Investigations Prior to Construction Phase

Explorations would occur at the intakes, tunnel shafts, tunnel alignments, power lines, access roads and bridges, railroads, levees, and at the terminal facilities.

Soil Boring and Cone Penetration Tests

Land-based soil borings, overwater soil borings, and CPTs would be conducted within the construction boundaries of the intakes, tunnel shafts, tunnel alignments, power lines, access roads and bridges, railroads, and levees. Tests would be conducted at the Bethany Reservoir Pumping Plant and Surge Basin, Bethany Reservoir Aqueducts, and the Bethany Reservoir Discharge Structure.

Bethany Fault Study

Electrical resistivity tomography (ERT) would be used to characterize subsurface soil characteristics above the Bethany Reservoir Aqueduct tunnels. ERT involves “a linear array of removable small steel electrodes (approximately 0.5 inch in diameter by 8 inches long) driven into the ground approximately every 10 feet over several hundred feet to induce a low current in the ground, while a small readout unit provides the measurements” (California Department of Water Resources 2020b:17 as cited in the BA).

Groundwater Testing and Monitoring

A test well for pumping tests would be installed at each tunnel shaft and at each intake. At each intake, a surface water gauge would be installed to track the elevation of the adjacent river for use in analysis of the results. For the tunnel alignment, it is assumed that vibrating wire piezometers would be installed in boreholes drilled along the tunnel alignment at a frequency of on average every third borehole, or approximately every 3,000 feet. Two test wells would be installed at the Bethany Reservoir Pumping Plant and Surge Basin, and at each of the two planned tunneled sections of the Bethany Reservoir Aqueduct.

Pumping tests would be conducted in the test wells. Water levels before, during, and following the various tests would be monitored using automated data loggers, which would also record barometric pressure and the level of the river. The groundwater monitoring program would be implemented to determine the seasonal variations in groundwater elevations, the constituents of the groundwater (including the nature and presence of dissolved gas), and the interrelation between groundwater and surface water levels for several years before construction. It is assumed that management of the groundwater monitoring program would be conducted partially using remotely monitored instrumentation and partially by on-site personnel.

Test Trenches

Test trenches approximately 30 feet long, 3 feet wide, and 10 feet deep would be implemented at all the facilities to confirm near-surface soils and to investigate potential buried magnetic anomalies. Trenches would be immediately backfilled following observations of the soil conditions encountered in the trench.

Monument Installation

Metal survey monuments would be installed at all construction sites and approximately every mile along the tunnel alignments to allow the remote monitoring of surface elevations prior to the start of construction, during construction, and during operations. Monuments would be approximately 10 feet by 10 feet base and 3 feet high to be of adequate size to be visible from satellite-based Interferometric Synthetic Aperture Radar used for remote monitoring. Concrete foundations would be installed for the monuments and the monuments would be left in place for the duration of construction. It is assumed that periodic monitoring of survey monuments would be conducted by security and on-site personnel.

Geotechnical Pilot Studies for Settlement

Site-specific pilot studies would be conducted to test the geotechnical response to placement of fill at tunnel shaft sites, especially at Delta islands. Pilot studies are proposed at New Hope Tract, Canal Ranch Tract, Terminous Tract, King Island, Lower Roberts Island, Upper Jones Tract, and Union Island.

Test fills would be within the construction boundaries of the project and, where feasible, within or adjacent to the shaft pad sites. The test fills would be approximately 10 feet high and roughly

1,000 square feet in base area. The material would be purchased from a commercial enterprise that provides soil. The studies would include the installation of inclinometers, piezometers, and borehole extensometers within soil borings, as well as settlement plates buried within the fill, to verify estimates of consolidation and lateral spreading of pad fills in peat and soft soils.

Additional soil borings and CPTs would be completed within and adjacent to the test fill areas prior to their placement. Inclinometers and extensometers would be installed in holes drilled within and adjacent to the test fills. It is assumed that management of the pilot studies would be conducted by on-site personnel.

Validation of Ground Improvement Methods

Ground improvement would likely consist of a combination of excavation of unsuitable soils and replacement with compacted suitable fill material, surcharging to induce consolidation before final construction, and in situ techniques such as deep mechanical mixing (DMM) method to mix amendments (such as cement) into the foundation to add strength and resistance to liquefaction, including the installation of a grid of DMM soil shear walls with cement under the footprints of large structures. Final site-specific methods would be determined through geotechnical investigations and test installations, especially on land with substantial deposits of peat and loose or soft soils. These investigations would include trial mix and DMM construction programs to confirm appropriate area and volume replacement ratios, desired cement content, and testing to confirm in situ strength and lateral extent. These activities are proposed at New Hope Tract, Canal Ranch Tract, Terminous Tract, King Island, Lower Roberts Island, Upper Jones Tract, and Union Island.

Pile Installation Methods at the Intake Location

The intake locations would include the construction of in-river cofferdams. These cofferdams would be in place for up to 5.5 years (Figure 3.5-12. Construction Schedule of the BA). The cofferdams would employ the use of interlocking steel sheet piles. Pilot studies would be conducted to test pile installation and possible acoustic mitigation measures in the river at one intake site along the Sacramento River. The studies would include use of equipment to monitor vibrations in air and water and noise while test driving a variety of pile types using vibratory and driving methods to validate rates and penetration depths. Noise associated with vibratory pile driving is considerably lower than noise associated with impact hammer pile driving. Additionally, CPTs would be performed in the river from a barge to determine the in situ density of the soils prior to, during, and after test pile installation.

Vibratory Testing of Dynamic Properties

Vibratory testing of dynamic properties of peat would be conducted in the Delta for validation of peat soil response during earthquakes. This would include continuation of previous studies in the Delta, including those on Sherman Island (Reinert *et al.* 2014 as cited in the BA), or additional peat studies at up to two sites at Lower Roberts Island, Upper Jones Tract, or Union Island.

Location of Buried Groundwater and Natural Gas Wells

A field test program would be used to evaluate the suitability of various geophysical techniques to detect buried and abandoned wells. To identify and/or confirm the location of well casings, including wells that have not been identified in the published database, the use of wide-area airborne methods (drone, helicopter, and/or fixed-wing aircraft) to conduct magnetic surveys followed by more site-specific walk- or tow-over ground-based magnetic surveys is assumed. These surveys would be conducted at intake and tunnel shaft locations, along tunnel alignments, and at the Bethany Complex to identify buried groundwater and natural gas and oil wells. Surface geophysical surveys would also be used at these locations. The locations of identified wells would be evaluated to determine methods to abandon, relocate, or avoid the wells.

West Tracy Fault Studies

Up to six test trenches (up to approximately 1,000 feet long, 3 feet wide, and 20 feet deep) would be excavated along a line running from the southeast of Byron to the southeast of Clifton Court Forebay to further investigate the nature and location of the West Tracy Fault between the town of Byron and the area southeast of the forebay. The trenches would remain open for up to 6 weeks, depending on the findings, and would be backfilled completely upon the completion of observation of soil conditions within the trench.

In addition to the test trenches, two arrays of surface geophysical surveys would be completed before, and along the alignment of, the excavation of the test trenches. Geophysical surveys would consist of noninvasive techniques that could be used to provide information on subsurface geologic conditions and anomalies, such as buried casings or abandoned wells. Seismic refraction/reflection techniques would be used at each of the two linear sites, referred to as geophysical arrays.

CPTs and soil borings would also be conducted. Select soil samples from the test borings would be subjected to age-dating laboratory testing.

Agronomic Testing

If field investigations described above indicate it is warranted, additional agronomic testing would be conducted. Agronomic testing would include investigations and testing of compacted soil rehabilitation methods and rehabilitation treatments for establishing agricultural crop or native grass species. Agronomic testing would validate the reuse assumptions prior to reclamation of disturbed areas based on representative samples and likely tunneling conditioners. This pilot-scale testing would be used to refine program-level approaches and strategies for RTM stockpiling and reuse.

Utility Potholing

Utility potholing, utilizing either a vacuum excavator or a backhoe, would be conducted to confirm locations of existing utilities such as public and residential utilities, surface water diversions, and agricultural drainage features. Utility potholing would be conducted at locations

near the intakes, underground supervisory control and data acquisition (SCADA) and power corridors, road and bridge modifications including intersections, tunnel shaft sites, and along the tunnel alignment. Utility potholing would also be conducted at Union Island, Bethany Reservoir Pumping Plant and Surge Basin, the Bethany Reservoir Aqueduct, the Bethany Reservoir Discharge Structure, the raw water feed from Skinner Fish Facility, and at new road and road widening locations. The investigations would be conducted within the construction footprint. The investigations would include vacuum or backhoe excavations, followed by noninvasive surface field surveys. Some features would not require utility potholing and would be located using only noninvasive surface field surveys.

6.2.1.3 Investigations during Construction Phase

These activities are primarily related to the installation of monitoring equipment, such as inclinometers, confirmatory sampling for areas of ground improvement, and investigations related to evaluation of changes in anticipated conditions or alternative contractor means and methods.

Soil Boring and Cone Penetration Tests

Soil boring and CPT investigations during construction would occur in the same locations as described in Section 6.2.1.2, Investigations Prior to Construction Phase, under Investigation at Facility Locations. These geotechnical investigations would generally be conducted within the first 2 years of the construction period, including during the period when ground improvement activities would be conducted, although they could extend throughout the duration of construction and commissioning to account for delayed starts and to resolve disputes. These investigations could be conducted at any location within the construction boundaries and would also be used to confirm the suitability of construction means and methods planned by the contractor.

6.2.1.4 Construction Monitoring

Monitoring for Ground Movement during Construction

Inclinometers and extensometers would be installed in vertical borings along levees at the intakes, along the tunnel alignment and at tunnel shafts. They would also be installed at King Island, Lower Roberts Island, Upper Jones Tract, and Union Island; and along levees near bridge improvements along Hood-Franklin Road over Snodgrass Slough, the access road to Lower Roberts Island over Burns Cutoff and Turner Cut, and at Bethany Complex.

No instrumentation is assumed at the new levees, while inclinometers are planned at 1000-foot centers along areas of levee improvements. Tilt meters, settlement plates, and survey monuments would be installed at all construction sites and approximately every mile along the tunnel alignment.

Groundwater Monitoring

Groundwater monitoring wells installed before construction could continue to be used during and following construction. Additional groundwater monitoring wells would be installed during construction if permanent easements or land ownership were not acquired before construction, or if initial monitoring results indicated the need for more detailed information related to groundwater elevation or water quality. It is anticipated that the groundwater monitoring locations would be located at the intakes, tunnel shafts, and access roads. Monitors would also be located at Bethany Complex. Monitoring wells would be located at approximately every 2 miles along the tunnel alignment between shafts. It is assumed that management of the groundwater monitoring program would be conducted partially using remotely monitored instrumentation and partially by on-site personnel.

Location of Buried Groundwater and Natural Gas Wells

Land surveys, drilling, and trenching would be used at all intake and tunnel shaft locations, along tunnel alignments, and at the Bethany Complex to identify and abandon buried groundwater and natural gas and oil wells before and during construction.

6.2.2 North Delta Intakes

New intakes on the Sacramento River in the north Delta would be constructed (Table 6.2-0-1). The two intakes (alone or in combination) on the east bank of the Sacramento River would divert water and convey it through a single main tunnel. Intake B would be just north of Hood, and Intake C would be between Hood and Courtland. Intakes would include state-of-the-art cylindrical tee fish screens, intake structures, sedimentation basins, sediment drying lagoons, flow control structures, intake outlet channel and intake outlet shaft, embankments, and other appurtenant structures. Intakes would also include associated facilities to support construction and operations of the intakes. During construction, the intake footprints would contain areas for standby engine generators, staging and management of construction equipment and materials, and ground improvement and slurry cutoff wall material preparation areas. Standby engine generators would be permanently installed at the intakes. Construction access to the intake sites would be by means of new access/haul roads and barge/tugboat. Intake construction will also include dredging, installation of log booms, and riprap placement. Permanent intake footprints when construction is complete would be smaller once certain construction-related features are removed.

Table 6.2-0-1. Summary of Intake Characteristics

Feature	Intake B	Intake C
Maximum capacity (cubic feet per second)	3,000	3,000
Total size of construction site (up to)	242 acres	239 acres
Total size of postconstruction site (up to)	123 acres	109 acres

Feature	Intake B	Intake C
Intake structure length	1,574 feet along river including training walls 964 feet along river for concrete structure only	1,528 feet along river including training walls 964 feet along river for concrete structure only
Cylindrical tee screen assembly	30 fish screen units	30 fish screen units
Area of cylindrical tee screen (including fish screen and manifold assembly, and mounted on the face of the structure)	Each unit: 8 feet in diameter and 30 feet long	Each unit: 8 feet in diameter and 30 feet long
Sedimentation basin dimensions (basin would be divided into two cells by a turbidity curtain)	Each cell = 1,300 feet long and 650 feet wide at top of the embankment Each cell = 990 feet long and 500 feet wide at bottom of the embankment Water surface elevation would vary from about 3 to 27 feet	Each cell = 1,300 feet long and 645 feet wide at top of the embankment Each cell: = 990 feet long and 495 feet wide at bottom of the embankment Water surface elevation would vary from about 3 to 26 feet
Sediment basin radial gate flow control structure at the junction with the outlet structure and intake outlet shaft	Four large radial gates: 30 feet wide and 40 feet tall, each One small radial gate: 15 feet wide and 8 feet tall Top elevation of flow control structure = 30.3 feet Bottom elevation of flow control structure = - 8.8 feet	Four large radial gates: 30 feet wide and 40 feet tall, each One small radial gate: 15 feet wide and 8 feet tall Top elevation of flow control structure = 29.3 feet Bottom elevation of flow control structure = - 9 feet
Sediment drying lagoons dimensions (four sediment drying lagoons at each intake)	Each approximately 146 feet wide and 350 feet long at the bottom of the embankment Each approximately 15 to 18 feet deep, containing an average of 10 to 12 feet of water when in use	Each approximately 146 feet wide and 350 feet long at the bottom of the embankment Each approximately 15 to 18 feet deep, containing an average of 10 to 12 feet of water when in use
Sediment drying lagoons outlet structure (to convey water from the lagoons to a pump to return any water to the sediment basin)	Each lagoon outlet structure = approximately 15 feet wide by 15 feet tall Top elevation at the top of lagoon embankment Bottom elevation 20 to 25 feet below top elevation	Each lagoon outlet structure = approximately 15 feet wide by 15 feet tall Top elevation at the top of lagoon embankment Bottom elevation 20 to 25 feet below top elevation
Intake outlet channel from flow control structure to intake outlet shaft	Bottom and inside of embankment: 750 feet long and 146 feet wide	Bottom and inside of embankment: 750 feet long and 146 feet wide
Length of temporary State Route 160 levee	4,250 feet along the centerline	4,200 feet along the centerline
Length of permanent levee	7,600 feet along the centerline	6,200 feet along the centerline
Top elevation of permanent levee	30.3 feet (20 to 23 feet above toe of temporary levee fill)	29.3 feet (20 to 23 feet above toe of temporary levee fill)
Ground improvement under the levees and facilities embankments	Approximately 1.5 to 2.0 million cubic yards of DMM wall sections and approximately 250,000 to 350,000 tons of cement	Approximately 1.5 to 2.0 million cubic yards of DMM wall sections and approximately 250,000 to 350,000 tons of cement

Feature	Intake B	Intake C
Cofferdam	Length = 2,942 feet (including sheet piles and DMM wall) Elevation at the top of cofferdam = about 25 feet	Length = 2,897 feet (including sheet piles and DMM wall) Elevation at the top of cofferdam = about 25 feet
Cofferdam impact pile driving duration (total hours) (vibratory pile driving hours not included)	15	14
Onsite electrical substations facilities footprint	Facilities contained within a 75-foot-wide by 125-foot-long enclosure with a separate safety and security fence Smaller transformers less than 10 feet wide by 10 feet long would be positioned at several locations around the site	Facilities contained within a 75-foot-wide by 125-foot-long enclosure with a separate safety and security fence Smaller transformers less than 10 feet wide by 10 feet long would be positioned at several locations around the site
Standby engine generator/fuel tank—during construction and operation phases	1 megawatt standby engine generator with a 1528 horsepower engine, installed inside a fenced area of about 30 feet by 30 feet at each electrical building, including both the generator and the fuel tank	1 megawatt standby engine generator with a 1528 horsepower engine, installed inside a fenced area of about 30 feet by 30 feet at each electrical building, including both the generator and the fuel tank
Appurtenant Structures Dimensions—during Construction Phase	Office trailers, showers/ washrooms, canteen and common area, and bus shelter Most of these buildings would be 15-feet tall or less (one story) Other buildings for warehousing for materials and temporary work enclosures would be less than 20 feet tall	Office trailers, showers/ washrooms, canteen and common area, and bus shelter Most of these buildings would be 15-feet tall or less (one story) Other buildings for warehousing for materials and temporary work enclosures would be less than 20 feet tall
Appurtenant structures dimensions—during operations phase	One of the construction buildings would be converted for indoor storage of portable equipment and vehicles used for maintenance of all intakes.	One of the construction buildings would be converted for indoor storage of portable equipment and vehicles used for maintenance of all intakes.
Land reclamation	Approximately 119 acres	Approximately 130 acres

6.2.2.1 Cylindrical Tee Fish Screens

The intake fish screens are part of an overall intake system that includes the screen units and an integrated screen cleaning system, piping, and flow control features. The "tee-shaped" screen units would consist of two fish screen cylinders installed on either side of a center manifold that would be connected to the facility's intake opening. Each intake fish screen would extend about 12 feet from the vertical face of the intake structure into the river. During diversion operations, water would flow from the Sacramento River through the fish screens into a 60-inch-diameter pipe and discharge into the sedimentation basins. Control gates would regulate the flow through each screen unit to the sedimentation basin.

Installing the intake facility would require construction of a temporary cofferdam for in-river portions of intake construction to divert water and aquatic organisms around the work site and

create a dry work area. Portions of the cofferdam would consist of interlocking steel sheet piles installed using a combination of vibratory and impact pile driving. Vibratory pile driving is a method by which the pile is vibrated into the soil beneath the site as opposed to being hammered in, as occurs in impact pile driving. Noise associated with vibratory pile driving is considerably lower than noise associated with impact hammer pile driving. To minimize disturbances from pile driving, vibratory pile driving would be used to the extent possible (where supported by additional geotechnical information). All pile driving would occur between 7:00 a.m. and 7:00 p.m. and would not occur outside of this timeframe. It is estimated that the longest installation period (at Intake C) would be no more than 255 hours over a 5- or 6- week period, including time for handling and preliminary vibratory pile driving. Assuming 2 minutes of driving time for each sheet pile pair, impact drive time would range from a total of 14 hours at Intake C with 3,000-cfs capacity, occurring over roughly 5 or 6 weeks. Each intake sheet pile construction period would be staggered by about 1 year.

6.2.2.2 Sediment Basins and Drying Lagoon

Diverted water would contain sediment suspended in the river water, a portion of which would be collected in a sedimentation basin. Each intake would have one sedimentation basin divided into two cells by a turbidity curtain. Water would flow from the intake through the sedimentation basin and through a flow control structure with radial gates into the outlet channel and shaft structure that would be connected to the tunnel system. Each intake would have four concrete-lined sediment drying lagoons, each approximately 15 feet deep, containing an average of 10 to 12 feet of water within its embankments when in use.

6.2.2.3 Temporary and Permanent Flood Control Levees and State Route 160

Constructing the intakes along the riverbank would require relocating the Federal project levee and State Route (SR) 160 prior to building the intake structure and fish screens. The Federal ("jurisdictional" or "project") levee was constructed as part of the Sacramento River Flood Control Project Levee Program established by the Corps to provide flood management for surrounding lands. Altering a jurisdictional levee requires approval by the Corps and the Central Valley Flood Protection Board prior to undertaking any modifications and requires that conformance with flood control criteria be maintained continuously during construction of any modifications. A temporary jurisdictional levee would be built at the intake sites east of the existing levee to reroute SR 160 (California Department of Transportation [Caltrans] jurisdiction) and maintain continuous flood protection during construction of the new intake facilities.

The temporary levee would also facilitate construction sequencing of the permanent jurisdictional levee around the perimeter of the intake shaft and sedimentation basin. The level of flood control afforded by the existing levee would be maintained during and after construction.

Between the temporary jurisdictional levee and the Sacramento River, a cofferdam would be constructed along the water side of the Sacramento riverbank adjacent to the existing SR 160 to provide a dry workspace for intake structure construction. Following construction of the intake structure and the permanent levee system on the land side of the temporary levee, the area to the east of the intake structure would be backfilled and SR 160 would be relocated on top of the

backfill along the Sacramento River. The intake structure and the temporary and permanent levees, including the sedimentation basin, radial gate structure, and intake outlet channel embankments would be designed to protect the site and surrounding area from the 200-year flood event with climate change and sea level rise in the Sacramento River as defined in the Preliminary Flood Water Surface Elevations memorandum (DWR 2020a as cited in the BA). The final configuration of the levee embankment around the intake outlet channel and shaft would protect the channel and shaft opening from the 200-year peak flood elevations plus extreme sea level rise assumed for the year 2100 and 3 feet of freeboard during operations.

On-Site Roads at the Intakes

Permanent paved roads and gravel-surfaced roads and work areas would be constructed at intakes for use during construction and later operations. At Intake B, approximately 8,900 feet of 20-foot-wide paved permanent roads would be installed on the intake site toward the end of construction. Several 24-foot-wide paved internal roads would be constructed around the base of the intake outlet shaft area, along the top of the embankments, and on ramps up the side of the embankments. About 6,500 feet of 20-foot-wide gravel roads with chip seal would be constructed around the sediment drying lagoons, along the length of the sedimentation basin parallel to SR 160, and to provide access along the sediment loading areas. All construction access and the primary maintenance access to the intake site would be from the intake access road.

Intake C would also have approximately 6,500 feet of 20-foot-wide gravel roads with chip seal around the same facilities as at Intake B. About 8,300 feet of paved permanent roads would be installed at Intake C near the end of construction, along with 24-foot paved internal access roads around the base of the intake outlet shaft area, along the top of the embankments, and on ramps up the side of the embankments. All construction access and the primary maintenance access to the intake site would be from the intake access road.

6.2.3 Tunnels

The tunnel from the intakes to the Bethany Complex would have an inside diameter of 36 feet and outside diameter of 39 feet and extend 45 miles from the intakes to the surge basin at the Bethany Reservoir Pumping Plant. The bottom elevations of the tunnel from the intakes to the tunnel reception shaft at the Bethany Complex Surge Basin would range from -139 feet to -164 feet (North American Vertical Datum of 1988 [NAVD88]), with a top elevation near sea level.

6.2.4 Tunnel Shafts

TBMs would be used to bore the tunnels. Tunnel shafts to launch, remove, and/or maintain the TBMs would be constructed at intakes, along the alignment, and at the Bethany Complex. The TBM would be lowered into a launch shaft and bore horizontally toward a reception shaft. Because the TBM cutterhead would need inspection and maintenance, maintenance shafts would be located approximately every 4 to 6 miles between launch and reception shafts to provide access for TBM maintenance, repair, access or evacuation, and logistic support in a free-air (not pressurized) environment. The northernmost intake shaft would serve as the reception shaft

during construction. During operations, shafts at intakes would serve as intake outlet shafts to convey water into the tunnel system as well as for maintenance access to the tunnel. Reception shafts would be used to remove the TBM from the tunnel at the end of each drive. All tunnel shafts would be maintained during operations to provide access, as needed.

Most shafts would require construction of a shaft pad. Tunnel shaft pads would be constructed above the ground surface to an elevation approximately equal to the adjacent levee system on the island or tract. The height of the shaft pad would be sufficient to protect the tunnel and construction personnel from localized flooding but lower than the top of the shaft postconstruction to reduce the need for imported fill. The final postconstruction shaft at the intakes would be raised above the shaft pad to an elevation above the maximum water surface in the tunnel for hydraulic surge events or the Sacramento River 200-year flood event with sea level rise and climate change hydrology for Year 2100, whichever is higher, including freeboard criteria. A concrete cover with air venting provisions would be placed over the top of the shaft. Cranes would be used to move the concrete cover and move any large equipment. A scaffold will be erected to allow personnel into and out of the tunnel during operations.

6.2.4.1 Tunnel Launch Shafts

Tunnel launch shafts would generally have a finished inside diameter ranging from 110 to 120 feet and 8-foot thick walls. Tunnel launch shaft sites would include a shaft pad for the tunnel launch shaft with adjacent areas for equipment to excavate and support the shaft, cranes, and appurtenant items to move equipment into and out of the tunnel shaft, equipment holding areas, and areas to receive and manage the excavated RTM. Tunnel launch shaft sites would also include areas for tunnel liner segment storage, aggregate storage, slurry/grout mixing plants, electrical substation and electrical building, workshops and offices, water treatment tanks, access roads, and RTM handling, drying, and storage areas. Construction activities at the launch shafts would continue for 7 to 9 years.

Double Launch Shaft at Twin Cities Complex

Construction would include the double launch shaft at the Twin Cities Complex. The double launch shaft would be constructed in a figure eight configuration with an inside diameter of 115 feet to allow TBMs to excavate in both north and south directions. This double launch shaft would be part of a larger complex that houses other construction components to facilitate tunnel excavation at this site.

The Twin Cities Complex would be off Twin Cities Road approximately 0.5 mile northeast of the interchange with Interstate (I-) 5. Its northern boundary would fall between Dierssen and Lambert Roads, its eastern boundary along Franklin Boulevard, its western boundary offset from the I-5 embankment, and a majority of the southern boundary at Twin Cities Road. During construction, the Twin Cities Complex would occupy up to 586 acres. The permanent site size would be up to 222 acres. The construction site would be surrounded by a ring levee, with height varying from about 3.5 feet to 11.5 feet, designed to protect the facilities from the 100-year flood event with the Delta-specific Public Law 84-99 equivalent standards (i.e., 1.5 feet of freeboard above the 100-year Federal Emergency Management Agency flood elevation with 2:1 [horizontal to vertical; H:V] exterior slopes and 3H:1V interior slopes).

The Twin Cities Complex during construction would contain the double launch shaft, tunnel segment storage, a grout plant, shops and offices for construction crews, parking, material laydown and erection areas, access roads, RTM conveyor and handling facilities, a water treatment plant, emergency response facilities, and a helipad. Tunnel segments, TBM machinery, and other equipment would be delivered to the Twin Cities Complex by road.

Excavated soil and RTM from the Twin Cities Complex would be used for constructing the on-site ring levee and tunnel shaft pad at the Twin Cities Complex and for constructing shaft pads on New Hope Tract, Canal Ranch Tract, Terminous Tract, and King Island.

No ground improvement would be expected for construction at the Twin Cities Complex because underlying soils appear to have low compressibility and are not anticipated to be subject to liquefaction. Any long-term RTM storage stockpile would be planted with erosion-control seed mix to stabilize the stockpile and avoid dust generation.

Double Launch Shaft at Lower Roberts Island

Construction would include a double launch shaft at Lower Roberts Island. The double launch shaft would be constructed in a figure eight configuration with an inside diameter of 115 feet to allow TBMs to excavate in both north and south directions (like the double launch shaft at Twin Cities Complex). Unlike the double launch shaft at Twin Cities Complex, Lower Roberts double launch shaft would not be part of a larger complex.

The double launch shaft at Lower Roberts Island would be located off SR 4 approximately 1.8 miles northeast of the interchange with I-5. It would make use of the existing levee roads but would also need new road developments. During construction, the double launch shaft at Lower Roberts Island would occupy up to 610 acres. The permanent site size would be up to 300 acres. The construction site would be surrounded by a ring levee, with height varying from about 3.5 feet to 11.5 feet, designed to protect the facilities from the 100-year flood event with the Delta-specific Public Law 84-99 equivalent standards (i.e., 1.5 feet of freeboard above the 100-year Federal Emergency Management Agency flood elevation with 2H:1V exterior slopes and 3H:1V interior slopes).

No ground improvement would be expected for construction at the double launch shaft at Lower Roberts Island because underlying soils appear to have low compressibility and are not anticipated to be subject to liquefaction. Any long-term RTM storage stockpile would be planted with erosion-control seed mix to stabilize the stockpile and avoid dust generation.

6.2.4.2 Reception and Maintenance Shafts

Reception and maintenance shafts would have finished inside diameters of 70 feet. Tunnel reception and maintenance shaft sites would include areas for the tunnel shaft with adjacent areas for equipment to excavate the shaft, and cranes and appurtenant items to move equipment into and out of the tunnel shaft. Reception shaft sites would be larger than maintenance shaft sites because of the area needed to disassemble the TBM equipment prior to removal from the construction site. Construction activities at the maintenance and reception shaft sites would

continue for approximately 2 years. Because they would not be used to supply tunnel segments or remove RTM, reception and maintenance shaft sites would not require areas for storing tunnel liner segments or RTM handling. Shafts will have ready-mix concrete hauled in. These shafts would be powered by new power lines extending from existing, local distribution networks and would not need an electrical substation.

6.2.4.3 Tunnel Shaft Maintenance

Tunnel shafts would be used for tunnel access postconstruction so that periodic inspections, repair, and maintenance activities could be performed. Design features of the gravity tunnel system should preclude the need for planned maintenance; necessary maintenance activities would be the result of inspection findings. However, it is anticipated that at some point during the service life of the system, some maintenance would be required. The maintenance work could range from cleaning out the tunnel invert with a loader or possibly patching or repairing the tunnel lining. Areas to perform inspection and maintenance activities would be provided adjacent to and on top of the shaft pads at each shaft location. Inspection and maintenance activities would comply with the confined space regulations in accordance with Occupational Safety and Health Administration requirements.

There would be daily inspection and security checks at shaft sites. Grounds maintenance would occur twice a year. All vegetation maintenance would be mechanical (e.g., with mower or other hand tools). At this time, the use of herbicides specifically, or pesticides in general, is speculative; because the location, timing, frequency, and methods of application are not known, thus, the use of chemicals to remove vegetation is not proposed. Repaving would occur every 15 years.

6.2.5 Reusable Tunnel Material

RTM would be generated at launch shafts as the TBMs bore the tunnel. RTM is the soil removed by the TBM boring the tunnel, mixed with conditioners, and lifted to the ground surface through the launch shaft. “Wet excavated RTM” refers to the bulk material, including conditioners, resulting from tunnel excavation. After RTM is removed from the tunnel, it would then be tested for hazardous materials, managed on-site to dry naturally, then stockpiled and transported for reuse or permanently stored.

RTM removed from the tunnel through the launch shafts would be transported by conveyor to handling and storage facilities near launch shaft sites. RTM excavation, testing, drying, and movement from the tunnel launch shaft sites during tunneling operations would occur year-round, 20 hours per day Monday through Friday and 10 hours on Saturdays, allowing time for equipment maintenance. RTM movement from temporary storage to dry stockpile areas would occur 5 days per week from sunrise to sunset. Permanent RTM stockpiles would be elevated above the surrounding grades, covered with excavated topsoil, and planted with native seed mixes primarily for erosion control. Recommended treatments for permanent RTM stockpiles would include spreading topsoil, cross disking, and planting native grasses. The planted vegetation would be managed by mechanical means (e.g., with mower or other hand tools) twice a year. The use of chemicals to remove vegetation is not proposed. An access road would also be constructed from the existing paved road nearest to the stockpile.

6.2.5.1 Disposal of Reusable Tunnel Material

Excavated RTM would be placed in temporary stockpile areas and tested (generally once or twice a day) in accordance with the requirements of the Central Valley Regional Water Quality Control Board and the Department of Toxic Substances Control for the presence of hazardous materials at concentrations above their regulatory threshold criteria. The contractor(s) would conduct chemical characterization of RTM and associated decant liquid prior to reuse or discharge, respectively, to determine whether it will meet requirements of the National Pollutant Discharge Elimination System and the Central Valley Regional Water Quality Control Board. All decant liquid would be collected and treated for direct on-site reuse or on-site storage to reduce water supply needs. If the amount of treated water from RTM decant, dewatering flows, and site runoff exceeds the on-site water demands and on-site storage, the treated flows would be discharged to adjacent water bodies in accordance with the stormwater pollution prevention plan. While additives used to facilitate tunneling would be nontoxic and biodegradable, it is possible that some quantity of RTM would be deemed unsuitable for reuse and would be disposed of at a site approved for disposal of such material. This is expected to apply to approximately 1% to 5% of the total volume of excavated material.

It is anticipated that several stockpiles would be developed. Each temporary area would be generally sized to accommodate up to 1 week of RTM production to allow for testing of RTM for presence of contaminated or hazardous materials and suitability for reuse before stockpiling on-site or transporting off-site. Each stockpile area would be lined with impermeable lining material. Additional features of the long-term material storage areas would include berms and erosion protection measures to contain storm runoff as necessary and provisions to allow for truck traffic during construction.

RTM would require drying for long-term stockpiling and storage. Natural drying (evaporation) is the proposed method. The dried RTM would be piled and moved by bulldozers and motor scrapers, and then deposited in the dry stockpile areas near the tunnel launch shaft sites. RTM permanently stored at launch sites would be graded and planted with erosion-control seed mix to avoid dust generation and the need for future handling. For natural drying, wet RTM would be spread over a broad area in relatively thin lifts (e.g., 18 inches) and allowed to dry and drain naturally over a period of up to 1 year. If portions of the RTM were identified as hazardous, that material would be transported in trucks licensed to handle hazardous materials to a disposal location licensed to receive those constituents. If the RTM meets the criteria for reuse, the material would be moved by conveyor to a long-term on-site storage site.

A portion of the dried RTM generated at the Twin Cities Complex and Lower Roberts Island would be used to refill the areas excavated at the launch site where soil is removed to construct tunnel shaft pads and levee modifications. The remaining dried RTM would ultimately be moved to a single on-site long-term storage area at each launch shaft work area and planted with erosion-control seed mix to stabilize the stockpile and avoid dust generation.

6.2.6 Bethany Complex

The Bethany Complex would be constructed southeast of Clifton Court Forebay (Table 6.2-0-2). The Bethany Reservoir Pumping Plant and Surge Basin would be located along Mountain House

Road approximately 0.5 mile south of the intersection with Byron Highway. The Bethany Reservoir Aqueduct would extend approximately 2.8 miles from the pumping plant to a new discharge structure on the banks of the Bethany Reservoir. The Bethany Complex would be located on ground above the flood elevations for the 200-year flood event with sea level rise and climate change hydrology for year 2100, as defined by DWR.

Table 6.2-0-2. Bethany Complex Feature Ground Footprint Summary

Feature	Item	Quantities
Bethany Reservoir Pumping Plant and Surge Basin	Total size of construction site (up to)	213 acres
	Total size of postconstruction site (up to)	184 acres
	Land reclamation (up to)	29 acres
	Pumping plant pad site	1,166-foot-wide x 1,260 feet long
	Surge basin site	Surge basin size: 815 feet wide x 815 feet long Overflow shaft diameter: 120 feet Overflow weir wall diameter: 180 feet Six 5 feet by 5 feet vertical sluice gates within the perimeter of the overflow weir will allow stored water from a surge event to drain into the overflow shaft
	Diaphragm walls	Pumping plant: Approximately 6 foot wide by 252 foot deep by 1,438 feet long; 5-foot wide by 100-foot deep by 1,750 feet long; and 5 foot wide by 252 foot deep by 630 feet long diaphragm walls Wet well inlet conduit: Approximately 6 feet wide by 252 feet deep by 800 feet long; and 5-foot-wide by 100-foot-deep by 160-foot-long diaphragm wall columns below foundation Surge Basin: Approximately 3 feet wide by 137 feet deep by 3,260 feet long with two levels of tiebacks
	Foundational piles	Pumping plant: Approximately 53 drilled piers would be installed 50 feet deep below the pump discharge isolation gate valve gallery Surge Basin: Approximately 2,530 drilled piers would be installed 60 feet deep below the surge basin base slab
	Pumping plant structure	Area of structure: 412 feet wide by 503 feet long Top of slab of wet well, wet well inlet conduit and pumping plant dry pit pump bays: 47 feet Top of canopy structures on the north end of each pumping plant dry pit above pad: 74.5 feet

Feature	Item	Quantities
	Pumps	Pumping plant: 14 pumps at 500 cfs, each, includes two standby pumps Surge Basin: four rail-mounted pumps at 100 cfs, each, for dewatering surge basin two vertical submersible pumps at 60 cfs each, for dewatering main tunnel
	Surge tanks for aqueduct to Bethany Reservoir Discharge Structure	Area of tank: 75-foot diameter by 20 feet high Total number of tanks: four
	Bethany Reservoir Surge Basin tunnel reception shaft	Shaft depth during construction: 209 feet (depth from existing ground surface prior to excavation or fill) Shaft depth during operations: 199 feet
	Concrete batch plants	Two batch plants in an area approximately 11.5 acres in size
Bethany Reservoir Aqueduct	Total size of construction site (approximately)	128 acres
	Total size of postconstruction site (approximately)	68 acres
	Land reclamation (approximately)	60 acres
	Aqueduct trench (excludes tunneled portions of aqueduct)	Aqueduct trench from the Bethany Reservoir Pumping Plant to the tunnel under Jones Penstock: 7,900 feet long Aqueduct trench from the tunnel under Jones Penstock to the tunnel under the conservation casement: 3,700 feet long Each aqueduct trench is approximately 115 feet wide at the bottom, to accommodate four pipes 180 inches in diameter and 30 feet on center A 24-foot-wide permanent gravel-surfaced patrol road would be placed on the completed fill in the center of the aqueduct
	Tunneled portions of aqueduct	Tunnel under Jones Penstock: Four 200-foot-long and 20-foot-diameter parallel tunnels (one per pipeline); tunnels separated by 40 feet between the center of each tunnel Tunnel under conservation easement: Four 3,064 foot long and 20 foot diameter parallel tunnels (one per pipeline) separated by 40 feet between the center of each tunnel at the entrance portal end to about 70 feet at the shaft end
	CLSM processing area	2 batch plants, each 100 feet wide by 100 feet long by 50 to 75 feet in height
Bethany Reservoir Discharge Structure	Total size of construction site (approximately)	15 acres
	Total size of postconstruction site (approximately)	13 acres
	Land reclamation (approximately)	None anticipated

Feature	Item	Quantities
	Tunnel shaft connection to the Bethany Reservoir Discharge Structure	Each of the four tunnels would extend upward vertically through shafts to discharge water into the Bethany Reservoir Discharge Structure. There would not be any tunnel shafts between the tunnel portal and the discharge structure (within the Conservation Easement)
	Discharge structure channels	Four channels extend from the vertical shaft to the bank of the Bethany Reservoir. The channels range in width from 55 feet at the vertical shaft to approximately 27.5 feet at the bank of the Bethany Reservoir

6.2.6.1 Bethany Reservoir Pumping Plant

The Bethany Reservoir Pumping Plant would be needed to lift the water from the tunnel to Bethany Reservoir. The main tunnel from the intakes would terminate at a reception shaft within the surge basin on the north side of the Bethany Reservoir Pumping Plant. Water would enter the Bethany Reservoir Pumping Plant and be conveyed directly to Bethany Reservoir in a cement-mortar-lined, welded steel aqueduct system.

The Bethany Reservoir Pumping Plant would be a multilevel underground structure with its roof at grade. Flow capacity would range from a minimum of 300 cfs to a maximum of 6,000 cfs. The pumping plant would have twelve 500-cfs pumps to achieve the flow of 6,000 cfs and two standby pumps. In addition to the below-ground pumping plant and wet well, the site would include aboveground water storage tanks for hydraulic transient-surge protection of the discharge pipelines, electrical building with variable speed drives and switchgear, heating and air conditioning mechanical equipment yard, transformer yard, electrical substation adjacent to the electrical building, standby engine generator building with an isolated and fully contained fuel tank, equipment storage building with drive-through access, offices, welding shop, machine shop, storage area for spare aqueduct pipe sections and accessories, and a walled enclosure/storage facility for bulkhead panel gates that would be used to isolate portions of the Bethany Reservoir Pumping Plant during maintenance procedures. The pumping plant would include two separate dry-pit pump bays adjacent to the wet well.

Electrical, generator, and maintenance buildings, an electrical substation, surge tanks, and protective canopies on the site would be aboveground structures. The finished site pad elevation of 46.5 feet above mean sea level, at about existing grade, would be substantially above the elevation required to protect the facilities from surge events and the 200-year flood event including sea level rise in 2100, which is calculated to be a water surface elevation of 27.3 feet within the surge basin.

6.2.6.2 Bethany Reservoir Surge Basin

The surge basin would normally be empty when the Bethany Reservoir Pumping Plant is in operation. The top of the surge basin would be at existing grade and the bottom would be about 35 feet below the ground surface. The tunnel shaft within the surge basin would accommodate

portable submersible pumps for dewatering the tunnel, if necessary. The top of the tunnel shaft would be at the floor of the surge basin and would be surrounded by an overflow weir wall inside the basin. A shaft pad would not be required at the surge basin reception shaft since natural ground elevations at this site are considerably above the potential flood stage, and groundwater intrusion is unlikely based on available information.

6.2.6.3 Bethany Reservoir Aqueduct

The aqueduct system would consist of four 15-foot-diameter parallel pipelines that would convey water from the Bethany Reservoir Pumping Plant to the Bethany Reservoir Discharge Structure, a distance of approximately 2.8 miles each. Each pipeline would have a maximum capacity of 1,500 cfs. The aqueduct system permanent footprint would be about 200 feet wide. Two separate aqueduct reaches would require parallel tunnels to carry each pipeline under existing features. The first reach would be under the Jones Pumping Plant discharge pipelines (about halfway from the Bethany Reservoir Pumping Plant to the discharge structure); at this location pipelines would run about 50 feet below ground surface for about 200 feet. Tunnels would also be needed under the existing conservation easements adjacent to Bethany Reservoir (at the last downstream reach of the aqueduct for about 3,064 feet, ranging from 45 to 180 feet below ground surface).

The aqueduct pipelines would be laid mostly in open trenches, constructed by open cut and backfill methods. The tops of the pipes would extend above the existing ground surface and be covered by a minimum of 6 feet of soil that would form a single mound of earth above the four pipelines. Excavated material from the Bethany Reservoir Aqueduct trenches and tunnels would be used for backfill of the trenches and also used to make controlled low-strength backfill material (CLSM) for pipe bedding and zone material.

The aqueduct pipelines would terminate near the bottom of four 55-foot-inside-diameter below-ground vertical shafts at the Bethany Reservoir Discharge Structure. The pipelines would make a 90-degree bend upward inside the shafts, ending at the floor of the discharge structure and flowing through a concrete channel into Bethany Reservoir.

Staging Areas, Controlled Low-Strength Backfill Material Batch Plants, and Ancillary Facilities

In addition to pipelines and tunnels, the aqueduct construction site would include contractor staging areas, CLSM batch plants, and ancillary facilities. The CLSM would be used to improve the strength of soil placed under the aqueduct pipes installed in the trenches, and possibly to fill the space between the inside wall of the tunnel and the outside of the pipeline wall for the tunnels that carry the pipelines below the Jones discharge pipelines and the conservation easements adjacent to Bethany Reservoir.

A CLSM processing area at the tunnel portion of the aqueduct would include two side-by-side CLSM batch plants for trench work, each 100 feet wide by 100 feet long and 50 to 75 feet tall. CLSM production would also require 2.75 acres for soil storage of up to 30,000 cubic yards of soil up to 7 feet deep; two 30-foot-diameter, 10-foot-tall water storage tanks mounted on 8-foot-tall platforms and holding a total of 100,000 gallons of water; and cement storage silos 50 to 75 feet tall on a site 50 feet wide by 100 feet long.
Aqueduct Tunnels

The aqueduct tunnels to carry the pipelines under the Jones discharge pipelines and the conservation easements would be constructed using a different method than used for the main tunnel between the intakes and the Bethany Reservoir Pumping Plant. Because of the shorter length of these tunnels compared to the main tunnel, a TBM would not be used during construction. For the Jones pipeline crossing a digger shield outfitted with an excavator arm could be used for the anticipated ground conditions. To avoid extensive disturbance of sensitive habitat areas within the conservation easement crossing, several excavation methods have been identified including a roadheader. Soil material would be moved out of the tunnels at the entry portals. The excavation would be supported with rock reinforcement and/or steel ribs or lattice girders and shotcrete depending on-the-ground conditions. Construction of the aqueduct tunnels under the conservation easement would avoid surface disturbance within the conservation easement.

The excavated material from the aqueduct tunnels would be removed by different methods and would be in different geologic formations compared to the main tunnel bore; therefore, the excavated material characteristics would be different from the RTM from the main tunnel. The Bethany Reservoir Aqueduct tunneling machines also would not need additives; therefore, the excavated soil would not need to undergo the extensive drying that would be required for RTM from the TBMs on the main tunnel. Materials excavated from the aqueduct tunnels that are too wet or otherwise unsuitable for CLSM of backfill would be transported to the permanent excavation stockpile adjacent to the Bethany Reservoir Pumping Plant and dried as part of final disposal.

Tunneling under the Jones discharge pipelines would require excavation of a large cut to establish entry and exit portals. The entry portal would be located on the east side of the Jones discharge pipeline crossings. Excavation of these tunnels would end at the exit portal about 200 feet away on the west side of the Jones pipelines. Major facilities at the site would include mobile cranes, construction shops and offices, parking, material laydown and erection area, equipment staging, tunnel ventilation system housing, temporary electrical substation, and storage for topsoil stripping. Construction activities would include clearing and grubbing, water quality protection, ground improvement, and other activities as needed.

Tunneling under the conservation easement also would require tunnel entry portals on the east side and tunnel exit portals on the west side of the 3,064-foot crossing. The entry portals would be located on the east side of the conservation easement and west of the existing high-voltage power lines, outside of the conservation easement boundary. Excavation of these tunnels would end at the vertical shafts on the east side of the Bethany Reservoir Discharge Structure.

6.2.6.4 Bethany Reservoir Discharge Structure

The Bethany Reservoir Discharge Structure on the bank of the Bethany Reservoir comprises the aqueduct conservation easement tunnel vertical exit shafts, contractor staging areas, and ancillary facilities. The discharge structure site is on a narrow strip of land between the conservation easement and Bethany Reservoir; a 10-foot-wide buffer would separate the disturbance area from the conservation easement. Significant grading would be required to build the structure on the site, above reservoir surface water level, which varies considerably in elevation. Constructing a temporary cofferdam within the water near the shore in the reservoir would allow excavation,

concrete, and backfill work to be completed on the reservoir bank within an area of dry ground excavated as much as 25 feet below the reservoir water surface.

The discharge structure would occupy 13 acres postconstruction. It would be divided into four separate channels, with a total width of approximately 327 feet encompassing the four 55-foot-wide aqueduct shafts with required approximately 81.5-foot center-to-center spacing. Each channel of the discharge structure would range from about 81 feet wide at the top of the aqueduct shafts to approximately half of that width at the bank of the Bethany Reservoir. The concrete floor of the discharge structure at elevation 227 feet above mean sea level would end near the reservoir bank, and a layer of riprap would be placed between the structure and the temporary cofferdam to help stabilize and protect the bank and bed of the reservoir from the energy of the water being discharged, which is expected to be minor, given the relatively low discharge velocity. The top of the discharge would be approximately at the same elevation as the existing California Aqueduct Bikeway that will traverse through and over the structure.

The Bethany Reservoir Discharge Structure would cross the existing California Aqueduct Bikeway, which is also used as a maintenance road. A 32-foot-wide bridge would span the four channels to maintain access for bikes and maintenance vehicles. Each of the four Bethany Reservoir Discharge Structure channels would be divided into two 21-foot-wide bays with radial gates and stop logs to prevent backflow in an emergency and double isolate the aqueduct system from Bethany Reservoir. A 16-foot-wide service deck would be installed on the opposite (reservoir) side of the gate and stop log area to facilitate operations and maintenance of the gates and installation and removal of stop logs. The bridge would include applicable openings for stop log installation and removal through traffic-rated hatches. Similarly, stop logs would be installed in open stop log grooves adjacent to the service deck. The radial gates would automatically close under pressure loss conditions in the aqueduct pipelines to prevent water from Bethany Reservoir from flowing into the aqueduct pipelines during the unlikely event of a pipeline break or valve malfunction. Due to the critical control nature of this facility, a standby engine generator would be provided for backup power in case of a power outage. A storage yard for isolation bulkhead gates is also included at the site.

6.2.7 Access Sites

Construction would require substantial transportation facility improvements. This would be to serve the construction and material delivery processes and access to compensatory mitigation sites. Construction would require temporary relocation and realignment of SR 160 at the intakes, and new or improved access roads to intakes, tunnel shafts, and the Bethany Complex. Pavement conditions on existing county and local roads are predominantly classified as marginal to unacceptable. State routes are generally in good condition although pavement condition data were not available for all State routes at the time of the needs assessment.

DWR will conduct preconstruction pavement and roadway analyses of access roadway segments on local and county roads to determine whether they need improving. Road improvement activities would include pavement remediation (e.g., fill potholes, asphalt cracking, and slurry seals), widening to a minimum of 12 feet, roadway design to serve construction traffic with new roads, and constructing new bridges or widening existing bridges. Where road and bridge

improvements are undertaken, wider shoulders would be considered to meet bicycle lane standards; design standards for each state or local entity that operates roads and bridges would be followed for all improvements on the existing respective roadways. Some project-area bridges rated as structurally deficient or functionally obsolete are scheduled to be replaced or rehabilitated by their respective jurisdictions.

Modifications to existing roadways during project construction would be completed in accordance with Caltrans or county criteria, depending upon the owner of the roadway. Future roadway projects under consideration by local or state agencies were reviewed to potentially coordinate road improvements. The preconstruction pavement and roadway analysis will be included as part of the Geometric Approval Drawings submittal for review, comment, and refinement, in consultation with the applicable transportation entities, including Caltrans for state highways and intersection facilities and local agencies for local roadway and intersection facilities. Improvements to State Routes would be designed and constructed in collaboration with Caltrans. Project roadway improvements to existing State Routes, local roadways, and bridges would remain after construction.

Roads used for material hauling, construction equipment access, and employee access would consist of existing State routes and two-lane roadways in the Delta, new gravel (with chip seal) or paved roadways constructed from existing roads to construction sites, and new roads within facility construction sites. Truck routes were evaluated for existing and project truck volumes and will be improved where project truck traffic warrants improvement, based on the duration of work and expected commodities to be carried. Minimum requirements for truck routes are 12-foot-wide lanes and 4-foot-wide shoulders. Interstate, State, and local roads would also provide direct access to project work sites. Construction access roads would remain postconstruction for maintenance access to the facilities.

SR 160 near the north Delta intakes would be temporarily rerouted east of its existing alignment during the intake construction process and then relocated through the intake facility in the vicinity of the current SR 160 alignment. Lambert Road would be widened from Franklin Boulevard to the eastern side of the bridge over Snodgrass Slough.

A new 3.8-mile paved intake access/haul road would be constructed along the west side of the abandoned railroad embankment, to a new dedicated haul road east of the intakes.

Approximately 180 feet of the existing bridge over Snodgrass Slough at Hood-Franklin Road would be widened. The haul road would eliminate the need for construction traffic to travel through the main portion of the Town of Hood and on SR 160; it would not be a public road. All access for construction, plus most operations-phase access, would use the haul road to enter the intake sites.

A new 0.3-mile access road to the shaft site on New Hope Tract maintenance shaft would be constructed from Blossom Road. To access the Terminous Tract maintenance shaft site, a new uncontrolled interchange with longer acceleration and deceleration lanes along SR 12 would be built and 2.3 miles of SR 12 from I-5 to the tunnel shaft site would be improved. Access to the Lower Roberts Island double launch shaft would involve building a new 1.2-mile access road

from West Fyffe Street to a new bridge; a new road and railroad bridges over Burns Cutoff from Port of Stockton; new 3.2-mile access road and rail lines along West House Road from the new bridge; and a new 1.6-mile access road on Lower Roberts Island. One mile of Dierssen Road between Franklin Boulevard and I-5 would be widened, and 0.48 mile of Franklin Boulevard would be widened between locations 0.22 mile north of Dierssen Road and 0.25 mile south of Dierssen Road. Twin Cities Road would be widened for 1 mile from a location 0.83 miles west of Franklin Boulevard to a location 0.17 mile east of Franklin Boulevard. Access to the Lower Roberts Island double launch shaft site would involve 1.2 miles of new paved road on Rough and Ready Road on Port of Stockton, a new bridge over Burns Cutoff from Port of Stockton, 2 miles of new paved road to West House Road with widening 1.2 miles of West House Road, and 1.3 miles of new paved road from West House Road to North Holt Road with a new bridge over Black Slough.

Construction would start with clearing, grubbing, and moving utilities. Existing drainage facilities either within the construction site or adjacent to construction sites would be rerouted to not affect overland drainage flows or groundwater seepage flows prior to construction. After completion of construction at a project site, the condition of the pavement of access roads would be analyzed and remediation would be completed as necessary to return the facility to the condition that DWR constructed.

6.2.8 Rail-Served Material Depots

Rail access to serve major construction sites would reduce truck use of local roads and highways. Rail-served materials depots with rail sidings would be constructed and used to transport certain large volumes of construction materials. The rail siding would be designed to allow the train to leave or pick up rail cars, hold the rail cars, and off-load or load the rail cars. The depot would include areas where trains would move off the main line to deposit the rail cars and areas to transfer the materials to trucks.

A rail-served materials depot at Lower Roberts Island would be constructed. Rail access to Lower Roberts Island would be provided from an extension of an existing short haul line at the Port of Stockton. Rail access would be extended over a new bridge over Burns Cutoff and continue to the launch shaft site and RTM storage area.

6.2.9 Construction Schedule

Construction would take approximately 13 years. Construction would not take place in all locations at the same time. Rather, it would proceed in stages, starting with access roads and site work at the intakes and launch shafts, plus power and SCADA installed to facilities sites, then concurrent tunnel and facility construction, and finally proceeding to commissioning, site reclamation, and road overlays in the final years.

6.10 Soil Balance

Project construction would require large amounts of fill material at many facility sites and would also generate extensive amounts of excavated soils and RTM. Roads and compensatory

mitigation would require imported materials from commercial sources. It is expected that soils excavated on-site at intakes would balance on-site soil needs and no significant import or export of structural fill would be necessary. However, some imported fine-grained levee embankment core material may be required if on-site soils do not meet regulatory requirements for construction. RTM generated at launch shafts at the Twin Cities Complex and Lower Roberts Island would be used for backfilling borrow areas on-site. Soil excavated at the Twin Cities Complex would be used for shaft pads on New Hope Tract, Canal Ranch Tract, Terminous Tract, and King Island. Soils excavated at the Lower Roberts Island double launch shaft site would be used for the shaft pads on Lower Roberts Island, Union Island, and Upper Jones Tract, and RTM generated on-site would be used to backfill borrow areas on Lower Roberts Island.

6.11 Electrical Facilities

Power supplies would be needed at construction sites for the intakes, tunnel shafts, Bethany Complex facilities, concrete batch plants, and park-and-ride lots. Power supplies would also be needed during operations of the intakes, Bethany Reservoir Pumping Plant and Surge Basin, and Bethany Reservoir Discharge Structure, plus lights, security, and minor operations and maintenance (O&M) loads at all permanent locations.

Power demand during construction would include support for large equipment, such as cranes and ground improvement machines, TBM and associated equipment including ventilation, conveyors and pumps, small tools, and construction-support facilities. Support facilities would include, but not be limited to, construction trailers, temporary lighting, and electric vehicle charging stations. Some of this equipment could be powered by on-site generators or internal combustion engines; however, electrical grid service to the sites, if available, would be more efficient, use less diesel fuels, and produce fewer emissions. DWR will also consider use of electric or hybrid-electric off-road equipment (including generators) over diesel counterparts to the extent that they become commercially available and earn a track record for reliability in real-world construction conditions and become cost-effective.

Power for construction and operation of the conveyance facilities would be delivered on existing power lines to the extent possible, but the location or required load of some facilities would require either new aboveground power towers with lines or underground conduit to serve those specific areas. Some existing lines would require adding new towers to extend service to conveyance facilities. Some existing lines would require adding new towers to extend service to conveyance facilities. Some power will also be abandoned or relocated, and some overhead lines, such as those crossing the intake haul road, will be moved underground to address overhead height constraints. For any aboveground power towers or lines that are new, non-specular materials would be used.

DWR is coordinating electric power transmission modifications with electricity providers Sacramento Municipal Utility District, Western Area Power Administration, and Pacific Gas and Electric Company.

6.12 SCADA Facilities

SCADA systems and associated data communication systems are common features of water infrastructure that enable remote monitoring and control of the performance and operation of the system, including video security cameras. The new DCP facilities would need to be integrated into SWP's existing SCADA system to allow for coordinated operations (Delta Conveyance Design and Construction Authority 2022d, 2023b as cited in the BA). The communications network would connect three major data centers, two intakes, and four remote data sites for the Bethany Complex. The major data centers would be at the existing DWR Project Control Center, DWR Operations and Maintenance Area Control Center at the Delta Field Division, and Bethany Reservoir Pumping Plant. SCADA would provide real-time performance data at intakes, tunnel launch shafts and some maintenance and reception shafts, and the Bethany Complex facilities. The communications aspects of the SCADA system would be used during construction to facilitate internet applications at the launch shaft sites, the intakes, and the Bethany Reservoir Pumping Plant.

The SCADA system would consist of SCADA equipment and communications links based upon fiber-optic cables that would be installed within and connecting to new structures. Whenever possible, the construction of fiber-optic based communications systems would use existing telecommunications infrastructure, dedicated conduits within project road modifications, and termination panels installed inside or on the buildings or structures. Wherever possible, underground routes would be located along existing roads and project access. SCADA fiber-optic cables serving the Bethany Reservoir Discharge Structure would be installed within the tunneled portion of the Bethany Reservoir Aqueduct; all construction and maintenance would take place from within the tunnels accessed from outside of the Bethany West Easement (Delta Conveyance Design and Construction Authority 2022d as cited in the BA).

6.2.13 Fencing and Lighting

Construction site security for major work sites would include security guards stationed at the main entry and exit gates for 24-hour site access management and surveillance. Security personnel would be on-site with regular inspection rounds. Cameras would also be used at key locations. Once construction is complete, permanent security fencing would be in place, and cameras would be installed with either local recording devices or transmission capabilities. These cameras would be located at sites where permanent power and SCADA facilities are located. Security personnel would monitor the sites periodically.

During construction, park-and-ride lots would use downcast lighting. Permanent lighting at facility sites would be downcast, cut-off type fixtures with non-glare finishes and controlled by photocells and motion sensors, depending on the location. Construction and maintenance lighting would be similar except for a few necessary nighttime work activities that would require higher-illumination safety lighting of the work sites. Lights would provide good color with natural light qualities and minimum intensity with adequate strength for security, safety, and personnel access. The lights would comply with the Illuminating Engineering Society industry standards for light source and luminaire measurements and testing methods.

During construction, night lighting at park-and-ride lots would be controlled by motion detectors. During operations, the lights at the intakes, tunnel shafts, and Bethany Complex would be motion activated to minimize light and glare to adjacent properties.

There will be no permanently mounted lighting on the north Delta intake structures or associated buildings that would produce light in the direction of the Sacramento River. Permanent lighting would be positioned such that no light can intersect the river channel at any angle regardless of vertical angle of the light source. Temporary lighting on the north Delta intake structures or associated buildings may be used for approved construction. To the extent possible, temporary lighting for worker safety would be positioned such that no light can intersect the river channel. All lights along the river channel would comply with U.S. Coast Guard criteria and regulations.

6.2.14 Park and Ride Lots

Park-and-ride lots would be established near major commute routes, where workers could park and ride shuttle buses or vans to construction sites. The employee shuttles would be electric-powered, and the park-and-ride lots would be equipped with electric vehicle charging stations. Trucks arriving late at night could also use these lots to park overnight to minimize nighttime deliveries to construction sites. Lots would be lighted with nighttime security lighting with motion detectors. Park-and-ride lots would be removed after construction unless local communities are interested in maintaining these lots in the future through the Community Benefits Program. Lots would be established at the following sites.

- Hood-Franklin Park-and-Ride Lot. Parking for employees at intakes. This lot would be located along the south side of Hood-Franklin Road immediately east of I-5. The total construction area would be 4.1 acres. The land is currently mostly agricultural land; a Caltrans construction yard occupies a small portion.

- Charter Way Park-and-Ride Lot. Parking for employees at tunnel shafts on Lower Roberts, New Hope Tract, Canal Ranch Tract, Terminous Tract, and King Island. This lot would be located along the south side of Charter Way at the southwest corner of the I-5 overpass, on the south side of SR 4, just west of I-5. The total construction area would be 2.4 acres. The land is currently a private truck parking lot and would only require upgrade or replacement of pavement and lighting systems.

Limited on-site parking would be provided at the intakes and Lower Roberts Island double launch shaft to supplement the park-and-ride lots. On-site parking for all workers would be provided at all other construction sites, including the Twin Cities Complex, all maintenance and reception shafts, and the Bethany Complex. After construction, these facilities would be removed.

6.2.15 Land Reclamation

As a part of construction, some areas would be temporarily disturbed but not needed for long-term operations (e.g., construction staging areas). DWR would transfer this land to interested parties to be consistent with local land uses, including agricultural production or open

space/natural habitat. To be able to use land for these purposes after construction, construction activities are necessary to reclaim this land.

Areas to be included in land reclamation are located at the Intakes B and C, Twin Cities Complex, Lower Roberts Island double launch shaft, and Bethany. Lands to be reclaimed would be those areas used during construction for material and equipment laydown and staging, material stockpiles, slurry/grout mixing plants, parking areas, and facilities/trailers. DWR would acquire the land for construction and would conduct agronomic testing to help determine whether the temporarily disturbed site could be reclaimed and final reclamation methods. The main goal of the land reclamation efforts would be to restore the soil health and condition, to the extent practical, in these temporary construction areas.

Construction activities, equipment, and material stockpiles could compact near-surface native soils or leave soils less suitable for agriculture or habitat. Initial reclamation tasks would include removal of all construction equipment and materials, demolition and removal of concrete slabs from temporary material storage areas, removal of temporary stockpiles/embankments, removal of temporary haul routes, and grading and leveling of the site to generally meet adjacent lands.

Initial soil treatments would depend on the actual disturbance, but for soils with more than minimal impact, the work would be expected to include ripping the soil and incorporating amendments (e.g., gypsum) to reduce compaction. This would be followed by spreading topsoil, cross disking, and fine grading/leveling to prepare the soil surface for future use. If the land transition would not occur in a relatively short period of time after construction, the areas would be drill seeded to provide erosion and dust control using a grass seed mix appropriate for the desired end use. Areas to be reclaimed to grassland would be seeded with a native grass and flowering forb mix, whereas areas to be reclaimed to agricultural use could be seeded with an erosion-control native seed mix.

Areas excavated to create borrow soil materials would be refilled to existing grade with soil or RTM from existing stockpiles at the end of construction. Treatments for reclamation using RTM base soil would be similar to those recommended for reclamation with native soils; however, additional treatments could be required to address soil conditions (for example, high or low pH). Lime and soil sulfur could be appropriate amendments for addressing soil pH; however, the actual amendments used would be based on soil tests performed at each of the sites postconstruction. Decisions on amendments to address nutrient deficiencies would be made in consultation with the end user. Topsoil would be spread to a depth of 1 foot over the RTM base soil. For agricultural uses, the top 1 foot of soil is typically most important and is where fertilizer application would be focused to address the specific needs of the crop.

Permanent RTM stockpiles would be expected at the tunnel launch sites. These stockpiles would be elevated above the surrounding grades and would be planted with native grasses primarily for erosion control, for habitat enhancement, and to blend with the surrounding area when the stockpile is not being accessed for a soil material source. Recommended treatments for permanent RTM stockpiles would include spreading topsoil, cross disking, and planting native grasses.

6.2.16 Other Construction Support Facilities

6.2.16.1 Concrete Batch Plants

Concrete batch plants would be located at Lambert Road at the intersection with Franklin Boulevard, and at the Bethany Reservoir Pumping Plant and Surge Basin construction site. The Lambert Road batch plant would be used for concrete delivery to the intakes, the Twin Cities Complex and the other tunnel shafts on New Hope Tract, Canal Ranch Tract, and King Island. Concrete for tunnel shaft sites on Terminous Tract, Lower Roberts Island, Upper Jones Tract, and Union Island would be provided from existing batch plants in Lodi and Stockton which are located in close proximity of these sites. The Bethany Complex concrete batch plants at the Bethany Reservoir Pumping Plant and Surge Basin site would be north of Kelso Road and the new Bethany access road east of Mountain House Road. These batch plants were sited to allow a central delivery location for cement and aggregate and site for distribution of the concrete around the Bethany Complex area.

The concrete batch plant sites would vary in size depending on location. They would include three bulk cement storage silos; a portable cement silo (trailer 10 feet tall by 60 feet long); a 500-square-foot batch trailer; four propane tanks; a 6,800-square-foot concrete block casting area; a 2,000- to 4,000-gallon diesel fuel tank; a 120,000-gallon water system consisting of six 20,000 gallons storage tanks and related collection facilities for stormwater and wash water; an admixing area that would include a pump house, admixture storage tanks, and secondary containment barriers; an aggregate storage area; a wash area for concrete mixing trucks and related returned concrete collection facilities; and parking for concrete trucks and employee vehicles. The concrete batch plant would include batcher, silo, and truck mixer dust collectors to minimize particulates in the surrounding air. Materials collected in the air filter bags would be hauled to licensed off-site disposal locations or added to the raw materials used to produce concrete. Concrete batch plant structures and equipment would be removed following construction.

6.2.16.2 Fuel Station and Fuel Storage

Two fuel stations with multiple tanks for diesel and gasoline would be constructed at the Bethany Complex. Fuel would also be stored at all tunnel shaft sites and at the intakes. The fuel tanks would be aboveground and would be surrounded by protective bollards to protect against collisions. Double-walled tanks with built-in secondary containment or external secondary containment beneath/around the tanks would protect surroundings from fuel leaks. A protective containment would be used beneath each of the fuel tanks and a protective area would be constructed beneath the refueling area to help contain leaks that may occur during fueling. Spill containment kits would be placed at each of the fueling locations. All fuel stations and storage would be removed following construction.

6.2.16.3 Emergency Response Facilities

In general, it is expected that primary emergency response services would be provided by the construction contractors. As needed on a site-specific basis, the contractors will be required to prepare a Project Emergency Response Plan with detailed information regarding emergency

services, access to construction sites, and emergency response times to Delta communities. The Project Emergency Response Plan requires on-site emergency response facilities and services at primary work sites during construction. Evaluations and discussions with local agencies would be conducted to determine the most appropriate method to coordinate between project contractor-provided emergency response services at the construction sites and integration with local agencies. Additionally, DWR would enter into mutual aid agreements with emergency services agencies in the project area. Emergency response facilities at construction sites could be removed during construction demobilization depending on DWR's decision for need during operations.

6.2.16.4 Standby Engine Generators

Engine generators would be used during construction at the intakes, Twin Cities Complex, Lower Roberts Island shaft site, each of the Bethany Reservoir Aqueduct tunnel portals, and Bethany Reservoir Discharge Structure. Standby engine generators would be used in the event of power outages.

During operations, intakes would each have two permanent standby engine generators. The standby engine generators would be installed inside a fenced area on the top of site embankments, with the fuel tank. The fuel would be provided by a diesel tank with suitable containment, or a propane tank set above ground. The permanent standby engine generators would provide energy to operate the valves and gates, including the ability to stop diversions at the intake structure. The Bethany Reservoir Pumping Plant and the Bethany Reservoir Discharge Structure sites would each have a permanent standby engine generator with an isolated and fully contained fuel tank.

6.2.16.5 Local Water Supply, Drainage, and Utilities

Construction and operation would require services of power, water, telecommunications, and SCADA utilities. All features would be designed to not increase peak runoff flows into adjacent storm drains, drainage ditches, or rivers and sloughs. At the intakes and tunnel shafts, water from dewatering activities and stormwater runoff on the construction site would be collected, treated, and stored on-site to reduce the need for off-site water sources. On-site reuse and storage would be maximized to reduce the peak runoff rate from the site and the need to purchase water. If additional stored water is not needed, the treated stormwater runoff flows would be discharged to adjacent waterbodies in a manner that would not increase peak flow rates. Use of the treatment and storage facilities would avoid increased peak stormwater runoff flow rates from project construction sites.

Typical water demands at construction sites include dust control, soil stabilization, mixture with construction materials (e.g., slurry material or bentonite to form cutoff walls), tire wash basins, and restroom facilities. Water supplies in the vicinity of the construction sites are provided by on-site groundwater, import from local sources, exchanges, existing riparian diversions, new temporary appropriations, or existing SWP appropriations. None of the construction sites are served by local or regional water agencies. Existing groundwater supplies occur at all of the

construction sites. Existing surface water right diversions occur on parcels at the intake sites, and Lower Roberts Island tunnel shaft site.

Most construction sites contain local irrigation and drainage facilities installed by existing or previous private landowners or reclamation districts. These systems may serve parcels that would be acquired for the project and adjacent parcels. Most of these existing facilities are buried and therefore not visible on aerial photographs. When the project can acquire access to specific parcels, irrigation and drainage facilities would be mapped for each site. If the facilities used by adjacent properties to move water from the existing diversion are located on a parcel to be used for a project feature, pipelines or canals would be installed to maintain service to the adjacent properties.

Wastewater service for structures near the project construction sites consist of individual septic systems with septic tanks and leach fields. Regional wastewater facilities are provided to the communities of Courtland and Walnut Grove by the Sacramento Area Sewer District. Interceptor pipelines extend between these communities and a regional pumping plant at the Rio Cosumnes Correctional Center (near the Franklin Field along Bruceville Road). The Rio Cosumnes Correctional Center pumping plant lifts the wastewater into another interceptor that extends to the Sacramento Regional County Sanitation District wastewater treatment plant near the community of Elk Grove.

Wastewater facilities for all of the project construction sites would be provided with portable restrooms. Septic systems would also be constructed at the intakes, Twin Cities Complex, Lower Roberts Island, and at Bethany Reservoir Pumping Plant and Surge Basin site. Because of high groundwater and/or low soil permeability at these sites, the leach fields would be sized larger than for locations with more favorable soil conditions, in accordance with the applicable county regulations.

6.3 Conservation Measures

6.3.1 General Avoidance and Minimization Measures

Table 6.3-1 lists the general avoidance and minimization measures that would be implemented before and during construction. Based on site-specific details and with the Service's concurrence, some of these general avoidance and minimization measures may not apply to specific, pre-construction field investigations. For the full text for each measure refer to Appendix 3A of the BA. The BA did not provide separate measures for delta smelt or longfin smelt. Avoidance and minimization measures specific to listed fish are included in the General Avoidance and Minimization Measures Appendix 3A. Most relevant to delta smelt and longfin smelt is number 7 in AMM-14: Construction Best Management Practices for Biological Resources below:

7. All in-water construction activities where special-status species are known or have a potential to occur will be conducted during the allowable in-water work windows established by the Service, National Marine Fisheries Service (NMFS), and CDFW for the protection of special-status fish or wildlife species. With regard to impact pile

driving, work windows for the north Delta intakes may be lengthened subject to NMFS, CDFW, and Service approval based on success of bubble curtain or other noise attenuation methods and real-time monitoring for fish presence. In-water activities associated with mobilization and demobilization (e.g., initial movement of materials to construction sites) are not subject to the work windows. In-water impact pile installation may occur outside of the work windows if performed within a cofferdam, or behind the sheet pile training walls, and with in-channel acoustic monitoring to verify that generated sound thresholds do not exceed the 150-dB behavioral criterion as described in *Delta Conveyance Project Final Environmental Impact Report* (California Department of Water Resources 2023) Chapter 12, Fish and Aquatic Resources, Impact AQUA-1: Effects of Construction of Water Conveyance Facilities on Fish and Aquatic Species at 10 meters from the cofferdam or sheet pile training walls. Apart from impact pile driving, any other in-water work may occur within a cofferdam, or behind the sheet pile training walls, regardless of the timing of in-water work windows. Any extension/reduction of in-water work windows would focus on half-month increments.

a. Geotechnical exploration: August 1 to October 31.

b. North Delta intakes: June 1 to October 31, except that in-water impact pile driving is unlimited during the period June 15 to September 15, and in-water impact pile driving is subject to the conditions noted above for the periods from June 1 to June 15 and September 15 to October 31.

c. Modified bridges: June 1 to October 31, except that in-water impact pile driving is unlimited during the period June 15 to September 15.

d. California Aqueduct (between Skinner Fish Facility, Banks Pumping Plant, and Bethany Reservoir) and Delta-Mendota Canal (between Tracy Fish Collection Facility and Jones Pumping Plant): January 1 through December 31.

e. Work in the Delta except for the north Delta intakes, modified bridges, and California Aqueduct and Delta-Mendota Canal: August 1 to October 31.

Table 6.3-1. General Avoidance and Minimization Measures

AMM	Title
AMM-1	Conduct Environmental Resources Worker Awareness Training
AMM-2	Develop and Implement Hazardous Materials Management Plans
AMM-3	Develop and Implement Spill Prevention, Control, and Countermeasure Plans
AMM-4a	Develop and Implement Erosion and Sediment Control Plans
AMM-4b	Develop and Implement Stormwater Pollution Prevention Plans
AMM-5	Develop and Implement a Fire Prevention and Control Plan
AMM-6	Conduct Cultural Resources Awareness Training
AMM-7	Off-Road Heavy-Duty Engines
AMM-8	On-Road Haul Trucks
AMM-9	On-Site Locomotives
AMM-10	Marine Vessels

AMM	Title
AMM-11	Fugitive Dust Control
AMM-12	On-Site Concrete Batching Plants
AMM-13	DWR Best Management Practices to Reduce GHG Emissions
AMM-14	Construction Best Management Practices for Biological Resources
AMM-15	Sediment Monitoring, Modeling, and Reintroduction Adaptive Management
AMM-16	Provide Notification of Construction and Maintenance Activities in Waterways
AMM-17	Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities
AMM-18	Avoid and Minimize Operational Traffic Impacts on Wildlife
AMM-19	Minimize Fugitive Light from Portable Sources Used for Construction
AMM-20	Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights toward Residences
AMM-21	Develop and Implement a Noise Control Plan
AMM-22	Electrical Power Line Support Placement
AMM-23	Develop and Implement a Mercury Management and Monitoring Plan
AMM-24	Minimize Access Road Impacts on Listed Amphibian Connectivity
AMM-25	Develop and Implement a Fish Rescue and Salvage Plan
AMM-26	Develop and Implement an Underwater Sound Control and Abatement Plan
AMM-27	Develop and Implement a Barge Operations Plan

6.3.2 Species-Specific Avoidance and Minimization Measures

The following sections detail aspects of the PA intended to avoid and minimize adverse effects on listed species of wildlife and describe offsetting measures intended to compensate for adverse effects. In addition to species-specific avoidance and minimization measures) discussed below, general avoidance and minimization measures that would be implemented uniformly during construction and operations of proposed water facilities and performance of conservation measures are fully detailed in Appendix 3A of the BA. Pre-construction field investigations may not require avoidance and minimization measures, based on site-specific details and with the Service's concurrence.

The following measures will only be required for activities occurring within suitable habitat as modeled in the BA and by additional assessments conducted during the planning for work in a given area. Surveys and monitoring will be conducted from locations where access is allowed. As properties become accessible for initiating project activities within areas of modeled habitat, DWR will require suitability assessments of the modeled habitat by a biologist qualified to identify suitable habitat for this species.

6.3.2.1 San Joaquin Kit Fox Avoidance and Minimization Measures

1. For areas verified as being suitable for San Joaquin kit fox, preconstruction surveys will be initiated within 14 to 30 days prior to ground disturbance, vegetation removal, or establishment of staging areas related to project activities. A Service- and CDFW-approved biologist with experience surveying for and observing the species will survey the project footprint and the area within 200 feet beyond the footprint to identify known

or potential San Joaquin kit fox dens. Adjacent parcels under different land ownership will not be surveyed unless access is granted within the 200-foot radius of the project footprint. The biologists will conduct these searches by systematically walking 30- to 100-foot-wide transects throughout the survey area; transect width will be adjusted based on vegetation height and topography. The biologist will conduct walking transects such that 100% visual coverage of the worksite footprint is achieved. Dens will be classified in one of the following four den status categories outlined in the *Standardized Recommendations for Protection of the Endangered San Joaquin Kit Fox Prior to or During Ground Disturbance* (Service 2011).

a. Potential den. Any subterranean hole within the species' range that has entrances of appropriate dimensions for which available evidence is sufficient to conclude that it is being used or has been used by a San Joaquin kit fox. Potential dens comprise any suitable subterranean hole or any den or burrow of another species (e.g., coyote, badger, red fox, or ground squirrel) that otherwise has appropriate characteristics for kit fox use. If a potential den is found, the biologist will establish a 50-foot buffer using flagging.

b. Known den. Any existing natural den or artificial structure that is used or has been used at any time in the past by a San Joaquin kit fox. Evidence of use may include historical records; past or current radiotelemetry or spotlighting data; kit fox signs such as tracks, scat, or prey remains; or other reasonable proof that a den is being or has been used by a kit fox. If a known den is found, the biologist will establish a 100-foot buffer using flagging.

c. Natal or pupping den. Any den used by San Joaquin kit foxes to whelp or rear their pups. Natal or pupping dens may be larger with more numerous entrances than dens occupied exclusively by adults. These dens typically have more kit fox tracks, scat, and prey remains near the den and may have a broader apron of matted dirt or vegetation at one or more entrances. A natal den, defined as a den in which kit fox pups are actually whelped but not necessarily reared, is a more restrictive version of the pupping den. In practice, however, it is difficult to distinguish between the two types of dens; therefore, for purposes of this definition, either term applies. If a natal or pupping den is discovered, a buffer of at least 200 feet will be established using fencing but a final buffer will be established in coordination with the Service and CDFW.

d. Atypical den. Any artificial structure that has been or is being occupied by a San Joaquin kit fox. Atypical dens may include pipes, culverts, and diggings beneath concrete slabs and buildings. If an atypical den is discovered, the biologist will establish a 50-foot buffer using flagging.

2. Disturbance to all San Joaquin kit fox den status categories (described directly above) will be avoided to the extent possible. Where dens are found during surveys and avoidance is not possible, the following procedures will be implemented.

a. If an atypical, natal or pupping, known or potential San Joaquin kit fox den is discovered within a project footprint, the den will be monitored for 3 days by a Service- and CDFW-approved biologist using a tracking medium or an infrared beam camera to determine whether the den is currently being used.

b. If an active natal or pupping den is found within a project footprint, Service and CDFW will be notified immediately.

c. If San Joaquin kit fox activity is observed at the potential, known, or atypical den during the preconstruction surveys, Service and CDFW will be notified immediately, and the den will be monitored for 5 consecutive days from the time of the first observation.

d. Construction requirements from *Standardized Recommendations for Protection of the San Joaquin Kit Fox Prior to or during Ground Disturbance* (U.S. Fish and Wildlife Service 2011) or the latest guidelines will be implemented.

e. If potential, known, atypical, or natal or pupping dens are identified within temporary work areas or within a 200-foot buffer of a temporary work area, exclusion zones around each den entrance or cluster of entrances will be demarcated. The configuration of exclusion zones will be circular, with a radius measured outward from the den entrance(s). No activities will occur within the exclusion zones. Exclusion zone radii for atypical dens and potential dens will be at least 50 feet and will be demarcated with four to five flagged stakes. Exclusion zone radii for known dens will be at least 100 feet and will be demarcated with staking and flagging that encircle each den or cluster of dens but do not prevent access to the den by the foxes. Exclusion zone radii for natal or pupping dens will be at least 200 feet and will be demarcated using fencing, but a final buffer will be established in coordination with the Service and CDFW.

f. Written results of the surveys will be submitted to the Service and CDFW within 5 calendar days of the completion of surveys and prior to the beginning of ground disturbance and/or construction activities in San Joaquin kit fox modeled habitat.

3. During construction, the following measures will be implemented for all activities in suitable San Joaquin kit fox habitat (as determined by a USFWS- and CDFW-approved biologist):

a. The Service- and CDFW-approved biologist for San Joaquin kit fox will be the contact source for any employee or contractor who might incidentally observe or discover kit fox. If a kit fox is observed or discovered within the work area, all work will cease within 200 feet and the Service- and CDFW-approved biologist will contact the Service immediately. The Service contact is the Assistant Field Supervisor of Endangered Species.

b. New sightings of kit fox will be reported to the California Natural Diversity Database (CNDDB). A copy of the reporting form and a topographic map clearly marked with the location of where the kit fox was observed will also be provided to the Service.

6.3.2.2 California Least Tern Avoidance and Minimization Measures

The following measures for the California least tern will only be required for surface construction activities occurring within suitable foraging and nesting habitat.

1. If suitable nesting habitat for California least tern (flat, unvegetated areas near aquatic foraging habitat) is identified during planning-level surveys the year prior to construction, DWR will require that at least three preconstruction surveys for this species will be conducted in all suitable habitat within 500 feet of the construction footprint, where construction-related noise levels could exceed 60 A-weighted decibel (dBA) equivalent continuous sound level (Leq) (1 hour), during the California least tern breeding season (April 15 to August 15). Construction-related noise level will be determined based on a noise contour map, created by a noise expert, showing the 60 dBA noise contour specific to the type and location of construction to occur in the area. Surveys will be conducted by a Service- and CDFW-approved biologist with experience observing the species and its nests. DWR will implement the following requirements to avoid loss of California least tern nesting colonies if construction will take place within 500 feet of a California least tern nest where construction-related noise levels could exceed 60 dBA Leq (1 hour) during the breeding season (April 15 to August 15 or extended as determined through surveys).

    a. A Service- and CDFW-approved wildlife biologist will monitor construction activities within 500 feet of active nests to ensure that construction activities do not affect nest success. Reduced buffers may be allowed, through coordination with the Service and CDFW, if a full-time Service- and CDFW-approved biologist is present to monitor the nest and has authority to halt construction if bird behavior indicates continued activities could lead to nest failure. Active nests will be monitored to track progress of nesting activities until the biologist determines that the young have fledged and are capable of independent survival or the nest site is no longer active.

    b. Activities performed during the California least tern breeding season, in occupied least tern nesting habitat, with Service and CDFW approval and under the supervision of a Service- and CDFW-approved biologist will be limited to inspection, research or monitoring.

    c. If a California least tern is found, construction activities will be limited such that sound will not exceed 60 dBA within 500 feet of the habitat being used until the Service- and CDFW-approved biologist has confirmed that the bird has left the area.

d. Portable and stationary equipment will be located, stored, and maintained as far as possible, with a minimum distance of 500 feet, from suitable California least tern habitat.

e. All lights will be screened and directed down toward work activities and away from suitable habitat. A biological construction monitor will ensure that lights are properly directed at all times during construction.

6.3.2.3 Least Bell's Vireo Avoidance and Minimization Measures

The following measures for least Bell's vireo will only be required for surface construction activities occurring between May 15 through September 1.

1. Prior to the construction, a noise expert will create a noise contour map showing the 60 dBA noise contour specific to the type and location of construction to occur in the area.

2. Two weeks prior to construction, a Service- and CDFW-approved biologist will conduct daily surveys, consistent with a Service- or CDFW- approved survey protocol (U.S. Fish and Wildlife Service 2001:1-3, or more current guidance) within 500 feet of suitable habitat where construction-related noise levels could exceed 60 dBA Leq (1 hour).

3. If a least Bell's vireo is found, construction activities will be limited such that sound will not exceed 60 dBA within 500 feet of the habitat being used until the Service- and CDFW-approved biologist has confirmed that the bird has left the area.

4. If surveys find least Bell's vireos in an area where vegetation will be removed, vegetation removal will be conducted when the Service- and CDFW-approved biologist has confirmed that least Bell's vireos are not present within 500 feet of vegetation removal activities.

5. Portable and stationary equipment will be located, stored, and maintained as far as possible, with a minimum distance of 500 feet, from suitable least Bell's vireo habitat.

6. All lights will be screened and directed down toward work activities and away from suitable habitat. A biological construction monitor will ensure that lights are properly directed at all times during construction.

6.3.2.4 Western Yellow-Billed Cuckoo Avoidance and Minimization Measures

The following measures for western yellow-billed cuckoo will only be required for surface construction activities occurring between May 15 through September 1.

1. Prior to the construction, a noise expert will create a noise contour map showing the 60 dBA noise contour specific to the type and location of construction to occur in the area.

2. Two weeks prior to construction, a Service- and CDFW-approved biologist will conduct daily surveys, consistent with a Service- or CDFW-approved survey protocol (e.g., Halterman *et al*. 2015:9-42, or more current guidance), within 500 feet of suitable habitat where construction-related noise levels could exceed 60 dBA Leq (1 hour).

3. If a yellow-billed cuckoo is found, construction activities will be limited such that sound will not exceed 60 dBA within 500 feet of the habitat being used until the Service- and CDFW-approved biologist has confirmed that the bird has left the area.

4. If surveys find cuckoos in an area where vegetation will be removed, vegetation removal will be conducted when the Service- and CDFW-approved biologist has confirmed that cuckoos are not present within 500 feet of vegetation removal activities.

5. Portable and stationary equipment will be located, stored, and maintained as far as possible, with a minimum distance of 500 feet, from suitable western yellow-billed cuckoo habitat.

6. All lights will be screened and directed down toward work activities and away from migratory habitat. A biological monitor will ensure that lights are properly directed at all times during construction.

6.3.2.5 California Red-Legged Frog Avoidance and Minimization Measures

1. When each site is available for surveys, a Service-approved biologist will then delineate California red-legged frog habitat at each project site, based on an agreed upon definition of suitable habitat, including both aquatic and upland habitat.

2. Once habitat has been delineated, the qualified biologist will conduct preconstruction surveys performed using a method approved by the Service to determine whether California red-legged frog is present on the project site to enable further determination of compensatory mitigation requirements. In the event of a dry year, the aquatic habitat will be evaluated based on general suitability (e.g., evidence of suitable ponding depths, proximity to occurrences) and the habitat will be assumed to represent occupied habitat.

3. To the greatest extent possible, identified and delineated habitat will be completely avoided.

For areas verified as being suitable for California red-legged frog and that cannot be avoided, the following measures will be implemented.

4. To the extent practicable, initial ground-disturbing activities will not be conducted between September 1 and April 30, to avoid the wet season which encompasses breeding as well as potential upland migration before and after. Once the area has been surveyed, initial ground disturbance has occurred, and exclusionary fencing is in place, the seasonal restriction would not apply.

5. Ground-disturbing activities will be designed to minimize or eliminate effects on rodent burrows that may provide suitable cover habitat for California red-legged frog. Surface-disturbing activities will avoid areas with a high concentration of burrows to the greatest extent practicable. In addition, when a concentration of burrows is present in a work site, the area will be staked or flagged to ensure that work crews are aware of their location and to facilitate avoidance of the area.

6. All initial ground disturbance or vegetation removal (clearing) will be limited to periods of no or low rainfall (less than 0.08 inch per 24-hour period and less than 40% chance of rain). To the extent practicable, clearing activities within California red-legged frog habitat will cease 24 hours prior to a 40% or greater forecast of rain from the closest National Weather Service (NWS) weather station. Clearing may continue 24 hours after the rain ceases, if no more than 0.5 inch of precipitation is in the 72-hour forecast. If clearing must continue when rain is forecast (i.e., greater than 40% chance of rain), a Service-approved biologist will survey the work site before clearing begins each day rain is forecast. If rain exceeds 0.5 inch during a 24-hour period, clearing will cease until the NWS forecasts no further rain. Modifications to this timing may be approved by the Service based on site conditions and expected risks to California red-legged frog. For a given site that has exclusion fencing in place and all surface soil disturbance completed (i.e., no burrows present), these restrictions would no longer apply.

7. To the maximum extent practicable, nighttime construction will be minimized or avoided when working in suitable California red-legged frog habitat. To the greatest extent practicable, earthmoving and construction activities will cease no less than 30 minutes before sunset and will not begin again prior to no less than 30 minutes after sunrise. Except when necessary for driver or pedestrian safety, artificial lighting at a work site will be prohibited during the hours of darkness when working in suitable California red-legged frog habitat.

8. If work must be conducted at night within 300 feet of California red-legged frog habitat, all lighting will be directed away and shielded from California red-legged frog habitat outside the construction area to minimize light spillover to the greatest extent possible. If light spillover into adjacent California red-legged frog habitat occurs, a Service-approved biologist will be present during night work to survey for California red-legged frogs in areas illuminated by construction lighting. If California red-legged frog is found to be illuminated, the Service-approved biologist has the authority to terminate the project activities until the light is directed away from the frog's location, or the California red-legged frog moves out of the illuminated area.

9. At least 30 days prior to any ground disturbance activities, DWR will prepare and submit a relocation plan for Service's written approval. The relocation plan will contain the name(s) of the Service-approved biologist(s) to relocate California red-legged frogs, the method of relocation (if different from described), a map, and a description of the proposed release site(s) outside of exclusion fencing and within 300 feet of the work area or at a distance otherwise agreed to by the Service, and written permission from the landowner (if other than the State) to use their land as a relocation site.

10. When there is California red-legged frog habitat within 300 feet of construction activities, exclusion fencing will be installed along the perimeter of construction sites to protect California red-legged frog habitat and minimize the potential for frogs to enter the construction work area. The perimeter of construction sites will be fenced with fencing material suitable for excluding amphibians by no more than 14 days prior to the start of construction. The placement of exclusion fencing will be determined, in part, by the locations of suitable habitat for the species. A conceptual fencing plan will be submitted to the Service prior to the start of construction and the approved California red-legged frog exclusion fencing will be shown on the final construction plans. DWR, as project proponent, will include the amphibian exclusion fence specifications including installation and maintenance criteria in the bid solicitation package special provisions. The amphibian exclusion fencing will remain in place for the duration of construction and will be regularly inspected and fully maintained. The biological monitor and construction manager will be responsible for checking the exclusion fencing around the work areas each day of construction for wildlife trapped inside and to ensure that they are intact and upright. This will be especially critical during times of inclement weather that can damage the fencing. Repairs to the amphibian exclusion fence will be made within 24 hours of discovery of a breach. Where construction access is necessary, gates will be installed in the exclusion fence and fencing will direct animals away from the work area to the extent practicable (e.g., fencing will flare out and turn back toward suitable habitat).

11. Preconstruction surveys will be conducted by a Service-approved biologist immediately prior to the initiation of any ground-disturbing activities or vegetation clearing, including immediately prior to exclusion fence installation, in areas identified as having suitable California red-legged frog habitat. These surveys will consist of walking the work site limits. The Service-approved biologist will investigate all potential areas that could be used by the California red-legged frog for feeding, breeding, sheltering, movement, or other essential behaviors. If there is a lapse in construction in a work area for 7 days or more, these preconstruction surveys will be repeated before activities resume.

12. The Service-approved biologist will conduct clearance surveys at the beginning of each day and regularly throughout the workday when construction activities are occurring that may result in take of California red-legged frog. These surveys will consist of walking surveys within the work sites and investigating suitable aquatic and upland habitat including potential refugia habitat such as small woody debris, refuse, and burrow entrances, that are not directly disturbed by project activities.

13. If a California red-legged frog is encountered at any point within a work area, activities within a minimum of 25 feet of the individual will cease immediately and the construction manager and Service-approved biologist will be notified, and the biologist will observe and follow within 10 feet of the individual to ensure it has safely left the area. The frog will be allowed to leave the area of its own volition, and work may resume when it is no longer in harm's way. Depending on site-specific conditions, such as the use of heavy equipment, a larger protective buffer may be established, as determined by

the Service-approved biologist. If the frog does not move out of the area on its own, and it is determined by the Service-approved biologist that relocating the frog is necessary, these steps will be followed:

a. Prior to handling and relocation, the biologist will take precautions to prevent introduction of amphibian diseases by following guidance in *The Declining Amphibian Task Force Fieldwork Code of Practice* (https://www.fws.gov/sites/default/files/documents/declining-amphibian-task-force-fieldwork-code-of-practice.PDF), or the most up-to-date guidance available at that time. California red-legged frogs will also be handled and assessed according to the *Restraint and Handling of Live Amphibians* (U.S. Geological Survey National Wildlife Health Center 2001 as cited in the BA), or the most up-to-date guidance available at that time.

b. California red-legged frogs will be captured by hand, dipnet, or other Service-approved methodology, transported, and relocated to nearby suitable habitat outside but within 300 feet of the work area, or at a distance otherwise specified in the relocation plan described above, and released as soon as practicable the same day of capture per the relocation plan. Holding/transporting containers and dipnets will be thoroughly cleaned, disinfected, and rinsed with fresh water prior to use within construction areas. The Service will be notified within 24 hours of all capture, handling, and relocation efforts. Service-approved biologists will wear clean, new disposable surgical style (latex, nitrile, etc.) gloves and/or ensure that their hands are free of soaps, oils, creams, lotions, repellents, or solvents of any sort while capturing and relocating individuals. To avoid transferring disease or pathogens in handling of the amphibians, Service-approved biologists will follow the Declining Amphibian Populations Task Force's "Code of Practice" or the most up-to-date, agency-accepted guidance.

c. If an injured California red-legged frog is encountered and the Service-approved biologist determines the injury is minor or healing and the frog is likely to survive, the frog will be released immediately, consistent with the preapproved relocation plan as described above. The frog will be monitored until it is determined that it is not imperiled by predators or other dangers.

d. If the Service-approved biologist determines that the frog has major or serious injuries because of activities at the work site, the Service-approved biologist, or designee, will immediately take it to a Service-approved facility. If taken into captivity, the individual will not be released into the wild unless it has been kept in quarantine and the release is authorized by the Service. DWR will bear any costs associated with the care or treatment of such injured frogs. The circumstances of the injury, the procedure followed, and the final disposition of the injured animal will be documented in a written incident report. Notification to the Service of an injured or dead California red-legged frog in the project area will be reported within 24 hours and will include details such as whether or not its condition resulted from activities related to the PA. In addition, the Service-

approved biologist will follow up with USFWS within 2 calendar days of the finding. Written notification to the Service will include the following information: the species, number of animals taken or injured, sex (if known), date, time, location of the incident or of the finding of a dead or injured animal, how the individual was taken, photographs of the specific animal, the names of the persons who observed the take or found the animal, and any other pertinent information. Dead specimens will be preserved, as appropriate, and held in a secure location until instructions are received from the Service regarding the disposition of the specimen.

e. Work within suitable aquatic habitats will not begin until the habitat is dry or has been adequately surveyed and dewatered. Aquatic habitats that must be dewatered will be surveyed for California red-legged frogs prior to dewatering. Dewatering pumps will be screened with wire mesh not larger than 5 millimeters to prevent larvae from entering the pump. The biological monitor will be present during dewatering. Any California red-legged frogs found will be relocated per the relocation plan.

6.3.2.6 California Tiger Salamander Avoidance and Minimization Measures

1. When each site is available for surveys a Service- and CDFW- approved biologist will then delineate California tiger salamander habitat at each project site, based on the definition of suitable habitat, including both aquatic and upland habitat.

2. Once habitat has been delineated, the Service- and CDFW-approved biologist will use preconstruction surveys performed using a method approved by the Service and CDFW to determine presence of the species on the project site to enable further determination of compensatory mitigation requirements. In the event of a dry year, the aquatic habitat will be evaluated based on general suitability (e.g., evidence of suitable ponding depths, proximity to occurrences) and the habitat will be assumed to represent occupied habitat. In areas where ground disturbance will occur, grasses within suitable upland habitat will be mowed within 24 hours of clearance surveys to allow the biologist to see and survey for California tiger salamander and burrows. Light mowing equipment will be used and will only occur during the day in dry conditions when California tiger salamander is unlikely to be aboveground.

3. To the greatest extent possible, identified and delineated habitat will be completely avoided.

For areas verified as being suitable for California tiger salamander and that cannot be avoided, the following measures will be implemented.

4. To the extent practicable, initial ground-disturbing activities will not be conducted between November 1 and March 31, or extended to April 30 during wet years, in areas identified during the planning stages as providing suitable California tiger salamander habitat, to avoid the period when they are most likely to be moving through upland areas.

Once clearance surveys have been conducted, exclusionary fence is in place, the area has been surveyed, and initial ground disturbance has occurred, work within the disturbed area can occur outside the construction window (defined as April 1 through October 31 or, during wet years, May 1 through October 31).

5. If aquatic habitat is identified by the qualified biologist(s) within the project area southwest of Byron Highway, DWR will restrict construction activities to beyond 300 feet of breeding habitat, during the breeding season (November 1 through March 31, or extended to April 30 during wet years). Where aquatic habitat cannot be avoided by 300 feet during the breeding season, DWR will notify and coordinate with the Service and CDFW to implement site-specific avoidance and minimization measures. Where construction takes place in aquatic habitat during the nonbreeding season (April 1 through October 31, or delayed to May 1 during wet years), activities will not be initiated until after the habitat is no longer ponding water or until a Service- and CDFW-approved biologist has conducted clearance surveys of the aquatic habitat for presence of California tiger salamander and results have been submitted to the agencies. No work or dewatering will be allowed in occupied habitat. If a work site is to be temporarily dewatered by pumping, intakes will be completely screened with wire mesh not larger than 5 millimeters to prevent larger aquatic species from entering the pump system.

6. Ground-disturbing activities will be designed to minimize or eliminate effects on rodent burrows that may provide suitable cover habitat for California tiger salamander. Surface-disturbing activities will avoid areas with a high concentration of burrows to the greatest extent practicable. In addition, when a concentration of burrows is present in a work site, the area plus a 50-foot buffer will be staked or flagged to ensure that work crews are aware of their location and to facilitate avoidance of the area.

7. All initial ground disturbance or vegetation removal (clearing) will be limited to periods of no or low rainfall (less than 0.08 inch per 24-hour period and less than 40% chance of rain). DWR will avoid ground disturbance and vegetation removal during rainfall events and between sunset and sunrise. Clearing activities within California tiger salamander habitat will cease 24 hours prior to a 40% or greater forecast of rain from the closest NWS weather station. Clearing may continue 24 hours after the rain ceases, if no more than 0.5 inch of precipitation is in the 72-hour forecast. If clearing must continue when rain is forecast (greater than 40% chance of rain), a Service- and CDFW-approved biologist will survey the work site before clearing begins each day rain is forecast. If rain exceeds 0.5 inch during a 24-hour period, clearing will cease until the NWS forecasts no further rain. If this measure cannot be implemented as written or modifications to this timing is pursued, DWR will notify and coordinate with the agencies based on site conditions and expected risks to California tiger salamander. For a given site that has exclusion fencing in place and all surface soil disturbance completed (i.e., no burrows present), these restrictions would no longer apply. If there is a lapse in construction in a work area for 7 days or more due to weather conditions, preconstruction surveys will be repeated as described below.

8. To the extent practicable, earthmoving and construction activities will cease no less than 30 minutes before sunset and will not begin again until no less than 30 minutes after sunrise within 300 feet of California tiger salamander habitat. Except when necessary for driver or pedestrian safety, to the greatest extent practicable, artificial lighting at a work site will be prohibited during the hours of darkness.

9. At least 30 days prior to any ground-disturbing activities, DWR will prepare and submit a relocation plan for the Service's and CDFW's written approval. The relocation plan will contain the name(s) of the Service and CDFW-approved biologist(s) to relocate California tiger salamanders, the method of relocation (if different from described), a map, and a description of the proposed release site(s) within 300 feet of the work area or at a distance otherwise agreed to by the Service and CDFW, and written permission from the landowner (if other than the State) to use their land as a relocation site. The relocation plan will also include methods for searching for California tiger salamander (i.e., clearance surveys) in the work areas to avoid and minimize the potential for injury and mortality. Generally, work areas will be attempted to be cleared of California tiger salamanders by placing pit fall traps along the inside of the exclusion fence (i.e., within work areas) or by hand-excavating mammal burrows. Methods will be selected based on site-specific conditions in a given work area and will be approved by the Service and CDFW. Any California tiger salamanders found will be relocated according to the agency approved relocation plan and will follow the handling protocols outlined below.

10. When there is California tiger salamander habitat within 300 feet of construction activities, exclusion fencing will be installed along the perimeter of construction sites to protect California tiger salamander habitat and minimize the potential for salamanders to enter the construction work area. The perimeter of construction sites within 300 feet of California tiger salamander habitat will be fenced with fencing material suitable for excluding amphibians by no more than 14 days prior to the start of construction activities (e.g., staging, vegetation removal, grading) in a given area. The placement of exclusion fencing will be determined, in part, by the locations of suitable habitat for the species (defined above). A conceptual fencing plan will be submitted to the Service and CDFW prior to the start of construction and the approved exclusion fencing will be shown on the final construction plans. DWR will include the amphibian exclusion fence specifications including installation and maintenance criteria in the bid solicitation package special provisions. The amphibian exclusion fencing will remain in place for the duration of construction and will be regularly inspected and fully maintained. The biological monitor and construction manager will be responsible for checking the exclusion fencing around the work areas each day of construction for wildlife trapped inside and to ensure that they are intact and upright. This will be especially critical during times of inclement weather that could damage the fencing. Repairs to the amphibian exclusion fence will be made within 24 hours of discovery of a breach. Where construction access is necessary, gates will be installed in the exclusion fence and fencing will be installed to direct animals away from the work area to the extent practicable (e.g., fencing will flare out and turn back toward suitable habitat).

11. Preconstruction surveys will be conducted by a Service- and CDFW-approved biologist immediately prior to the initiation of any ground-disturbing activities or vegetation clearing, including immediately prior to exclusion fence installation, in areas identified as having suitable California tiger salamander habitat. These surveys will consist of walking surveys within the work sites and investigating suitable aquatic and upland habitat including potential refugia habitat such as small woody debris, refuse, burrow entrances, etc., that are not directly disturbed by project activities. If there is a lapse in construction in a work area for 7 days or more, these preconstruction surveys will be repeated before activities resume.

12. The Service- and CDFW-approved biologist will conduct clearance surveys within the construction work area at the beginning of each day and regularly throughout the workday when construction activities are occurring that may result in take of California tiger salamander. Surveys will be conducted in the same manner as the preconstruction surveys.

13. If a California tiger salamander is observed at any point within a work area, the Service- and CDFW-approved biologist will implement the following species observation and handling protocol. Only Service- and CDFW-approved biologists will participate in activities associated with the capture, handling, and monitoring of California tiger salamanders. If a California tiger salamander is encountered in a construction area, activities within a minimum of 25 feet of the individual will cease immediately and the construction manager and Service- and CDFW- approved biologist will be notified, and the biologist will observe and follow within 10 feet of the individual to ensure it has safely left the area. Depending on site-specific conditions, such as the use of heavy equipment, a larger protective buffer may be established, depending on site-specific conditions such as the use of heavy equipment, as determined by the Service- and CDFW- approved biologist. The California tiger salamander will be allowed to leave the area of its own volition, and work may resume when it is no longer in harm's way. All personnel on-site will be notified of the finding and no work will occur within a minimum of 10 feet of the California tiger salamander, or a larger buffer depending on site-specific conditions, without a Service- and CDFW-approved biologist present. If the salamander does not move out of the area on its own, and it is determined by the approved biologist that relocating the California tiger salamander is necessary, these steps will be followed.

    a. Prior to handling and relocation, the Service- and CDFW-approved biologist will take precautions to prevent introduction of amphibian diseases in accordance with the *Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander* (Service 2003), or the most up-to-date guidance available at the time. Disinfecting equipment and clothing is especially important when biologists are coming to the Action Area to handle amphibians after working in other aquatic habitats. California tiger salamanders will also be handled and assessed according to the *Restraint and Handling of Live Amphibians* (U.S. Geological Survey National

Wildlife Health Center 2001 as cited in the BA), or the most up-to-date guidance available at the time.

b. California tiger salamanders will be captured by hand, dipnet, or other Service- and CDFW-approved methodology, transported, and relocated to nearby suitable habitat outside of the work area and released as soon as practicable the same day of capture. Following the conditions of the relocation plan described in measure 9, individuals will be relocated outside of the exclusion fencing and at a distance no greater than 300 feet outside of the work area to areas with an active rodent burrow or burrow system (unless otherwise approved by the Service). Holding/transporting containers and dipnets will be thoroughly cleaned, disinfected, and rinsed with fresh water prior to use within the Action Area. Service and CDFW will be notified within 24 hours of all capture, handling, and relocation efforts. Service- and CDFW-approved biologists will wear clean, new disposable surgical style (nitrile, etc.) gloves and/or ensure that their hands are free of soaps, oils, creams, lotions, repellents, or solvents of any sort while capturing and relocating individuals. To avoid transferring disease or pathogens in handling of the amphibians, Service- and CDFW-approved biologists will follow the Declining Amphibian Populations Task Force's "Code of Practice" or the most recent guidance.

c. If an injured California tiger salamander is encountered and the Service- and CDFW-approved biologist determines the injury is minor or healing and the salamander is likely to survive, the salamander will be released immediately, consistent with the preapproved relocation plan as described in measure 9. The California tiger salamander will be monitored until it is determined that it is not imperiled by predators or other dangers.

d. If the Service- and CDFW-approved biologist determines that the California tiger salamander has major or serious injuries because of activities at the work site, the Service- and CDFW-approved biologist, or designee, will immediately take it to a Service- and CDFW-approved facility. If taken into captivity, the individual will not be released into the wild unless it has been kept in quarantine and the release is authorized by the Service. DWR will bear any costs associated with the care or treatment of such injured California tiger salamanders. The circumstances of the injury, the procedure followed, and the final disposition of the injured animal will be documented in a written incident report. Notification to Service and CDFW of an injured or dead California tiger salamander in the project area will be reported within 24 hours and will include details such as whether or not its condition resulted from activities related to the PA. In addition, the Service- and CDFW-approved biologist will follow up with the Service and CDFW within 2 calendar days of the finding. Written notification to the Service and CDFW will include the following information: the species, number of animals taken or injured, sex (if known), date, time, location of the incident or of the finding of a dead or injured animal, how the individual was taken, photographs of the specific animal, the names of the persons who observed the take or found the animal, and any other

pertinent information. Dead specimens will be preserved, as appropriate, and held in a secure location until instructions are received from the Service regarding the disposition of the specimen.

14. The Service- and CDFW-approved biologist will have the authority to stop activities at the work site if they determine that any of the avoidance and minimization measures are not being fulfilled.

15. If the exclusion fence is compromised during the rainy season, when California tiger salamanders are likely to be active, the fence will be repaired and a survey will be conducted immediately preceding construction activity that occurs in modeled or suitable California tiger salamander habitat, as determined by a Service- and CDFW-approved biologist, or in advance of any activity that may result in take of the species. The biologist will search along exclusion fences, and beneath vehicles each morning before they are moved. The survey will include a careful inspection of all potential hiding spots, such as along exclusion fencing; large, downed woody debris; and the perimeter of ponds, wetlands, and riparian areas. Any California tiger salamanders found will be captured and relocated according to the Service/CDFW-approved relocation plan.

16. If work must be conducted at night within 300 feet of California tiger salamander habitat, all lighting will be directed away and shielded from California tiger salamander habitat outside the construction area to minimize light spillover to the greatest extent possible. If light spillover into adjacent California tiger salamander habitat occurs, a Service- and CDFW-approved biologist will be present during night work to survey for burrows and emerging California tiger salamanders in areas illuminated by construction lighting. If California tiger salamander is found aboveground the Service- and CDFW-approved biologist has the authority to terminate the project activities until the light is directed away from the burrows, the California tiger salamander moves out of the illuminated area, or the California tiger salamander is relocated out of the illuminated area by the Service- and CDFW-approved biologist.

17. If requested before, during, or upon completion of ground disturbance and construction activities where suitable California tiger salamander habitat is present, DWR will require that the Service and CDFW can access and inspect the work site for compliance with the description of the project and avoidance and minimization measures, and to evaluate effects on the California tiger salamander and its habitat. A Service- and CDFW-approved biologist will be on-site during all activities that may result in take of California tiger salamander.

6.3.2.7 Giant Garter Snake Avoidance and Minimization Measures

1. When each site is available for surveys, a Service- and CDFW-approved biologist will then delineate giant garter snake habitat at each project site, including both aquatic and upland habitat. Suitability of aquatic and upland habitat characteristics will be determined by the biologist consistent with the description of suitable habitat defined in the BA.

2. Once habitat has been delineated, the biologist will use giant garter snake preconstruction surveys performed using a method approved by the Service and CDFW to determine presence of the species on the project site to enable further determination of compensatory mitigation requirements.

3. For sites where such surveys are performed, the surveys will conform to established protocols for giant garter snake surveys and all occurrence data gathered will be reported to the CNDDB and Service to add to the understanding of populations and occurrences for the species in the Delta.

To the greatest extent possible, identified and delineated habitat will be completely avoided. If the construction or restoration activity does not fully avoid effects on suitable habitat, the following measures will be implemented.

4. Initiate construction and conduct initial ground disturbance within suitable habitat in the summer months, between May 1 and October 1, and avoid giant garter snake habitat during periods of brumation (between October 1 and May 1). Suitability of aquatic and upland habitat characteristics will be determined by the biologist consistent with the description of suitable habitat defined in the BA. Once initial ground disturbance removing suitable habitat within a construction site has been conducted prior to September 15 and exclusionary fencing is in place, work within the cleared area can occur between October 1 and May 1.

5. To the extent practicable, as determined by project engineers and contractors, in coordination with the Service- and CDFW-approved biologist, conduct all activities within paved roads, farm roads, road shoulders, and similarly disturbed and compacted areas; confine ground disturbance and habitat removal to the minimal area necessary to facilitate construction activities.

6. At least 30 days prior to any ground-disturbing activities, DWR will prepare and submit a relocation plan for Service's and CDFW's written approval. The relocation plan will contain the name(s) of the biologist(s) to relocate giant garter snakes, the method of relocation (if different from described), a map, and a description of the proposed release site(s) within 300 feet of the work area or at a distance otherwise agreed to by the Service and CDFW, and written permission from the landowner (if other than the State) to use their land as a relocation site.

7. When there is giant garter snake habitat within 200 feet of construction activities, exclusion fencing will be installed along the perimeter of construction sites to protect giant garter snake habitat and minimize the potential for snakes to enter the construction work area. The perimeter of construction sites (except for work sites within areas of open water, like the Sacramento River) within or adjacent to giant garter snake habitat will be fenced with exclusion fencing by no more than 14 days prior to the start of construction activities (e.g., staging, vegetation removal, grading) in a given area. The placement of exclusion fencing will be determined, in part, by the locations of suitable habitat for the species. A conceptual fencing plan will be submitted to the Service and CDFW prior to

the start of construction and the approved exclusion fencing will be shown on the final construction plans. DWR, as project proponent, will include the exclusion fence specifications including installation and maintenance criteria in the bid solicitation package special provisions. The exclusion fencing will remain in place for the duration of construction and will be regularly inspected and fully maintained. The biological monitor and construction manager will be responsible for checking the exclusion fencing around the work areas each day of construction to ensure that they are intact and upright. This will be especially critical during times of inclement weather that can damage the fencing. Repairs to the exclusion fence will be made within 24 hours of discovery of a breach. Where construction access is necessary, gates will be installed in the exclusion fence and fencing will direct animals away from the work area to the extent practicable (e.g., fencing will flare out and turn back toward suitable habitat).

8. Immediately prior to the initiation of any vegetation clearing, ground-disturbing activities, and exclusion fence installation, the Service- and CDFW-approved biologist will survey suitable aquatic and upland habitat in the entire work site for the presence of giant garter snakes. Beginning no more than 7 days prior to initiating ground-disturbing activities during the active season (May 1 to October 1), the biologist shall conduct 2 days of walking preconstruction surveys within each construction site and a 3-foot boundary, surrounding the exclusion fencing, where access is allowed. If access is not allowed outside of the exclusion fencing, the biologist will conduct a visual survey of the 3-foot boundary from the edge of the exclusion fencing. The final preconstruction survey shall occur within 24 hours preceding exclusion barrier installation. If there is a lapse in construction in a work area for 7 days or more, these preconstruction surveys will be repeated before activities resume.

9. If exclusionary fencing is found to be compromised, a survey of the exclusion fencing and the area inside the fencing will be conducted immediately preceding construction activity that occurs in delineated giant garter snake habitat or in advance of any activity that may result in take of the species. The biologist will search along exclusionary fences, in pipes, and beneath vehicles before the vehicles are moved.

10. If a giant garter snake is found in the work area, activities within a minimum of 25 feet of the individual will cease immediately and the construction manager and Service- and CDFW-approved biologist will be notified, and the biologist will observe and follow within 10 feet of the individual to ensure it has safely left the area. Depending on site-specific conditions, such as the use of heavy equipment, a larger protective buffer may be established, as determined by the Service- and CDFW-approved biologist. The snake will be allowed to move of its own volition out of harm's way. If the snake does not move and it is deemed necessary to relocate the animal to prevent harm, the snake may be captured and relocated to suitable habitat a minimum of 200 feet outside of the work area in accordance with the relocation plan, prior to resumption of construction activity.

11. Within 24 hours prior to construction activities, and dredging, requiring heavy equipment, a Service- and CDFW-approved biologist will conduct a clearance survey of all the activity area not protected by exclusionary fencing where giant garter snake could

be present. This survey of the work area will be repeated if a lapse in construction or dredging activity of 2 weeks or greater occurs during the aestivation period (October 1 to May 1) or if the lapse in construction activity is more than 12 hours during active season (May 1 to October 1). If a giant garter snake is encountered during surveys or construction, cease activities until appropriate corrective measures have been completed, it has been determined that the giant garter snake will not be harmed, or the giant garter snake has left the work area.

12. The Service- and CDFW-approved biological monitor will help guide access and construction work around wetlands, active rice fields, and other sensitive habitats capable of supporting giant garter snake to minimize habitat disturbance and risk of injuring or killing giant garter snakes.

13. Store equipment in designated staging area areas at least 200 feet away from giant garter snake aquatic habitat to the extent practicable.

14. Visually check for giant garter snake under any vehicles or equipment that have been idle for more than 1 hour, or parked overnight, prior to moving the vehicles. Check any crevices or cavities in the work area where individuals may be present, including stockpiles that have been left for more than 24 hours where cracks/crevices may have formed.

For activities that will occur within suitable giant garter snake habitat during the giant garter snake inactive season (October 2 to April 30) and will last more than 2 weeks, DWR will implement the following additional avoidance and minimization measures.

15. All aquatic giant garter snake habitat will be dewatered between May 1 and October 1 (giant garter snake active season) to the extent that the area is no longer suitable giant garter snake habitat, as defined in the BA. Dewatering will be limited to the immediate construction area and will remain dry for at least 15 consecutive days prior to excavating or filling the dewatered habitat. The Service- and CDFW-approved biologist will be on-site during dewatering activities to salvage and relocate any snakes that cannot escape on their own. Dewatering is necessary because aquatic habitat provides prey and cover for giant garter snake; dewatering serves to remove the attractant and increase the likelihood that giant garter snake will move to other available habitat. Any deviation from this measure will be done in coordination with and with approval of the Service and CDFW.

16. Following dewatering of aquatic habitat, all potential impact areas that provide suitable aquatic or upland giant garter snake habitat will be surveyed for giant garter snake by the biologist. If giant garter snakes are observed, they will be passively allowed to leave the potential impact area. If the snake does not move of its own accord and it is determined necessary, the snake will be relocated in accordance with the approved relocation plan.

17. Once habitat is deemed free of giant garter snakes, exclusion fencing will be installed around the construction site so no snakes may reenter prior to or during construction.

6.3.2.8 Valley Elderberry Longhorn Beetle Avoidance and Minimization Measures

As properties become accessible for initiating project activities, DWR will require surveys for elderberry shrubs to be conducted in construction areas by a Service-approved biologist.

Elderberry shrubs will be avoided to the maximum extent practicable. Complete avoidance (i.e., no adverse effects) will be assumed when a buffer of at least 165 feet is established and maintained around elderberry shrubs containing stems measuring 1 inch or greater in diameter at ground level (Service 2017b).

Elderberry shrubs determined or assumed to be occupied, according to the criteria in the Service's 2017 *Framework for Assessing Impacts on Valley Elderberry Longhorn Beetle (Desmocerus californicus dimorphus)* (2017 Framework) (Service 2017b) or the most recent available guidance at that time, that are identified within project footprints that cannot be avoided (i.e., those in the project footprint) will be transplanted to conservation areas identified in the Compensatory Mitigation Plan (BA Appendix 3B). Transplanting will follow the guidance outlined in the 2017 Framework or the most recent available guidance at that time.

For shrubs not directly affected by construction but that occur within 165 feet of ground-disturbing activities, the following measures, which come from the 2017 Framework, will be implemented to avoid or substantially reduce the impact consistent with the recommendations by a Service-approved biologist.

1. Fencing. All areas to be avoided during construction activities will be fenced and flagged as close to construction limits as feasible.

2. Avoidance area. Activities that may damage or kill an elderberry shrub (e.g., trenching, paving, etc.) may need an avoidance area of at least 20 feet from the drip-line, depending on the type of activity.

3. Timing. As much as feasible, all activities that occur within 165 feet of an elderberry shrub, will be conducted outside of the flight season of the species (March to July).

4. Trimming. Trimming may remove or destroy valley elderberry longhorn beetle eggs and/or larvae and may reduce the health and vigor of the elderberry shrub. In order to avoid and minimize adverse effects on valley elderberry longhorn beetle, trimming will occur between November 1 and February 1 and will avoid the removal of any branches or stems that are ≥ 1 inch in diameter. Measures to address regular or largescale maintenance (trimming) should be established in consultation with the Service.

5. Chemical usage. Herbicides will not be used within the drip-line of an elderberry shrub. Insecticides will not be used within 100 feet of an elderberry shrub. All chemicals will be applied using a backpack sprayer or similar direct-application method.

6.3.2.9 Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp Avoidance and Minimization Measures

As properties become accessible for initiating project activities, planning-level surveys will be conducted to assess the suitability of modeled habitat and, where suitable, conduct protocol-level surveys for vernal pool fairy shrimp and vernal pool tadpole shrimp.

To the extent practicable, work areas will be designed to avoid habitat for vernal pool invertebrates, plants, and critical habitat for vernal pool fairy shrimp. Where practicable, the project will be planned and designed to avoid ground-disturbing activities or alterations to hydrology within 250 feet of vernal pool aquatic invertebrate habitat. Where activities need to occur within 250 feet of habitat, those work areas will be assessed for their potential to alter the hydrology of the pool habitat such that the hydroperiod of the pool will no longer support the species. Where the Service agrees that any changes to the hydroperiod will not permanently affect habitat functionality, compensatory mitigation would not be required.

To the extent practicable, DWR will minimize impacts on critical habitat for vernal pool fairy shrimp. To achieve this, project construction will occur at least 250 feet from vernal pool fairy shrimp critical habitat containing the primary constituent elements defined in the *Status of the Species and Critical Habitat* section below unless it is determined through Service review that the activities within the buffer will not substantially modify the primary constituent elements of vernal pool fairy shrimp critical habitat.

For suitable aquatic habitat for vernal pool fairy shrimp and vernal pool tadpole shrimp that will be affected by the project, protocol-level surveys for these species will be conducted to determine whether they are present or where time does not allow for surveys to be completed (e.g., dry years, timely access), the suitable habitat will be assumed to be occupied. Surveys will be conducted according to the most recent Service guidelines by Service-approved biologists with the appropriate recovery permit under section 10(a)(1)(A) of the Act.

Project elements will be designed to avoid direct and indirect effects on vernal pool aquatic invertebrate habitat to the extent practicable. Where avoidance is not possible, and construction occurs within 250 feet of vernal pool crustacean habitat, construction best management practices, as described in AMM-14: Construction Best Management Practices for Biological Resources, will be implemented to ensure that construction activities minimize effects on the habitat. Construction best management practices include protective fencing installed around vernal pool aquatic invertebrate habitat with signage identifying these areas as containing sensitive biological resources. A biological monitor will ensure that fencing and best management practices are maintained for the duration of construction and that construction personnel are provided the necessary worker awareness training.

6.3.2.10 Northwestern Pond Turtle Avoidance and Minimization Measures

1. When each site is available for surveys, a Service- and CDFW-approved biologist will then delineate northwestern pond turtle habitat at each project site, including both aquatic and upland habitat. Suitability of aquatic and upland habitat characteristics will be

determined by the biologist consistent with the description of suitable habitat defined in the BA.

2. Once habitat has been delineated, the biologist will use northwestern pond turtle preconstruction surveys performed consistent with a Service- or CDFW-approved survey protocol (U.S. Geological Survey 2006, or more current guidance) to determine presence of the species on the project site to enable further determination of compensatory mitigation requirements.

To the greatest extent possible, identified and delineated habitat will be completely avoided and activities will be conducted within paved roads, farm roads, road shoulders, and similarly disturbed and compacted areas. If the construction or restoration activity cannot fully avoid effects on suitable habitat, the following measures will be implemented.

3. Initiate construction and conduct initial ground disturbance in suitable upland habitat within 300 feet of suitable aquatic habitat prior to the start of nesting season (August 1–February 28) and avoid northwestern pond turtle upland habitat during periods of nesting and nestling emergence (between March 1–July 31). Suitability of aquatic and upland habitat characteristics will be determined by the biologist consistent with the description of suitable habitat defined in the BA. Once initial ground disturbance removing suitable habitat within a construction site has been conducted and exclusionary fencing is in place and maintained, work within the cleared area can occur throughout the year.

4. At least 30 days prior to any ground-disturbing activities that could result in take of northwestern pond turtle, DWR will prepare and submit a relocation plan for the Service's written approval. The relocation plan will contain the name(s) of the biologist(s) to relocate northwestern pond turtles or their nests, the method of relocation, a map, and a description of the proposed release site(s) that are a minimum of 300 feet outside of the work area or at a distance otherwise agreed to by the Service, and written permission from the landowner (if other than the State) to use the land as a relocation site. Any capture and handling of turtles will be done by a Service-approved biologist wearing clean, new disposable surgical style (e.g., nitrile) gloves.

5. Within 72 hours prior to the initiation of any vegetation clearing, ground-disturbing activities, and exclusion fence installation or modification, the Service- and CDFW-approved biologist will conduct a preconstruction survey within suitable aquatic and upland habitat in the entire work site for the presence of northwestern pond turtles or nests. These surveys will consist of walking the work site limits. The biologist will investigate all potential areas that could be used by northwestern pond turtle for feeding, basking, nesting, or other essential behaviors. If there is a lapse in construction of 7 days or more for work areas surrounded by exclusion fencing, these preconstruction surveys will be repeated before activities resume.

6. When there is northwestern pond turtle habitat within 300 feet of construction activities, exclusion fencing will be installed along the perimeter of construction sites to protect northwestern pond turtle habitat and minimize the potential for turtles to enter the

construction work area. The perimeter of construction sites (except for work sites within areas of open water, like the Sacramento River) within 300 feet of suitable northwestern pond turtle aquatic habitat will be fenced with exclusion fencing no more than 14 days prior to the start of construction activities (e.g., staging, vegetation removal, grading) in a given area. To the greatest extent feasible, exclusion fencing will be installed prior to the start of nesting season (March 1). The placement of exclusion fencing will be determined, in part, by the locations of suitable habitat for the species. A conceptual fencing plan will be submitted to the Service and CDFW prior to the start of construction and the approved exclusion fencing will be shown on the final construction plans. DWR, as project proponent, will include the exclusion fence specifications including installation and maintenance criteria in the bid solicitation package special provisions. The exclusion fencing will remain in place for the duration of construction and will be regularly inspected and fully maintained. Where openings need to be maintained, such as on the levee road, fencing will be installed to direct turtles away from the work area to the extent practicable (e.g., fencing will flare out and turn back toward the river and adjacent riparian). Where construction access is necessary, gates will be installed in the exclusion fence and fencing will direct animals away from the work area to the extent practicable (e.g., fencing will flare out and turn back toward suitable habitat).

7. The biological monitor and construction manager will be responsible for checking the exclusion fencing around the work areas each day of construction to ensure that they are intact and upright. Repairs to the exclusion fence will be made within 24 hours of discovery of damage. If exclusionary fencing is found to be compromised, the suitable habitat inside the fencing will be surveyed in advance of any activity that may result in take of the species. Following repairs, the biologist will search all potential areas that could be used by northwestern pond turtle for feeding, basking, nesting, or other essential behaviors, including along exclusion fencing and beneath vehicles before the vehicles are moved.

8. For work sites where exclusion fencing cannot be placed around the entire perimeter, the Service- and CDFW-approved biological monitor will help guide access and construction work around wetlands, ponds, and other sensitive habitats capable of supporting northwestern pond turtle to minimize habitat disturbance and risk of injuring or killing northwestern pond turtles.

9. The Service- and CDFW-approved biologist will conduct clearance surveys prior to the start of construction each day and regularly throughout the workday when construction activities are occurring that may result in take of northwestern pond turtle. Surveys will be conducted in the same manner as the preconstruction surveys.

10. If a northwestern pond turtle is encountered in a construction or restoration area, all personnel on-site will be notified and activities within a minimum of 25 feet of the individual will cease immediately, the construction manager and Service- and CDFW-approved biologist will be notified, and the biologist will observe and follow within 10 feet of the individual to ensure it has safely left the area. Depending on site-specific conditions, such as the use of heavy equipment or other activities that may cause harm to

the individual, as determined by the biologist, a larger protective buffer may be established. The turtle will be allowed to leave the area of its own volition out of harm's way. If the turtle does not move out of the area on its own, and it is determined by the biologist, in coordination with the construction manager that relocating the turtle is necessary to prevent harm, the turtle may be captured and relocated to suitable habitat a minimum of 300 feet outside the work area in accordance with the relocation plan, prior to resumption of construction activity.

11. Equipment must be stored in designated staging areas at least 300 feet away from northwestern pond turtle aquatic habitat to the extent practicable.

12. If a work site is to be temporarily dewatered by pumping during the northwestern pond turtle active season, intakes will be completely screened with wire mesh not larger than 5 millimeters to prevent juvenile northwestern pond turtles and other aquatic species from entering the pump system. Any turtles found in the dewatered area will be relocated according to the Service- and CDFW-approved relocation plan.

For proposed activities that will occur within suitable northwestern pond turtle aquatic habitat during the northwestern pond turtle inactive season (October 1 through February 28), DWR will implement the following additional avoidance and minimization measures.

13. All aquatic northwestern pond turtle habitat will be dewatered prior to the start of the inactive season (October 1) to the extent that the area is no longer suitable northwestern pond turtle habitat, as defined in the BA. Dewatering is necessary because aquatic habitat provides overwintering habitat for northwestern pond turtle; dewatering serves to remove the attractant and increase the likelihood that northwestern pond turtle will move to other available habitat. Pump intakes will be completely screened with wire mesh not larger than 5 millimeters to prevent juvenile northwestern pond turtle and other aquatic species from entering the pump system. Dewatering will be limited to the immediate construction area. The Service- and CDFW-approved biologist will be on-site during dewatering activities to salvage and relocate any turtles that cannot escape on their own according to the Service- and CDFW-approved relocation plan. Any deviation from this measure will be done in coordination with and with approval of the Service and CDFW.

14. Following dewatering of aquatic habitat, all potential impact areas that provide suitable aquatic or upland northwestern pond turtle habitat will be surveyed for northwestern pond turtle by the biologist. If northwestern pond turtles are observed, they will be allowed to move of their own accord or relocated in accordance with the approved relocation plan.

15. Once habitat is deemed free of northwestern pond turtles, exclusion fencing will be installed around the construction site so no turtles may reenter prior to or during construction.

6.3.2.11 Western Spadefoot Avoidance and Minimization Measures

1. When each site is available for surveys a Service-approved biologist will then delineate western spadefoot habitat at each project site, based on the definition of suitable habitat, including both aquatic and upland habitat. Suitability of aquatic and upland habitat characteristics will be determined by the biologist consistent with the description of suitable habitat defined in the BA.

2. Once habitat has been delineated, the biologist will use western spadefoot preconstruction surveys performed consistent with a Service-approved survey protocol to determine presence of the species on the project site to enable further determination of compensatory mitigation requirements.

3. To the greatest extent possible, identified and delineated habitat will be completely avoided and activities will be conducted within paved roads, farm roads, road shoulders, and similarly disturbed and compacted areas. If the construction or restoration activity cannot fully avoid effects on suitable habitat, the following measures will be implemented. Except for limited vegetation clearing necessary to minimize effects on nesting birds, initial suitable upland habitat clearance and disturbance will not be conducted between November 1 and March 31, with the period extending to April 30 during wet years. Once the initial ground disturbance has occurred, the area has been surveyed, and exclusionary fencing is in place, work in the disturbed area can occur outside the construction window (defined as April 1 through October 31 or, during wet years, May 1 through October 31).

4. Where construction or restoration activities take place in aquatic habitat, activities will not be initiated until after the habitat is no longer ponding water or until a Service-approved biologist has surveyed the aquatic habitat for presence of western spadefoot larvae. No work or dewatering will be allowed in occupied habitat. If a work site is to be temporarily dewatered by pumping, intakes will be completely screened with wire mesh not larger than 5 millimeters to prevent larger aquatic species from entering the pump system.

5. Ground-disturbing activities will be designed to minimize or eliminate effects on rodent burrows that may provide suitable upland habitat for western spadefoot. Surface-disturbing activities will avoid areas with a high concentration of burrows to the greatest extent practicable. In addition, when a concentration of burrows is present in a work site, the area plus a 50-foot buffer will be staked or flagged to ensure that work crews are aware of their location and to facilitate avoidance of the area.

6. All initial ground disturbance or vegetation removal (clearing) will be limited to periods of no or low rainfall (less than 0.08 inch per 24-hour period and less than 40% chance of rain). To the extent practicable, clearing activities within western spadefoot habitat will cease 24 hours prior to a 40% or greater forecast of rain from the closest NWS weather station. Clearing may continue 24 hours after the rain ceases, if no more than 0.5 inch of precipitation is in the 72-hour forecast. If clearing must continue when rain is forecast (greater than 40% chance of rain), a qualified biologist will survey the work site before

clearing begins each day rain is forecast. If rain exceeds 0.5 inch during a 24-hour period, clearing will cease until the NWS forecasts no further rain. For a given site that has exclusion fencing in place and all surface soil disturbance completed (i.e., no burrows present), these restrictions would no longer apply.

7. To the extent practicable, earthmoving and construction activities will cease no less than 30 minutes before sunset and will not begin again until no less than 30 minutes after sunrise within 300 feet of western spadefoot habitat. Suitability of aquatic and upland habitat characteristics will be determined by the Service-approved biologist consistent with the description of suitable habitat defined in the BA and by additional assessments conducted prior to ground disturbance. Except when necessary for driver or pedestrian safety, to the greatest extent practicable, artificial lighting at a work site will be prohibited during the hours of darkness.

8. At least 30 days prior to any ground-disturbing activities that could result in take of western spadefoot, DWR will prepare and submit a relocation plan for the Service's written approval. The relocation plan will contain the name(s) of the biologist(s) to relocate western spadefoot, the method of relocation, a map, and a description of the proposed release site(s) a minimum of 300 feet outside of the work area or at a distance otherwise agreed to by the Service and written permission from the landowner (if other than the State) to use their land as a relocation site.

9. When there is western spadefoot habitat within 300 feet of construction activities, exclusion fencing will be installed along the perimeter of construction sites to protect western spadefoot habitat and minimize the potential for spadefoot to enter the construction work area. The perimeter of construction and restoration sites within western spadefoot habitat will be fenced with fencing material suitable for excluding amphibians by no more than 14 days prior to the start of construction activities (e.g., staging, vegetation removal, grading) in a given area. The placement of exclusion fencing will be determined, in part, by the locations of suitable habitat for the species (defined above). A conceptual fencing plan will be submitted to the Service and CDFW prior to the start of construction and the approved exclusion fencing will be shown on the final construction plans. DWR will include the amphibian exclusion fence specifications including installation and maintenance criteria in the bid solicitation package special provisions. The amphibian exclusion fencing will remain in place for the duration of construction and will be regularly inspected and fully maintained.

10. The biological monitor and construction manager will be responsible for checking the exclusion fencing around the work areas each day of construction for wildlife trapped inside and to ensure that they are intact and upright. This will be especially critical during times of inclement weather that can damage the fencing. Repairs to the amphibian exclusion fence will be made within 24 hours of discovery of a breach. Where construction access is necessary, gates will be installed in the exclusion fence and fencing will direct animals away from the work area to the extent practicable (e.g., fencing will flare out and turn back toward suitable habitat). If the exclusion fence is compromised during the rainy season, a survey will be conducted immediately preceding construction

activity that occurs in suitable western spadefoot habitat, or in advance of any activity that may result in take of the species. The biologist will search along exclusion fences, and beneath vehicles each morning before the vehicles are moved. Surveys will be conducted in the same manner as the preconstruction surveys.

11. Preconstruction surveys will be conducted by a Service-approved biologist immediately prior to the initiation of any ground-disturbing activities or vegetation clearing, including immediately prior to exclusion fence installation, in areas identified as having suitable western spadefoot habitat. These surveys will consist of walking surveys within the work sites and investigating suitable aquatic and upland habitat including potential refugia habitat such as small woody debris, refuse, burrow entrances, etc., that are not directly disturbed by project activities. If there is a lapse in construction in a work area for 7 days or more, these preconstruction surveys will be repeated before activities resume.

12. The Service-approved biologist will conduct clearance surveys within the construction work area at the beginning of each day and regularly throughout the workday when construction activities are occurring that may result in take of western spadefoot. Surveys will be conducted in the same manner as the preconstruction surveys.

13. If a western spadefoot is encountered in a construction or restoration area, activities within a minimum of 25 feet of the individual will cease immediately, the construction manager and biological monitor will be notified, and the biological monitor will observe and follow the individual within 10 feet to ensure it has safely left the area. A larger protective buffer may be established, depending on site-specific conditions such as the use of heavy equipment, or other activities that may cause harm to the individual, as determined by the biological monitor. The spadefoot will be allowed to leave the area of its own volition out of harm's way. If the spadefoot does not move out of the area on its own, and it is determined by the biologist, in coordination with the construction manager that relocating the individual is necessary to prevent harm, the individual may be captured and relocated to suitable habitat a minimum of 300 feet outside the work area in accordance with the relocation plan, prior to resumption of construction activity.

    a. Prior to handling and relocation, the biologist will take precautions to prevent introduction of amphibian diseases by following guidance in *The Declining Amphibian Task Force Fieldwork Code of Practice* or the most up-to-date guidance available at the time. Western spadefoot will also be handled and assessed according to the Restraint and Handling of Live Amphibians (U.S. Geological Survey National Wildlife Health Center 2001 as cited in the BA) or the most up-to-date guidance available at the time.

    b. Western spadefoot will be captured by hand, dipnet, or other Service-approved methodology, transported, and relocated to nearby suitable habitat outside of the work area and released as soon as practicable the same day of capture.

6.3.2.12 Monarch Butterfly Avoidance and Minimization Measures

Prior to project construction, DWR will implement the following measures if surface ground disturbance will occur during the monarch butterfly breeding season (March 15 through October 31).

1. All areas that will be affected by construction activities will be surveyed for monarch adults, eggs, larvae, and chrysalids, and milkweed host plants according to the methodology below or in alignment with a future Service-approved methodology by a qualified biologist familiar with the identification and life histories of monarch butterfly and milkweeds.

    a. Preconstruction Surveys. Within one week prior to construction activity, the qualified biologist will perform meandering transects through the planned construction footprint, plus a 50-foot buffer where accessible, to visually survey the area for butterfly activity and presence of milkweed host plants. All milkweeds encountered will be inspected for presence of monarch butterfly eggs or larvae, and evidence of past caterpillar herbivory, which would indicate potential presence of chrysalids nearby.

    b. Notification. If any monarch butterfly eggs, larvae, or chrysalids are identified during preconstruction surveys, the location will be recorded with Global Positioning System (GPS) by the qualified biologist and will be reported to the Service within 48 hours.

    c. Unoccupied Milkweed Removal. If unoccupied milkweed plants (i.e., no eggs, larvae, or chrysalids present) are observed during preconstruction surveys, unoccupied plants within the disturbance footprint will immediately be cut to ground level and removed from the site to prevent monarch egg deposition. If new unoccupied milkweed plants are observed within the disturbance footprint after removal activities occur, then exclusion devices (such as mesh fencing or netting) will be installed to prevent monarchs from depositing eggs on emerging milkweeds that sprout after removal.

2. If only monarch butterfly adults are observed and no milkweed plants are found, or if all milkweed plants are unoccupied and immediately cut and maintained at ground level (effectively made unavailable for egg deposition), construction activities can proceed without a full-time biological monitor being present; however, if there is a lapse in initial construction disturbance greater than 2 weeks, an additional clearance survey will be made prior to ground disturbance. If monarch butterfly eggs, larvae, or chrysalids are found, a biological monitor will provide biological construction monitoring as long as necessary to ensure implementation of applicable measures below.

3. If monarch butterfly eggs, larvae, or chrysalids are discovered within the construction or restoration area, a protective buffer of 30 feet will be established around the observed location until it is no longer in use, as determined by the qualified biologist or biological monitor or until the project activities in the project area are complete, whichever is first.

4. If implementation of a 30-foot non-disturbance buffer is not possible but take of the individual can be avoided by implementing a non-disturbance buffer of less than 30 feet, a buffer of the greatest distance possible will be established in coordination with and approved by the Service prior to any ground disturbance, and ground disturbance can proceed under supervision of the qualified biologist.

5. If the individual cannot be avoided and mortality is likely to occur without intervention, an attempt will be made to relocate the individual, with review and approval by the Service and CDFW. If approved, a qualified biologist will attempt to relocate the individual to a suitable location outside the project footprint. A monarch butterfly relocation plan will be prepared and submitted to the Service for approval prior to ground disturbance. The relocation plan will describe the following: (a) how the different monarch life stages will be relocated; (b) who will conduct the relocation; where potential relocation sites will be located (i.e., as close to the existing location as feasible and with access to suitable habitat to sustain the individual through metamorphosis); and suitable habitat requirements.

6. If biological monitoring or surveys find a recently deceased monarch butterfly within the project area, the Service will be notified and the individual will be photographed and the date of observation, location, and suspected cause of mortality will be recorded.

7. Temporarily disturbed grassland will be reseeded as described in AMM-14, Construction Best Management Practices for Biological Resources (Appendix 3A, General Avoidance and Minimization Measures in the BA) with a seed mix that includes native milkweeds and nectar-producing plants commonly used as a food source by monarch butterfly.

Currently, there are no Service-approved survey protocols specific to monarch butterfly. Therefore, DWR proposes to use a project-specific methodology (as described), which includes the following major requirements: (1) surveyors are knowledgeable about the identification and biology of monarch butterfly life stages; (2) surveys are conducted at the appropriate time of year; and (3) suitable breeding habitat is surveyed prior to ground disturbance. If a survey methodology is developed specifically for determining presence or absence of breeding monarch butterfly and is approved by the Service, that methodology will be used.

6.4 Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources (CMP)

This section summarizes the Compensatory Mitigation Plan (CMP) as proposed in the BA's Appendix 3B. The CMP describes project-specific (enhancement of the initial mitigation sites at Bouldin Island and the I-5 ponds) and programmatic actions (tidal restoration and channel margin enhancement) that would be implemented to offset the impacts associated with the PA. See Appendix 3B for specific details. The CMP includes compensatory mitigation measures for each species, which are described in Attachment 3B.1, *Compensatory Mitigation Design Parameters* of the BA and are included by reference.

6.4.1 Bouldin Island Mitigation Sites

Three separate mitigation sites are proposed on Bouldin Island: B1, B2, and B3 (Figure 7-2). Sites B1 and B2 would support the creation and enhancement of extensive wetland habitat and other aquatic resources and would provide compensatory mitigation for losses to waters of the U.S. and State. They would be designed and managed specifically to fulfill Federal and state wetland mitigation requirements, while also providing suitable habitat for several special-status species. Mitigation Site B3 would support the creation of native perennial grassland habitat. The approximate total of created or enhanced habitat is 552.21 acres for Site B1, 94.30 acres for Site B2, and 309.78 acres for Site B3.

The following general sequence of anticipated construction activities for Mitigation Site B1 includes: (1) weed control; (2) wildlife protection; (3) site preparation; (4) earthmoving; (5) planting and seeding; (6) access improvements; and (7) optional water control structures.

Sites B2 and B3 near the center of Bouldin Island would be restored without excavation or grading. Mitigation Site B2 would expand and enhance existing riparian vegetation around an existing depression to create a larger patch of forested wetland through plantings. Mitigation Site B3 near the center of Bouldin Island would create grasslands through vegetation clearing and grubbing, soil preparation/disking, and planting with native grasses.

The mitigation sites would be built over a period of several years, with construction beginning once relevant permits and approvals have been acquired for the project. Construction would likely occur over a period of 2 to 4 years given the scale of the three mitigation sites on Bouldin Island. Each site would be protected in perpetuity under a conservation easement.

6.4.2 I-5 Ponds

DWR owns three rectangular former borrow pits near West Woodbridge Road and SR 12, known as I-5 Ponds 6, 7, and 8 (Figure 7-2). The proposed design at these sites would reconfigure the three ponds to develop compensatory habitat to mitigate project impacts on giant garter snake and other species. The approximate total of created or enhanced habitat is 181.49 acres for Pond 6, and 161.25 acres for Ponds 7 and 8. The following general sequence of anticipated construction activities for all three sites includes: (1) weed control; (2) wildlife protection; (3) site preparation; (4) earthmoving; (5) planting and seeding; (6) access improvements; (7) optional water control structures; and (8) culvert improvements.

The mitigation sites would be built out over a period of several years, with construction beginning once relevant permits and approvals have been acquired for the project. Each parcel would require approximately one construction season for initial establishment; however, the timing could overlap so various parcels would undergo restoration simultaneously. Construction would likely occur over a period of 2 to 4 years. Pond 6 would most likely be built first due to the abundance of upland habitat that could be created. Construction would likely occur on the Pond 7 site before the Pond 8 site given the site access constraints for Pond 8. Note that initial ground-disturbance activities would be conducted during the giant garter snake active season (May 1 to October 1) to minimize potential impacts on giant garter snake. Like the

Bouldin Island sites, the I-5 Pond sites would be protected in perpetuity under a conservation easement.

6.4.3 Mitigation Credits and Site Protection Instruments

The second approach of the CMP is to obtain credits from approved mitigation/conservation banks or to develop site protection instruments to meet mitigation needs for certain natural community types, including some types of wetlands and other waters, and for species.

Mitigation Credits from Approved Banks

The final amount of mitigation credits to be secured for aquatic resources and species habitats will be determined during the construction phase of the project, as preconstruction surveys have the potential to reduce mitigation needs. On-the-ground land cover surveys and presence/absence surveys will inform more precise impact calculations and may reduce the final mitigation articulated in Table 3B.S-1. Estimated Permanent Habitat Loss with the Proposed Action and Corresponding Mitigation Commitments for Special-Status Species in Appendix 3B. In some instances, reduced impact calculations may not result in changes to restoration design and implementation. However, as described in Section 3B.S.2 of Appendix 3B, mitigation implementation will stay ahead of the cumulative, permanent suitable habitat loss by 10%.

Site Protection Instruments

Another approach to provide on- or off-site mitigation is to use real estate protection instruments and other site protection instruments to ensure the long-term protection of a mitigation site. Examples include conservation easements, deed restrictions, transfer of title, or other documents such as Conservation Land Use Agreements. The site protection instrument would describe site ownership, management (e.g., vegetation or pest control, crop type requirements, water provisions for wildlife), and enforcement of any use restrictions (e.g., pesticide restrictions). Once the site protection instrument is drafted, DWR will share it with the appropriate agencies.

6.4.4 Tidal Habitat Mitigation Framework

Appendix 3B of the BA describes the general approach to identify and construct mitigation sites for channel margin and tidal wetland habitats as referenced in the 2024 LTO BiOp. As this will be fully analyzed in a subsequent consultation, please refer to the Appendix 3B for the description of these elements.

7. DESCRIPTION OF THE ACTION AREA

The Action Area is defined in 50 CFR § 402.02, as “all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action.” The Action Area for this BiOp is based on the PA elements described in the *Description of the Proposed Action* (and as described in the BA), including some for which exact locations and extent of the effects are not yet known. These components are addressed both standard and programmatically and will either rely on existing consultations or be subject to subsequent consultation or

reinitiation. Please note, the BA used a Study Area that is not the same as the Action Area and, at times, used the terms interchangeably. The Action Area identified in the main BA is much smaller than the Study Area and consists of the aquatic and terrestrial habitats within the footprint of the proposed facilities, which include the intakes in the north Delta, tunnel shafts, access roads, park-and-ride lots, and facilities associated with the proposed Bethany Complex, and Bouldin Island and I-5 Ponds initial mitigation sites. See Figures 7-1 and 7-2 for the general footprints for the DCP and initial mitigation sites.

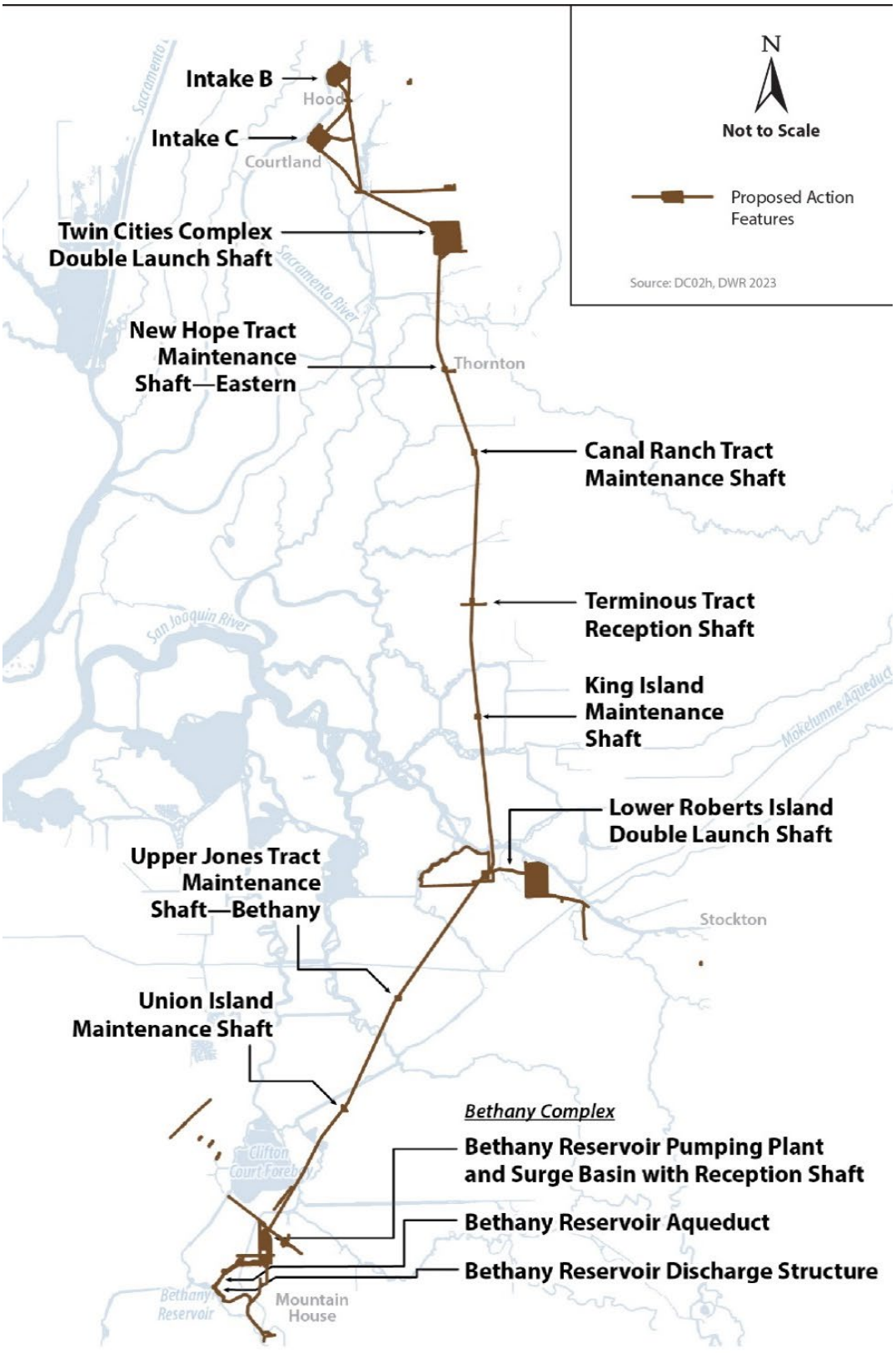

Figure 7-1. BA Figure 3.1-1 Bethany Reservoir Alignment Map

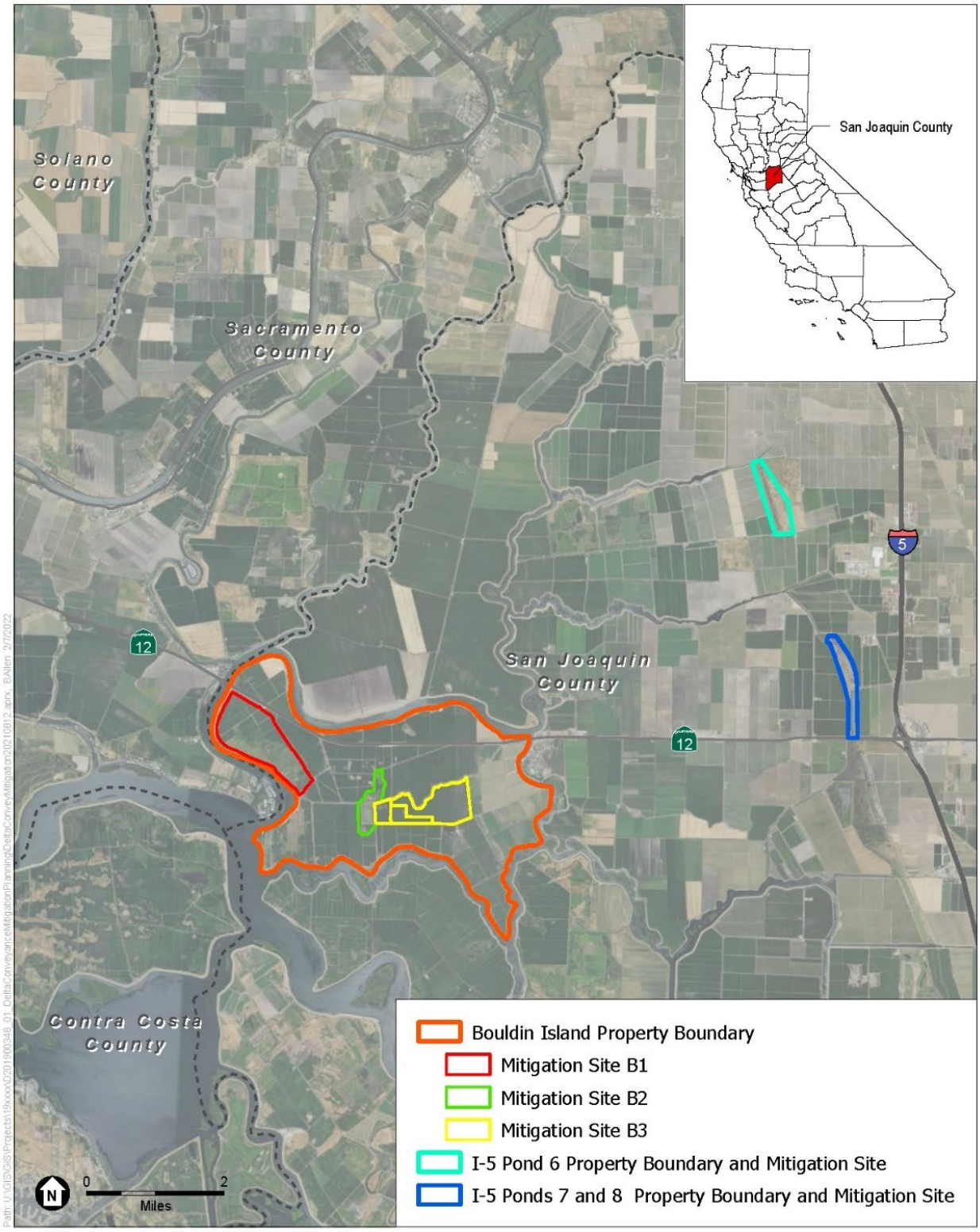

Figure 7-2. BA Figure 3B-1. Mitigation Site Locations

8. ANALYTICAL FRAMEWORK FOR THE JEOPARDY DETERMINATION

Section 7(a)(2) of the Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02).

The jeopardy analysis in this BiOp considers the effects of the proposed Federal action, and any cumulative effects, on the range-wide survival and recovery of the listed species. It relies on four components: (1) the *Status of the Species*, which describes the current range-wide condition of the species, the factors responsible for that condition, and its survival and recovery needs; (2) the *Environmental Baseline*, which analyzes the current condition of the species in the Action Area without the consequences to the listed species caused by the PA, the factors responsible for that condition, and the relationship of the Action Area to the survival and recovery of the species; (3) the *Effects of the Action*, which includes all consequences that are caused by the proposed federal action, including the consequences of other activities that are caused by the PA but that are not part of the action; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-federal activities in the Action Area on the species. The *Effects of the Action* and *Cumulative Effects* are added to the *Environmental Baseline* and in light of the status of the species, the Service formulates its opinion as to whether the PA is likely to jeopardize the continued existence of listed species.

9. ANALYTICAL FRAMEWORK FOR THE ADVERSE MODIFICATION DETERMINATION

Section 7(a)(2) of the Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to destroy or to adversely modify designated critical habitat. "Destruction or adverse modification" means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species (50 CFR 402.02).

The adverse modification analysis in this BiOp relies on four components: (1) the *Status of Critical Habitat*, which describes the current range-wide condition of the critical habitat in terms of the key components (i.e., essential habitat features, primary constituent elements, or physical and biological features) that provide for the conservation of the listed species, the factors responsible for that condition, and the intended value of the critical habitat overall for the conservation/recovery of the listed species; (2) the *Environmental Baseline*, which analyzes the current condition of the critical habitat in the Action Area without the consequences to designated critical habitat caused by the PA, the factors responsible for that condition, and the value of the critical habitat in the Action Area for the conservation/recovery of the listed species; (3) the *Effects of the Action*, which determines all consequences to designated critical habitat that are caused by the proposed federal action, including the consequences of other activities that are caused by the PA but that are not part of the action, on the key components of critical habitat that provide for the conservation of the listed species, and how those impacts are likely to influence

the conservation value of the affected critical habitat; and (4) *Cumulative Effects,* which evaluate the effects of future non-federal activities that are reasonably certain to occur in the Action Area on the key components of critical habitat that provide for the conservation of the listed species and how those impacts are likely to influence the conservation value of the affected critical habitat. The *Effects of the Action* and *Cumulative Effects* are added to the *Environmental Baseline* and in light of the status of critical habitat, the Service formulates its opinion as to whether the action is likely to destroy or adversely modify designated critical habitat. The Service's opinion evaluates whether the action is likely to impair or preclude the capacity of critical habitat in the Action Area to serve its intended conservation function to an extent that appreciably diminishes the rangewide value of critical habitat for the conservation of the listed species. The key to making that finding is understanding the value (i.e., the role) of the critical habitat in the Action Area for the conservation/recovery of the listed species based on the *Environmental Baseline* analysis.

10. STATUS OF THE SPECIES AND CRITICAL HABITAT

10.1 San Joaquin Kit Fox

The Service listed the San Joaquin kit fox on March 11, 1967 as endangered under the Endangered Species Preservation Act (Service 1967; https://www.fws.gov/sites/default/files/federal_register_document/FR-1967-03-11.pdf). Critical habitat has not been designated for this species. The species recovery strategy is described in the *Recovery Plan for Upland Species of the San Joaquin Valley, California*, along with 33 additional species of plants and animals that occur in the region (Service 1998). Please refer to the *Species Status Assessment Report for the San Joaquin Kit Fox* (*Vulpes macrotis mutica*) *Version 1.0* (SSA) (Service 2020a) for the current status of the species. No change in the species' listing status was recommended in the Service's most recent 5-year review (Service 2025a). Threats evaluated during that review and previous reviews have continued to act on the species since the review was published.

10.2 Least Bell's Vireo

The Service listed the least Bell's vireo as endangered on May 2, 1986 (Service 1986). Critical habitat was designated for least Bell's vireo on February 2, 1994, consisting of ten units across Santa Barbara, Ventura, Riverside, and San Diego counties (Service 1994a). Critical habitat does not occur within the Action Area; therefore, it will not be addressed further in this consultation. A Draft Recovery Plan was printed and distributed within and outside of the Service on May 6, 1998 (Service 1998b) This plan was never finalized and remains in draft form. A 5-year review was conducted in 2006 where a downlist to threatened status was recommended (Service 2006a). Please refer to the 2006 5-year review for the species description, life history, distribution, and habitat use.

10.3 Western Yellow-Billed Cuckoo

The Service listed the western distinct population segment (DPS) of the yellow-billed cuckoo (*Coccyzus americanus*) as threatened on October 3, 2014 (Service 2014). Critical habitat was

designated on April 21, 2021 (Service 2021) but does not occur in the Action Area. On September 16, 2020, the Service announced a 12-month finding on a petition to delist the western yellow-billed cuckoo DPS and concluded that delisting was not warranted at that time (Service 2020b). The information in the 12-month finding served as the 5-year review for the species and no change to the listing status was made. There is currently no Recovery Plan available for this species. Please refer to the Service's 2014 listing document for the species description, life history, distribution, and habitat use.

10.4 California Red-Legged Frog and Critical Habitat

California Red-Legged Frog

The Service listed the California red-legged frog (*Rana draytonii*) as threatened on May 23, 1996 (Service 1996) and designated critical habitat on May 17, 2010 (Service 2010). A recovery plan for the species was finalized on September 12, 2002 (Service 2002). For the most recent comprehensive assessment of the range-wide status for the California red-legged frog, please refer to the *California Red-Legged Frog 5-Year Review* (Service 2022; https://ecos.fws.gov /docs/tess/species_nonpublish/ 4021.pdf). No change in the listing status for the species was recommended in the 5-year review. Threats evaluated during that review and discussed in the final document have continued to act on the species since the December 2022 5-year review was finalized, with habitat loss and fragmentation, isolation of populations south of Santa Barbara County and in the Sierra Nevada, invasive predators, and climate change being the most significant effects.

California Red-Legged Frog Critical Habitat

The Service designated critical habitat for the California red-legged frog on April 13, 2006 (Service 2006b) and a revised designation to the critical habitat was published on March 17, 2010 (Service 2010). The PCEs defined for the California red-legged frog are: (1) aquatic breeding habitat; (2) aquatic non-breeding habitat; (3) upland habitat; and (4) dispersal habitat. The final revised critical habitat designation encompasses those areas containing the PCEs that are necessary to support one or more of the species' life history functions and that are laid out in the appropriate quantity and spatial arrangement essential to the conservation of the species. Because not all life-history functions require all the PCEs, not all areas designated as critical habitat will contain all the PCEs. Refer to the final designation of critical habitat for California red-legged frog for additional information (Service 2010).

10.5 California Tiger Salamander

The Service listed the Central California DPS of the California tiger salamander as threatened on August 4, 2004 (Service 2004). Critical habitat was designated in 2005; however, there is no designated critical habitat in the action area for the PA and will not be discussed further. The Service completed a recovery plan for the species on June 6, 2017 (Service 2017a). For the most recent comprehensive assessment of the range-wide status of the California tiger salamander, please refer to the California Tiger Salamander Central California Distinct Population Segment (*Ambystoma californiense*) 5-Year Review: Summary and Evaluation (Service 2023b). Threats

discussed in the final document have continued to act on the species, with loss of habitat being the most significant effect.

10.6 Giant Garter Snake

The Service listed the giant garter snake as a threatened species on October 20, 1993 (Service 1993). Critical habitat has not been designated for this species. A Draft Recovery Plan was proposed for the snake on July 2, 1999 (Service 1999) and published as the *Revised Draft Recovery Plan for the Giant Garter Snake* (Service 2015). A 5-year review was conducted in 2006 where no change of status was recommended (Service 2006c). Another 5-year review was conducted in 2012 where no change of status was recommended (Service 2012) and the most recent 5-year review was completed in June 2020 where again no change in status was recommended (Service 2020c). In 2017, the Service issued the final *Recovery Plan for the Giant Garter Snake* (*Thamnophis gigas*) (Service 2017c) (https://ecos.fws.gov/docs/recovery_plan/20170928_Signed%20Final_GGS_Recovery_Plan.pdf. Please refer to the 2017 Recovery Plan for the species' description, habitat preference, and life history and the most recent 5-year review for the most recent status assessment.

10.7 Delta Smelt and Critical Habitat

Delta Smelt

The Service listed the delta smelt as threatened on March 5, 1993 (Service 1993) and designated critical habitat for the species on December 19, 1994 (Service 1994b). The delta smelt was one of eight fish species addressed in the *Recovery Plan for the Sacramento–San Joaquin Delta Native Fishes* (Service 1996). A 5-year status review of the delta smelt was completed on March 31, 2004 (Service 2004). The review concluded that delta smelt remained a threatened species. A subsequent 5-year status review recommended uplisting delta smelt from threatened to endangered (Service 2010a). A 12-month finding on a petition to reclassify the delta smelt as an endangered species was completed on April 7, 2010 (Service 2010b). After reviewing all available scientific and commercial information, the Service determined that re-classifying the delta smelt from a threatened to an endangered species was warranted but precluded by other higher priority listing actions (Service 2010c). The Service reviews the status and uplisting recommendation for delta smelt during its Candidate Notice of Review (CNOR) process. Each year it has been published, the CNOR has recommended the uplisting from threatened to endangered. Electronic copies of these documents are available at https://ecos.fws.gov/ecp/species/321. Please refer to the 2022 delta smelt Species Assessment and Listing Priority Assignment Form of the CNOR for the status of the species. Electronic copies of this document are available at https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/publication/4119.pdf (Service 2023c).

The delta smelt is predominantly an annual fish meaning most individuals live about one year and die shortly after spawning in the late winter and spring. The Service now considers delta smelt a conservation-reliant species existing as an integrated hatchery-wild population (*Delta Smelt Supplementation Strategy Update* Service 2025b). For the past five years, most individuals

have completed a large majority of their life cycle in captivity at UC Davis' Fish Conservation and Culture Laboratory (FCCL; Lindberg *et al*. 2013). Most of the captive-reared individuals have been released back into the Delta after reaching an age of 200-300 days post hatch. The actual numbers of fish released in each of the past five years was 55,733 in Water Year (WY) 2022, 43,940 in WY2023, 91,468 in WY2024, and 124,946 in WY2025 and 163,349 in WY2026 (Service unpublished). Several thousand adult fish are retained at FCCL to be used as broodstock for the next year's production and a subset of these fish is held as a back-up refuge population at the Service's Livingston Stone National Fish Hatchery. Each year, a few released individuals have spawned in the wild to produce wild-born offspring. A few of those appear to have survived each year. For each of the previous five years, the number of captively-bred fish released into the Delta is believed to have been much higher than the number of wild-born fish that survived to adulthood.

Delta Smelt Critical Habitat

The Service designated critical habitat for the delta smelt on December 19, 1994 (Service 1994b). The geographic area encompassed by the designation includes all water and all submerged lands below ordinary high water and the entire water column bounded by and contained in Suisun Bay (including the contiguous Grizzly and Honker Bays); the length of Goodyear, Suisun, Cutoff, First Mallard (Spring Branch), and Montezuma sloughs; and the existing contiguous waters contained within the legal Delta (as defined in section 12220 of the California Water Code) (Service 1994b).

Conservation Role of Delta Smelt Critical Habitat

The Service's primary objective in designating critical habitat was to identify the key components of delta smelt habitat that support successful completion of the life cycle, including spawning, larval and juvenile transport, rearing, and adult migration back to spawning sites. Delta smelt are endemic to the Bay-Delta and the vast majority of wild-born individuals only live one year. Thus, regardless of annual hydrology, the Bay-Delta estuary must provide suitable habitat all year, every year but as detailed in the 2024 LTO BiOp and identified in the 2022 delta smelt Species Assessment and Listing Priority Assignment Form of the CNOR it no longer does (Service 2023c). The primary constituent elements (PCEs) considered essential to the conservation of the delta smelt as they were characterized in 1994 are physical habitat, water, river flow, and salinity concentrations required to maintain delta smelt habitat for spawning, larval and juvenile transport, rearing, and adult migration (Service 1994b). Please refer to the 2022 delta smelt Species Assessment and Listing Priority Assignment Form of the CNOR for the status of the PCEs at https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/publication/4119.pdf (Service 2023c).

10.8 Longfin Smelt

The Service listed the longfin smelt DPS as endangered on July 30, 2024 (Service 2024a). For the comprehensive assessment of the longfin smelt DPS, please refer to the listing rule at https://www.govinfo.gov/content/pkg/FR-2024-07-30/pdf/2024-16380.pdf#page=1 and the Species Status Assessment for the San Francisco Bay-Delta Distinct Population Segment of the

Longfin Smelt at https://ecos.fws.gov/ServCat/DownloadFile/253023 (Service 2024b). Critical habitat was proposed on January 15, 2025 (Service 2025c; https://www.govinfo.gov/content/pkg/FR-2025-01-15/pdf/2024-29641.pdf#page=1) but does not occur in the Action Area.

10.9 Valley Elderberry Longhorn Beetle

The valley elderberry longhorn beetle was listed as threatened throughout its range and critical habitat was designated on August 8, 1980 (Service 1980). Critical habitat for the valley elderberry longhorn beetle does not occur within the Action Area; therefore, it will not be addressed further in this biological opinion. The most recent recovery plan was published on October 4, 2019 (Service 2019). For the most recent comprehensive assessment of the range-wide status of the valley elderberry longhorn beetle, please refer to the species' 2023, *5-Year Review* (Service 2023a). Primary threats discussed in the 5-year review include destruction, modification, and curtailment of the insect's habitat or range, climate change, invasive plant species, ant predation, drought, and fires.

10.10 Vernal Pool Fairy Shrimp, Vernal Pool Tadpole Shrimp, and Vernal Pool Fairy Shrimp Critical Habitat

Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp

The Service listed the vernal pool fairy shrimp and vernal pool tadpole shrimp as threatened species on September 19, 1994 (Service 1994c) and revised critical habitat was designated on February 10, 2006 (Service 2006d). The status of the vernal pool fairy shrimp and vernal pool tadpole shrimp have been assessed in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Service 2005) (Recovery Plan) and 5-year reviews. For the most recent comprehensive assessment of the range-wide status of the vernal pool fairy and tadpole shrimp, please refer to the *Vernal Pool Fairy Shrimp (Branchinecta lynchi) Vernal Pool Tadpole Shrimp (Lepidurus packardi) Conservancy Fairy Shrimp (Branchinecta conservatio) 5-Year Review: Summary and Evaluation* (Service 2024c). Threats discussed in the original listing have continued to act on the species, with loss of habitat being the most significant effect.

Vernal Pool Fairy Shrimp Critical Habitat

The Service designated critical habitat for 4 vernal pool crustaceans, including vernal pool fairy shrimp, and 11 vernal pool plants in 34 counties in California and 1 county in southern Oregon in a final rule of August 11, 2005, and subsequently published species-specific critical habitat unit descriptions and maps on February 10, 2006 (Service 2006d).

The primary constituent elements of critical habitat for vernal pool fairy shrimp are the habitat components that provide: (1) Topographic features characterized by mounds and swales and depressions within a matrix of surrounding uplands that result in complexes of continuously, or intermittently, flowing surface water in the swales connecting the pools, providing for dispersal and promoting hydroperiods of adequate length in the pools; (2) depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter

rains and that continuously hold water for a minimum of 18 days, in all but the driest years; thereby providing adequate water for incubation, maturation, and reproduction. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands; (3) sources of food, expected to be detritus occurring in the pools, contributed by overland flow from the pools' watershed, or the results of biological processes within the pools themselves, such as single-celled bacteria, algae, and dead organic matter, to provide for feeding; and (4) structure within the pools consisting of organic and inorganic materials, such as living and dead plants from plant species adapted to seasonally inundated environments, rocks, and other inorganic debris that may be washed, blown, or otherwise transported into the pools, that provide shelter.

10.11 Northwestern Pond Turtle

The Service proposed to list the northwestern pond turtle as a threatened species on October 3, 2023 with a section 4(d) rule (Service 2023d). The proposed listing can be found at 2023-21685.pdf. At this time, a final listing determination has not been issued. Critical habitat has not yet been proposed and no recovery plan has been developed for the northwestern pond turtle. In April 2023, the Service published a species status assessment report for northwestern pond turtle and southwestern pond turtle. Please refer to the 2023 species status assessment (Service 2023e) and the listing proposal for a comprehensive assessment of the species' range-wide status, life history, and habitat preferences.

10.12 Western Spadefoot

In 2005, the Service issued the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Service 2005) which included western spadefoot as a species of concern. This recovery plan was for multiple plant and animal species, using an ecosystem-level approach because many of the listed species and species of concern co-occur in the same natural ecosystem and share the same threats. The Service proposed to list both the northern and southern DPSs of the western spadefoot as threatened on December 4, 2023 (Service 2023f). For a current and comprehensive assessment of the northern DPS of the western spadefoot, please refer to the proposed listing rule at https://www.govinfo.gov/content/pkg/FR-2023-12-05/pdf/2023-26579.pdf#page=1 and the *Species Status Assessment Report for Western Spadefoot* (*Spea hammondii*) Version 1.1 at https://iris.fws.gov/APPS/ServCat/DownloadFile/238764 (Service 2023g).

10.13 Monarch Butterfly

The Service proposed to list the monarch butterfly as threatened and designate critical habitat on December 12, 2024 (Service 2024d). For a comprehensive assessment of the monarch butterfly, please refer to the proposed listing rule at https://www.govinfo.gov/content/pkg/FR-2024-12-12/pdf/2024-28855.pdf#page=1 and the *Monarch Butterfly (Danaus plexippus) Species Status Assessment Report, Version 2.3* at https://iris.fws.gov/APPS/ServCat/DownloadFile/263030 (Service 2024d).

11. ENVIRONMENTAL BASELINE

Environmental Baseline refers to the condition of the listed species or its designated critical habitat in the Action Area, without the consequences to the listed species or designated critical habitat caused by the PA. The environmental baseline includes the past and present impacts of all federal, State, or private actions and other human activities in the Action Area, the anticipated impacts of all proposed federal projects in the Action Area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The impacts to listed species or designated critical habitat from ongoing federal agency activities or existing federal agency facilities that are not within the agency's discretion to modify are part of the *Environmental Baseline*.

11.1 General Environmental Conditions

11.1.1 Intakes and Aquatic Delta within the Action Area

The leveed, channelized reaches of the Sacramento River near the proposed north Delta intakes primarily function as a listed fish migration corridor. The physical and biological features of migration and rearing habitat for listed fish species have been degraded from historical conditions. The temporary and permanent footprints of the intake facilities are characterized by steep, riprap-armored levee slopes with low quantities of overhanging and instream woody cover. Vegetation densities are low and much of the levee slope is unshaded. Shallow water is limited to a narrow band along the steep levee slope and there is no off-channel or floodplain habitat.

The Interagency Ecological Program (IEP) conducts various aquatic monitoring and research studies in the Delta. The Service has issued several consultations/amendments over the lifetime of the program including the most recent one in 2024 for the longfin smelt DPS (Service file numbers: 2024-0052290-S7-001, 1-1-98-F-1296, 1-1-96-F-91, 1-1-95-FW-38). Some studies like the Georgiana Slough Salmonid Migratory Barrier Project have separate consultations (Service file number: 2022-0012599-S7-001).

11.1.2 Bethany Complex

The Bethany Conservation Easement area is part of multi-agency mitigation requirements for the South Bay Aqueduct Improvement and Enlargement Project (Service file numbers: 1-1-05-F-0028, 1-1-06-F-0129, 81420-2008-F-1422-2) managed for wetlands, San Joaquin kit foxes, California red-legged frogs, California tiger salamanders, and burrowing owls (*Athene cunicularia*).

In addition to the conservation easement on the Bethany parcel that is being impacted, other protected habitats occur within and adjacent to the Action Area. The Mountain House Conservation Bank, just north of the Bethany Reservoir, was established on July 24, 2012, for the purpose of preserving habitat for several State and/or federally listed species. The federally listed species include the California tiger salamander, San Joaquin kit fox, California red-legged frog, and vernal pool fairy shrimp. North of the Mountain House Conservation Bank is the sold-out Byron Conservation Bank that had State credits for the California tiger salamanders, San

Joaquin kit foxes, and California red-legged frogs. Figure 11.2-3 illustrates the Bethany Complex and the conservation easement areas.

In 2015 and 2020 the Service issued a biological opinion and reinitiated biological opinion for DWR's Bethany Dams Improvements Project (Service file numbers: 08ESMF00-2014-F-0664 and 08ESMF00-2014-F-0664-R001). DWR compensated for effects by purchasing credits at Mountain House Conservation Bank. In 2017, the Service issued a biological opinion on DWR's Bethany Dam Sediment Removal Project (Service file number: 08ESMF00-2017-F-0115).

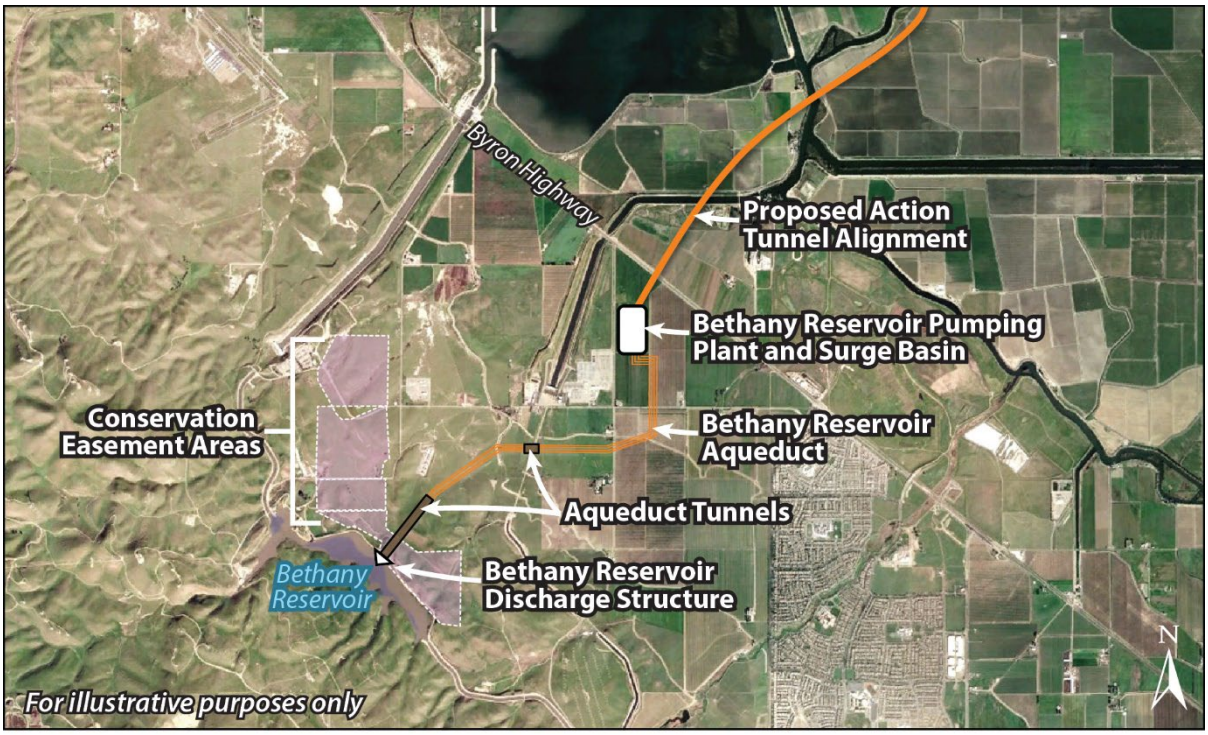

Figure 11.2-3. Bethany Reservoir Aqueduct Route with Tunnel Reaches (Figure 3.2-8 in BA)

11.1.3 Bouldin Island

Bouldin Island, owned by the Metropolitan Water District of Southern California, is an approximately 5,900-acre island that is bounded to the north by the South Mokelumne River, to the east by Little Potato Slough, to the south by Potato Slough, and to the west by the Mokelumne and San Joaquin Rivers. SR 12 crosses the northern part of Bouldin Island. A swing bridge over the Mokelumne River on SR 12 connects the northwestern part of the island to Andrus Island. Near the northeastern tip of Bouldin Island, a high-level bridge on SR 12 spans Little Potato Slough, connecting the island to the small community of Terminous. Currently the island consists of roughly 98% farmland with the remaining 2% being wetlands, riparian, or open water habitat. Site elevations on Bouldin Island range from -24 feet NAVD 88 to 19 feet NAVD 88, with an average elevation of -13 feet NAVD 88. Current land use is predominately agricultural, including corn, alfalfa, and row crops. The land is leased to farmers for this production, with primary farming activities taking place between March and November of each

year. Fields are typically flooded in the winter months for soil management, weed control, stubble decomposition, and duck hunting.

Mitigation Site B1 is located near the northwest corner of the island, just south of SR 12. The site is currently dominated by agricultural fields (primarily row crops) as well as seasonal wetlands within the farmed fields. Ditches and maintenance roads are also present. It is bounded by the perimeter levee to the west, SR 12 to the north, and irrigation ditches to the south and east. Mitigation Site B2 and Mitigation Site B3 are near the center of the island. Mitigation Site B2 contains a mixture of agricultural fields, patches of valley/foothill riparian habitat, and open water (remnants of a borrow pit). Mitigation Site B3 includes agricultural fields and roads.

11.1.4 I-5 Ponds

DWR owns three rectangular former borrow pits near West Woodbridge Road and SR 12, known as I-5 Ponds 6, 7, and 8. They are located within the White Slough Wildlife Area and within 2 miles of Woodbridge Ecological Reserve. The three ponds, totaling approximately 345 acres, were excavated between 1974 and 1978 to provide fill for freeway construction. Currently, all three ponds are managed under an interagency agreement with CDFW as Class C wildlife areas that are open to the public for hunting and fishing. The borrow pits are fed by groundwater and via periodic overland flow from precipitation, irrigation runoff, and high canal flows, creating three perennial ponds characterized by deep open water, steep vegetated banks, and relatively flat adjacent uplands.

11.2 Species

Due to access issues, DWR did not conduct on-the-ground habitat assessments for the BA but instead developed habitat suitability models primarily using land cover data from existing geographic information system (GIS) data sources. The species models likely include habitat that may not be suitable or is unoccupied, they provide a conservative estimate of potentially suitable habitat.

11.2.1 San Joaquin Kit Fox

Within the Action Area, the range of the species is limited to areas of suitable habitat generally around Bethany Reservoir. There are 55.90 acres of modeled habitat that overlap with the project footprint, 55.63 acres of which are modeled low-quality habitat, 0.08 acre of which is modeled moderate-quality habitat, and 0.19 acre of which is modeled high-quality habitat.

Bethany Reservoir is part of the Livermore analysis unit and is noted to be in very low condition as showing “no evidence of a current population” and having records that are over 10 years old (Service 2020a). There are historical CNDDB occurrences that overlap with the Action Area (CDFW 2025). These occurrences are generally to the west of Clifton Court Forebay and consist of observations that range from 1972 to 2000. Some observations consist of observed tracks and others consist of adult and juvenile observations. The most recent occurrence from 2000 (#34) consists of an observation of dens (not adults), hearing a “yip,” and frequent observations by Western Area Power Authority employees (CDFW 2025). A non-CNDDB verified 2015

observation was reported in the *Tracy Hills Habitat Conservation Plan* (ICF 2020) in the California Aqueduct right-of-way. The BA notes surveys and monitoring conducted between 2009 and 2017, and again in 2021, to the east and west of Bethany Reservoir, which included den surveys and trail camera use, did not detect San Joaquin kit fox in these areas (California Department of Water Resources 2021; Environmental Science Associates 2017 as cited in the BA). Based on this information, there is low potential for San Joaquin kit fox to be present in the Action Area. However, because the Action Area maintains some connectivity with the region south of San Luis Reservoir where San Joaquin kit fox persist, it is assumed that there remains some potential for dispersing individuals to occur in the Action Area, and permanent protection of suitable San Joaquin kit fox habitat, such as the Bethany Conservation Easement and Mountain House Conservation Bank, occurs within the Action Area.

11.2.2 Least Bell's Vireo

In recent years, there have been a number of observations of adult least Bell's vireos and nesting activity in central and northern California, indicating the species is attempting to recolonize the Central Valley. Additionally, recent modeling of habitat suitability suggests that parts of the Central Valley are highly suitable for least Bell's vireos (Klicka *et al.* 2016). However, the least Bell's vireo population in Central and Northern California has remained very low. Limited suitable habitat between the species' stronghold in the riparian corridors of southern California and suitable restored habitats in the Central Valley may be limiting the ability of the species to disperse and recolonize the northern extent of its historic range. Major contributing factors to the loss of riparian habitat throughout the Action Area include hydrologic regulation and decreased flows in rivers from dams, in-channel water diversions, and groundwater pumping, construction of flood control levees and bank protection, conversion of riparian zones to agriculture and grazing, timber harvest, mining, and urbanization (Katibah 1984; Dybala *et al.* 2017).

The DCP BA modeled suitable riparian habitat within the Action Area and the larger Study Area. Riparian corridors within the Action Area currently have the potential to support populations of least Bell's vireo during breeding and migration (Howell *et al.* 2010; Klicka *et al.* 2016). Least Bell's vireos rarely over-winter in California and are not anticipated to regularly occupy habitat in the Action Area between November and March. Based on recent observations of attempted and successful breeding, restored and managed riparian habitats along the San Joaquin and Sacramento Rivers are currently playing an important role in the dispersal of the species from southern California back into its historic range in the Central Valley. While the species does not have a final recovery plan, the Service has established delisting criteria, including "stable or increasing least Bell's vireo populations/metapopulations, each consisting of several hundred or more breeding pairs, having become established and are protected and managed at the following sites: Salinas River, a San Joaquin metapopulation, and a Sacramento Valley metapopulation" (Service 1998a, Service 2006a). While it is possible that a few more least Bell's vireo breeding territories are dispersed across the region than what has been reported, this delisting criterion is far from being met. The Service has not yet completed a population viability analysis (PVA) for least Bell's vireo, nor a final recovery plan. However, researchers have attempted to model the potential response of the least Bell's vireo population within the Action Area to large-scale riparian restoration. Dybala *et al.* (2017) estimated that the population of least Bell's vireos

across the Sacramento Valley, San Joaquin Valley, Tulare Basin, and Yolo Basin-Delta could increase to between 1,000 and 10,000 individuals within 10 years if 31,923 acres (12,919 hectares) of riparian habitat were restored. The researchers also predicted the species could be become resilient within 100 years if 460,848 acres (186,499 hectares) were restored (Dybala *et al.* 2017). Within the Action Area, the least Bell's vireo is likely in the beginning phases of reoccupation of its Central Valley breeding habitat from which it has been extirpated since the 1970s. If existing and permitted (but not yet implemented) Federal actions to restore riparian habitat within the Central Valley are successful in creating and maintaining suitable habitat for the least Bell's vireo, the Service expects the species' numbers to increase in the Action Area.

11.2.3 Western Yellow-Billed Cuckoo

The western yellow-billed cuckoo is known to have been historically common in riparian habitat throughout the Central Valley, from Kern County north to Redding (Laymon 1998). While the species has been detected in watersheds near the Action Area, only the Sacramento River Valley is believed to currently sustain breeding populations at isolated sites along the Sacramento River and Sutter Bypass between Red Bluff and Colusa (Laymon and Halterman 1989; Laymon 1998; Halterman 2001; Hammond 2011; Dettling 2014; Stanek 2014; Parametrix Inc. and Southern Sierra Research Station 2015).

The DCP BA contains a description of modeled suitable habitat within the Action Area and the larger Study Area. Most of the riparian habitat in the Action Area tends to be more narrow and linear than in the mainstem Sacramento River between Red Bluff and Colusa where the cuckoo is more frequently detected and where breeding/nesting typically occurs. Based on sightings in and around the proposed Action Area, cuckoos likely use locations throughout the Action Area as stop-over habitat for feeding, resting, and sheltering during their migration from Mexico to the Upper Sacramento River. As suitable nesting habitat exists, it is possible for cuckoos to breed and nest in the Action Area; however, the cuckoo is not known to actively use habitat within the Action Area for nesting.

11.2.4 California Red-Legged Frog and Critical Habitat

California Red-Legged Frog

Within the Action Area, the range of the species is limited to areas of suitable habitat generally around Clifton Court Forebay and Bethany Reservoir and is within the South and East San Francisco Bay Recovery Unit. Bethany Reservoir in the East San Francisco Bay Core Area of the larger recovery unit. There are multiple occurrences in this region, including extant populations in and adjacent to Italian Slough, Byron-Bethany Irrigation District Canal, and along the northeast border of Bethany Reservoir (CDFW 2020). Byron Highway, which runs northwest to southeast along the southwest border of Clifton Court Forebay, is considered a somewhat permeable barrier to California red-legged frog movement. Also, habitat quality is assumed to decrease west to east, between Bethany Reservoir and Clifton Court Forebay, as the density of artificial water conveyance infrastructure and agricultural land cover types increase, and occurrences decrease. The DCP BA includes modeled 148 acres of aquatic, 668 acres of upland, and 21,580 acres of their defined dispersal habitat within this area.

California Red-Legged Frog Critical Habitat

The Bethany Reservoir Aqueduct, Bethany Reservoir Discharge Structure, access road to the Bethany Reservoir Discharge Structure, and underground SCADA fiber routes overlap with critical habitat unit CCS-2B for California red-legged frog. There are over 1.6 million acres of designated critical habitat for California red-legged frog, and approximately 44,470 acres of critical habitat in Unit CCS-2B. Unit CCS-2B contains PCEs 1-4.

11.2.5 California Tiger Salamander

Within the Action Area, the range of the species is limited to areas of suitable habitat generally around Clifton Court Forebay and Bethany Reservoir. The DCP BA modeled suitable habitat within the Action Area and the larger Study Area. The DCP footprint overlaps with modeled habitat in the southwestern part of the Action Area, west, south, and southwest of Clifton Court Forebay, where there are known, extant California tiger salamander CNDDB occurrences in the Central Valley Recovery Unit (CDFW 2020; Service 2017a).

11.2.6 Giant Garter Snake

The Action Area includes the sub-population in the Delta Basin Population and Recovery Unit as defined in the Recovery Plan for Giant Garter Snake (Service 2017c). The Delta Basin includes portions of Sacramento, Yolo, Solano, Contra Costa, and San Joaquin counties. A large portion of the Sacramento-San Joaquin Delta area has not been comprehensively surveyed for the giant garter snake, primarily because the majority of land is privately owned. There are numerous CNDDB records of giant garter snakes throughout the Action Area (CDFW 2025). The population status of giant garter snakes in the Delta is relatively undetermined and likely underestimated because sightings are sporadic in time and distance. The DCP BA includes a description of modeled suitable habitat within the Action Area and the larger Study Area.

Habitat has also been preserved, created, or restored in the Action Area. Projects such as the Sherman Island Whale's Mouth Wetland Restoration Project (Service File No. 08FBDT00-2014-F-0027) restored approximately 600 acres of palustrine emergent wetlands and the Twitchell Island East End Habitat Restoration Project (Service File No. 08FBDT00-2013-I-0013) restored approximately 740 acres of palustrine emergent wetlands in the western portions of the Sacramento-San Joaquin Delta. There are various section 7 consultations with biological opinions for giant garter snake that occur throughout the Action Area. Large scale habitat restoration projects such as the Prospect Island Habitat Restoration Project (Service File No. 08FBDT00-2018-F-0069) and the Lookout Slough Habitat and Restoration Project (Service File No. 08FBDT00-2020-F-0181) are in stages of converting portions of terrestrial habitat that could be utilized by giant garter snake to primarily aquatic habitats for fish species and upland habitat for giant garter snake. The Corps dredges the Sacramento and Stockton Deep Water Shipping Channels annually and deposits the dredged material into landside placement sites throughout the Delta that have or are near suitable habitat for giant garter snake (Service File Nos. 08FBDT00-2017-F-0098, 08FBDT00-2017-F-0099). Several flood protection projects such as the Twitchell Island Levee Improvement Project (08FBDT00-2015-F-0023) and the North Mokelumne River

Multi-Benefit Project (Service File No. 2024-0048110-S7-001) proposed to repair or build new levees that have or were near suitable giant garter snake habitat.

11.2.7 Delta Smelt and Critical Habitat

Delta Smelt

Historically, surveys conducted within the Sacramento River reach of the proposed intake locations indicate few delta smelt were found in that vicinity. As discussed in the *Status of the Species,* delta smelt are now a conservation reliant species and have not been detected in recent surveys in this area of the Sacramento River. Since experimental releases began in December of 2021, the Service has not collected any delta smelt in the Sacramento River between the American River confluence and Isleton despite considerable sampling effort (more than 900 beach seine hauls and more than 6,400 trawl tows; Lodi Fish and Wildlife Office, unpublished data). The Service has previously concluded delta smelt used this area, but our recent information provides no evidence that they continue to do so.

There are two bridge crossings proposed: one located in Snodgrass Slough east of the river where the proposed intakes would be constructed and one in the Burns Cutoff a waterway that surrounds Rough and Ready Island in Stockton. Neither location is known to be a place delta smelt have regularly occurred in the past few decades. Occasionally, individuals may have moved through Snodgrass Slough or Burns Cutoff in the winter and spring, but delta smelt are not anticipated to be in these proposed construction sites during the June-October work windows.

As described above, existing IEP monitoring and other studies are on-going and have existing consultations. The 2024 LTO BiOp addressed effects of operations of the CVP and SWP which includes influencing the abundance and distribution of delta smelt in the Action Area as well as supplementation of cultured delta smelt to the wild.

Delta Smelt Critical Habitat

The PA is within the delta smelt's designated critical habitat and contains PCEs 1-3 described in the critical habitat designation but is outside the low salinity zone (PCE 4). The temporary and permanent footprints of the intake facilities are characterized by steep, riprap-armored levee slopes with low quantities of overhanging and instream woody cover. Shallow water habitat for spawning (PCE 1) is limited to a narrow band along the steep levee slope and there is no off-channel or floodplain habitat. During the proposed summer-fall in-water work window, PCEs 2 and 3 (water quality and river flow) conditions at the intake and bridge crossing locations vary depending on upstream dam releases, in-Delta irrigation and agricultural run-off, and aquatic vegetation.

11.2.8 Longfin Smelt

Longfin smelt migrate back into the estuary from the Pacific Ocean in the fall and winter to spawn mainly during the winter months. Most spawning is now believed to take place in the

estuary's low-salinity zone which is outside the proposed construction area. Historically, surveys conducted within the Sacramento River reach and upstream of the proposed intake locations indicate few longfin smelt are found in that vicinity. The Service has previously concluded longfin smelt used this area, but our recent information provides no evidence that they currently do. Since December of 2021, the Service's Lodi Fish and Wildlife Office has not collected any longfin smelt in the Sacramento River between the American River confluence and Isleton despite considerable sampling effort (more than 900 beach seine hauls and more than 6,400 trawl tows; Service unpublished data).

There are two bridge crossings proposed: one located in Snodgrass Slough east of the river where the proposed intakes would be constructed and one in the Burns Cutoff a waterway that surrounds Rough and Ready Island in Stockton. Neither location is known to be a place longfin smelt have regularly occurred in the past few decades, though occasional individuals may have moved through Snodgrass Slough or Burns Cutoff in the winter and spring, but these species are not anticipated to be in these proposed construction sites during the June-October work windows.

As described above, existing IEP monitoring and other studies are on-going and have existing consultations. The 2024 LTO BiOp addressed effects of operations of the CVP and SWP which includes influencing the abundance and distribution of longfin smelt in the Action Area.

11.2.9 Valley Elderberry Longhorn Beetle

The DCP is within the range of the valley elderberry longhorn beetle but there are no occurrences within the Action Area and very few in the larger Study Area. The current distribution of valley elderberry longhorn beetle in the Action Area is unknown. Comprehensive surveys for the species or its host plant, elderberry, have not been conducted and thus the population size and location of the species in the Action Area is unknown. Distribution is typically based on the occurrence of elderberry shrubs, which are known to occur along riparian corridors throughout the Action Area, including the Sacramento River, San Joaquin River, and along smaller natural and channelized drainages, as well as in upland habitats.

11.2.10 Vernal Pool Fairy Shrimp, Vernal Pool Tadpole Shrimp, and Vernal Pool Fairy Shrimp Critical Habitat

Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp

The DCP is within the range of the vernal pool fairy shrimp and vernal pool tadpole shrimp and there are occurrences within the Action Area and the larger Study Area. The Action Area overlaps with the Southeastern Sacramento Valley, San Joaquin Valley, and Livermore Vernal Pool Regions defined in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Service 2005). The modeled habitat in the Livermore region overlaps with the Altamont Hills core area. Vernal pool fairy shrimp and vernal pool tadpole shrimp occur in the edges of the Action Area near Stone Lakes National Wildlife Refuge and west of Clifton Court Forebay.

Vernal Pool Fairy Shrimp Critical Habitat

Designated critical habitat Unit 19B for vernal pool fairy shrimp within the Action Area is located west of Clifton Court Forebay near Byron. Unit 19B contains 4,925 acres out of the total of 597,821 total acres of designated critical habitat for vernal pool fairy shrimp. Approximately 0.57 acre of the West Tracy Fault work area overlaps with vernal pool modeled habitat that is within this unit. The BA states this area is degraded due to proximity to agricultural land use but did not specifically describe the quality of the PCEs.

11.2.11 Northwestern Pond Turtle

The entire Action Area falls within the range of northwestern pond turtle where suitable habitat exists. The Action Area overlaps with the Bay Delta and Nevada analysis unit and the San Joaquin Valley analysis unit identified in the Species Status Assessment (Service 2023e). Each of these basins includes an extant population of northwestern pond turtle. There are numerous CNDDB records of northwestern pond turtle throughout the Action Area (CDFW 2025) and the DCP BA modeled suitable habitat within the Action Area and the larger Study Area.

11.2.12 Western Spadefoot

The DCP is within the range of the northern DPS of the western spadefoot but there are no known extant occurrences or populations within the Action Area or the larger Study Area (CDFW 2025). The Action Area overlaps with the Southeastern Sacramento Valley, San Joaquin Valley, and Livermore western spadefoot regions identified in the Species Status Assessment (Service 2023g) which mirror the vernal pool regions defined in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Service 2005). The modeled habitat in the Livermore region overlaps with the Altamont Hills core area. The BA modeled western spadefoot habitat in the larger Study Area but specific to the Action Area near Hood, around the I-5 ponds, and southwest of Clifton Court Forebay and near Bethany Reservoir; however, the western spadefoot is associated with vernal pool and grassland habitat which only occurs southwest of Clifton Court Forebay and near Bethany Reservoir. The modeled habitat in BA near the PA footprint outside of these areas is likely an overestimate as most of the Delta islands were historically tidal marsh and therefore did not historically or currently support appropriate habitat for vernal pool species.

11.2.13 Monarch Butterfly

The DCP is within the range of the monarch butterfly and there are numerous occurrences within the Action Area and the larger Study Area. The area supports various species of milkweed (*Asclepias* sp.), which are potential spring and summer breeding locations, and a broad variety of flowering plants provide foraging opportunities. Areas with active agriculture or herbicide/pesticide use likely have a lower abundance of milkweed and suitable flowering plants and butterflies.

The DCP BA contains a description of modeled suitable habitat within the Action Area and the larger Study Area. Modeled habitat at Bouldin Island and the I-5 ponds consists of agricultural fields and undeveloped natural areas likely to provide low- to moderate-quality monarch habitat,

depending on agricultural activity, level of ground disturbance, amount of contiguous natural areas, and presence of seasonal floral resources.

12. EFFECTS OF THE PROPOSED ACTION

Effects of the action are all consequences to listed species or critical habitat that are caused by the PA, including the consequences of other activities that are caused by the PA but that are not part of the action. A consequence is caused by the PA if it would not occur but for the PA and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action.

Construction elements and compensatory mitigation for construction effects to terrestrial species have been analyzed and described in the BA at the site-specific level with no future Federal action required, including biological surveying and species relocations required prior to start of construction. Subsequent Federal approvals will occur for the 2024 LTO BiOp programmatic-level actions, such as listed fish species compensatory mitigation (including monitoring and adaptive management) and operations and maintenance of the DCP.

Construction of the water conveyance facility will continue for 13 years; the construction schedule includes preconstruction field investigations, habitat suitability surveys, vegetation removal and grading, facility construction, restoration of undeveloped portions of the construction footprint, and creation and enhancement of the I-5 Ponds and Bouldin Island mitigation sites. The total duration of construction work at each intake is 5.5 years.

12.1 San Joaquin Kit Fox

The PA will result in the permanent loss of 38.69 acres of modeled low-quality dispersal habitat, 0.06 acres of modeled moderate-quality habitat, and 0.13 acres of modeled high-quality habitat. Field investigations and construction of access roads would temporarily disturb another 16.94 acres of modeled low-quality habitat, 0.06 acre of modeled high-quality habitat, and 0.02 acre of modeled moderate-quality habitat. The permanent loss of 38.88 acres of modeled San Joaquin kit fox habitat would be offset by the purchase of Service-approved conservation bank credits at a 1:1 ratio or an undetermined site protection instrument. Reinitiation may be required if the undetermined site protection instrument results in effects not analyzed in this consultation.

While there is low potential for an individual to be present in the vicinity of the PA as described above, construction activities will occur over a long period of time increasing chances of exposure to the wide-ranging species. San Joaquin kit foxes could be attracted to the construction footprint due to the increased availability of cover (e.g., within pipes, trenches, or materials staging areas) or the increased availability of forage items such as food scraps and trash, increasing their risk of injury. San Joaquin kit foxes near the construction footprint are expected to experience disturbance resulting from increased levels of human disturbance and vehicle use and excavation of dens and burrows. These activities could displace kit foxes which will make them vulnerable to increased predation, exposure, starvation, or stress through disorientation, loss of shelter, and intraspecific and interspecific aggression. The disturbance caused by the PA resulting from construction noise, nighttime illumination, vibration, odors, and human activity

can interfere with sensory perception of kit fox, decreasing their ability to locate prey, pups, or mates, or detect approaching predators. Disturbance can induce stress which can alter normal behaviors. The resulting effects can lead to increased energetic requirements, decreased reproductive success and immunological functions, altered temporal or spatial use patterns, displacement, and in some cases death. Responses to external stresses vary among individuals, causing some animals to be more affected than others; however, it is unknown whether disturbance results in reduced local abundance. While kit fox could also be injured or killed by construction vehicles, the proposed vehicle speed limits are likely to avoid collisions with kit foxes. As mentioned above, the potential for San Joaquin kit foxes to occur in the Action Area is low. Implementation of preconstruction surveys and the *Standardized Recommendations for Protection of the San Joaquin Kit Fox Prior to or during Ground Disturbance* (U.S. Fish and Wildlife Service 2011) or the latest guidelines if dens or sign is expected to reduce most construction-related effects.

Construction effects on the kit fox are expected to be greater during the den selection, gestation, and the early rearing period of the breeding cycle (December through July) than at other times of the year. These adverse effects would be minimized through implementation of avoidance and minimization measures to reduce the risk of disturbance, injury, and mortality of individuals although den destruction, if occupied, could result in mortality of individuals and effects noted above from displacement.

Effects to Recovery

The PA would not increase the threats currently impacting the San Joaquin kit fox core or satellite areas as identified in the recovery plan, as described in the *Status of the Species*, or preclude implementation of recovery actions. The resulting adverse effects of the PA's construction footprint are considered permanent due to duration of construction, proposed structures and ongoing operations and maintenance. The suitable habitat affected is outside of the core recovery areas; therefore, with implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in minimal change in population numbers and distribution. DWR has proposed to minimize the adverse effects to species resulting from the loss of individuals.

12.2 Least Bell's Vireo

Construction activities associated with field investigations, north Delta intakes, tunnel shafts, RTM, access roads, electrical and SCADA facilities, Bethany Complex, and the CMP have the potential to affect the least Bell's vireo and will impact a total of 17.44 acres of modeled habitat. Per the BA, the PA will result in the permanent loss of 9.68 acres. Approximately 7.67 modeled upland acres will be temporarily affected and restored to pre-project conditions. Compensatory mitigation for loss of suitable riparian habitat will consist of the restoration of habitat and the creation of habitat, through purchasing of mitigation credits at either a Service-approved conservation bank or at a non-bank site approved by the Service supporting habitat for vireo at a 2:1 ratio for a total commitment of 19.36 acres. However, creation and enhancement of approximately 204.79 acres of riparian habitat at Bouldin Island is proposed to offset the permanent loss of sensitive natural communities and habitat for special-status species, including

least Bell's vireo. The creation and enhancement actions at Bouldin Island are assumed to have a long-term benefit to the species. Reinitiation may be required if the site protection instrument results in effects not analyzed in this consultation.

While there is low potential for an individual to be present in the vicinity of the PA as described above, construction activities will occur over a long period of time increasing chances of exposure if the vireo is present within the Action Area. The activities listed in the above paragraph are expected to affect the vireo through mortality, injury, disturbance, and harm of individuals if present. Ground disturbance associated with construction activities will result in removal of vegetation and other materials utilized for cover, migration, and foraging. Disturbance caused by construction activities may cause individuals to disperse into areas containing unsuitable habitat, and increase the risk of predation or other sources of mortality. Disturbance, injury, or mortality to the vireo may result from night-lighting, noise, and vibration, which are further described below. Construction-related contaminants, such as fuels, cement, and oils accidentally discharged or spilled into modeled habitat could expose the species to toxic materials, resulting in injury and mortality, and lead to habitat degradation. These adverse effects would be minimized through implementation of avoidance and minimization measures to reduce the risk of disturbance, injury, and mortality of individuals.

Effects to Recovery

Given the baseline conditions in the Action Area, the PA is not expected to increase the threats currently impacting the least Bell's vireo as described in the *Draft Recovery Plan for the Least Bell's Vireo* (Service 1998b) and or preclude implementation of recovery actions. Although suitable habitat will be temporarily and permanently affected this loss would be offset with the restoration or creation of 19.36 acres of suitable riparian habitat (2:1 ratio) which is assumed to be included in the creation and enhancement of up to 204.79 acres of suitable riparian habitat, primarily on Bouldin Island. With implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in little to no change in population numbers and distribution.

12.3 Western Yellow-Billed Cuckoo

Construction activities associated with field investigations, north Delta intakes, tunnel shafts, RTM, access roads, electrical and SCADA facilities, Bethany Complex, and the CMP have the potential to affect the cuckoo and will impact a total of 17.34 acres of modeled habitat. Per the BA, the PA will result in the permanent loss of 9.68 acres. Approximately 7.67 modeled upland acres will be temporarily affected and restored to pre-project conditions. Compensatory mitigation for loss of suitable riparian habitat will consist of the restoration of habitat and the creation of habitat, through purchasing of mitigation credits, at either a Service-approved conservation bank or at a non-bank site approved by the Service supporting habitat for cuckoo at a 2:1 ratio for a total commitment of 19.36 acres. However, creation and enhancement of approximately 204.79 acres of riparian habitat at Bouldin Island is proposed to offset the permanent loss of sensitive natural communities and habitat for special-status species, including the cuckoo. The creation and enhancement actions at Bouldin Island are assumed to have a long-term benefit to the species. Reinitiation may be required if the site protection instrument results in effects not analyzed in this consultation.

While there is low potential for an individual to be present in the vicinity of the PA as described above, construction activities will occur over a long period of time increasing chances of exposure if the cuckoo is present within the Action Area. The activities listed in the above paragraph are expected to affect the cuckoo through mortality, injury, disturbance, and harm of individuals if present. Ground disturbance associated with construction activities will result in removal of vegetation and other materials utilized for cover, migration, and foraging. Disturbance caused by construction activities may cause individuals to disperse into areas containing unsuitable habitat, and increase the risk of predation or other sources of mortality. Disturbance, injury, or mortality to the cuckoo may result from night-lighting, noise, and vibration, which are further described below. Construction-related contaminants, such as fuels, cement, and oils accidentally discharged or spilled into modeled habitat could expose the species to toxic materials, resulting in injury and mortality, and lead to habitat degradation. These adverse effects would be minimized through implementation of avoidance and minimization measures to reduce the risk of disturbance, injury, and mortality of individuals.

Effects to Recovery

A recovery plan has yet to be developed for the western yellow-billed cuckoo. Given baseline conditions in the Action Area, the PA is not expected to increase the threats currently impacting the western yellow-billed cuckoo as described in the cuckoo's listing documents. With implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in little to no change in population numbers and distribution.

12.4 California Red-Legged Frog and Critical Habitat

California Red-Legged Frog

The PA will affect a total of approximately 421.57 acres of modeled habitat and result in the permanent loss of 0.21 acre of modeled aquatic habitat, 7.06 acres of modeled upland habitat, and 363.48 acres of modeled dispersal habitat. Temporary loss of habitat would include 0.12 acre of aquatic habitat, 2.72 acres of upland habitat, and 47.97 acres of dispersal habitat. While the BA acknowledges the adverse effects to California red-legged frogs from temporary and permanent impacts to dispersal habitat, DWR is not proposing to offset the loss of modeled dispersal habitat. However, the permanent loss of 0.21 aquatic and 7.06 upland acres of modeled California red-legged frog habitat would be offset by the purchase of Service-approved conservation bank credits at a 3:1 ratio or an undetermined site protection instrument. Reinitiation may be required if the undetermined site protection instrument results in effects not analyzed in this consultation.

Activities included in the PA that will have adverse effects on California red-legged frog and its modeled suitable habitat are activities related to the construction of the Bethany Complex. This would include construction of the pumping plant, surge basin, reception shaft, discharge structure, aqueduct, and the construction of a water pipeline, electrical substation, switchyard, and access roads which would be used in support of construction and operations within the Bethany Complex footprint.

The activities listed above are expected to affect the California red-legged frog through mortality, capture, relocation, injury, disturbance, and harm of individual eggs, larvae, subadults and adults. Ground disturbance associated with construction activities will result in removal of vegetation and other materials utilized for cover and aestivation, fill or crush burrows or crevices, and reduce the prey base for the California red-legged frog. Since California red-legged frog utilizes small mammal burrows and soil crevices for shelter, individuals may be crushed, buried, or otherwise injured during construction activities. Disturbance caused by construction activities may cause individuals to disperse into areas containing unsuitable habitat and increase the risk of predation or other sources of mortality. Injury or mortality to the animals may result from night-lighting, noise, and vibration. These adverse effects would be minimized through implementation of avoidance and minimization measures to reduce the risk of disturbance, injury, and mortality of individuals.

Effects to Recovery

The PA would not increase the threats currently impacting the California red-legged frog recovery unit or core area as identified in the recovery plan, as described in the Status of the Species, or preclude implementation of recovery actions. The resulting adverse effects of the PA to the species habitat are considered permanent due to the PA's footprint and duration. Suitable habitat will be affected inside and adjacent to the East San Francisco Bay Core Recovery Area. DWR has proposed to minimize the adverse effects of the loss of individuals and compensate for the permanent loss of habitat at 3:1 ratio by purchasing mitigation or conservation bank credits from banks subject to Service-approval or through an undetermined site protection instrument. With implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in no change in population numbers and distribution.

California Red-Legged Frog Critical Habitat

The PA would permanently remove 0.01 acre of modeled aquatic habitat (PCE 1 and PCE 2); 1.65 acres of modeled upland habitat (PCE 3), and 43.61 acres of modeled dispersal habitat (PCE 3 and PCE 4) within this unit. This is less than 0.01% of total California red-legged frog designated critical habitat, and 0.10% of California red-legged frog critical habitat in Unit CCS-2B. Permanent and temporary habitat loss due to the PA would result in fragmentation and isolation of habitat within this critical habitat unit, but this effect would be small because the access road would not be heavily traveled and is assumed frogs can traverse the road without impediments or added risk of vehicular strikes, and the Bethany Reservoir Discharge Structure is located adjacent to the edge of Bethany Reservoir (and therefore does not pose a new, substantial barrier to movement).

The PA would not appreciably reduce the conservation value of critical habitat for California red-legged frog because the impact is to a small percentage of designated critical habitat; the impact occurs in a very small portion at the northeastern edge of designated critical habitat in an area that is already highly fragmented with water conveyance facilities and roads; avoidance and minimization measures would be implemented; and compensation (if within the critical habitat unit) would minimize the loss.

12.5 California Tiger Salamander

The PA will affect approximately 79.49 acres of modeled habitat and result in the permanent loss of 0.20 acre of modeled aquatic habitat, and 60.20 acres of modeled upland habitat. Temporary loss of habitat would include 19.08 acres of upland habitat. The permanent loss of 60.4 acres of modeled California tiger salamander habitat would be offset by the purchase of Service-approved conservation bank credits at a 3:1 ratio or an undetermined site protection instrument. Reinitiation may be required if the undetermined site protection instrument results in effects not analyzed in this consultation.

Activities included in the PA that will have adverse effects on California tiger salamander and its modeled suitable habitat are activities related to the construction of the Bethany Complex. This would include construction of the pumping plant, surge basin, reception shaft, discharge structure, aqueduct, and the construction of a water pipeline, electrical substation, switchyard, and access roads which would be used in support of construction and operations within the Bethany Complex footprint.

The activities listed above are expected to affect the threatened Central California tiger salamander through capture, relocation, disturbance, harm, injury and mortality of all life stages. Ground disturbance and construction activities associated with the PA will result in loss of upland habitat used for dispersal, refugia, and foraging. Central California tiger salamanders that are using small mammal burrows or cracks in the soil within the construction footprint of the PA are likely to be killed during grading and ground compaction activities as burrows are crushed and the inhabitants of burrows are entombed. Central California tiger salamanders may be killed or injured from inadvertent trampling by workers from foot traffic and operation of construction equipment during construction activities. Central California tiger salamanders may also become trapped in open excavations or construction trenches, making them vulnerable to desiccation, starvation, and predation. Injury or mortality to the Central California tiger salamanders may result from harassment from night lighting, noise and vibrations due to increased exposure to desiccation and predation. These adverse effects would be minimized through implementation of avoidance and minimization measures to reduce the risk of disturbance, injury, and mortality of individuals.

Effects to Recovery

The PA would not increase the threats currently impacting the Central California tiger salamander in the Central Valley Recovery Unit identified in the recovery plan and described in the *Status of Species* or preclude implementation of recovery actions. The PA is expected to result in permanent loss of 60.4 acres of Central California tiger salamander habitat. DWR has proposed to offset the adverse effects of the loss of individuals and habitat through the purchase of mitigation or conservation bank credits from banks subject to Service-approval or from a non-bank site at a 3:1 ratio. With implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in no change in population numbers and distribution.

12.6 Giant Garter Snake

The PA is estimated to adversely affect a total of 132.47 acres of modeled habitat. Approximately 80.89 acres of modeled habitat will be permanently impacted of which 9.65 acres is aquatic habitat and 71.24 acres is upland habitat. The PA is also estimated to temporarily affect approximately 51.57 acres of modeled habitat resulting from construction of permanent facilities such as intake structures and associated electrical buildings and facilities, and permanent access roads. The Service considers impacts occurring over multiple years to be a permanent effect to listed species. To compensate for the loss of this habitat and minimize effects from habitat loss to giant garter snake, DWR proposes to either restore, create, or enhance high quality habitat areas targeted for giant garter snake recovery at an approximately 2.5:1 ratio. Under a full implementation of the CMP, DWR proposes to restore, create, or enhance approximately 340.35 acres that will benefit the giant garter snake in the Delta (150.54 acres of suitable aquatic and 189.81 acres of suitable upland habitats) at the Bouldin Island and I-5 Ponds. The creation and enhancement actions at Bouldin Island and the I-5 ponds are assumed to have a long-term benefit to the species.

Construction and ground disturbing activities related to the PA are likely to affect giant garter snake. Construction activities at each intake include ground clearing and grading, construction of the intakes and associated facilities, and vehicular use including transport of construction equipment and materials. Giant garter snake may be killed or injured by vehicles and heavy construction equipment used as part of the PA. This effect would be most likely to occur during site clearing (up to several days at each location). Vehicle strikes are a common threat to giant garter snake and several occurrence records of giant garter snake in the CNDDB are from dead individuals found along roadsides which were struck by vehicles. Giant garter snakes commonly use roadside ditches for movement corridors or for foraging and are known to use roadsides for basking sites. The recent documented observations of giant garter snakes using riprap along major river levee banks also show that giant garter snakes can use this habitat for basking and sheltering and possibly for foraging or brumation/aestivation. This makes giant garter snakes highly vulnerable to vehicle strikes as giant garter snakes bask on the road or cross back and forth over roads from the various suitable aquatic and upland habitats.

Associated equipment noise, vibration, and increased human activity may interfere with normal behaviors. These behaviors include feeding, sheltering, movement between refugia and foraging habitats, and other essential behaviors of giant garter snake. Project related activities that occur in areas that have suitable habitat but create intolerable levels of disturbance may force individuals from cover and potentially subject them to circumstances that otherwise would not occur and could result in an increased threat to their survival such as predation.

Natural food sources may also be reduced as a result of habitat disturbance and loss. Short-term temporal effects will occur when vegetative cover is removed within upland habitat during project implementation, which may also subject this species to an increased risk of predation. Since snakes use small mammal burrows, soil crevices, and/or rock crevices for shelter for brumation during the winter season and aestivation during extremely hot days during their active period, implementation of the PA will likely result in harassing snakes away from suitable habitat or by disrupting brumation/aestivation if snakes are occupying a burrow or rock

outcropping. As ground squirrel burrows can be deep and long, construction and maintenance equipment may come into direct contact with a brumating/aestivating snake which would likely be killed from these ground disturbing activities. Snakes in terrestrial habitat may also become entombed under soil, crushed or damaged by equipment or personnel, thereby resulting in harm or mortality to individuals. To minimize these effects, DWR proposes a series of conservation measures such as work windows, exclusionary fencing, biological monitoring and worker awareness training.

Effects to Recovery

The PA could increase the threats currently impacting the giant garter snake in the Delta Basin Population and Recovery Unit as described in the *Recovery Plan for the Giant Garter Snake (Thamnophis gigas)* (Service 2017c) and preclude implementation of recovery actions in the areas of suitable habitat which will be temporarily and permanently affected within the Delta Recovery unit. However, DWR has proposed to implement conservation measures to minimize effects to individuals and minimize the loss of habitat by restoring/creating habitat at an approximately 2.5:1 ratio including the creation and enhancement of the I-5 Ponds and Bouldin Island sites. Therefore, with implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in minimal to no change in population numbers and distribution.

12.7 Delta Smelt, Longfin Smelt, and Delta Smelt Critical Habitat

Delta Smelt and Longfin Smelt

Construction of the two intake structures would result in a permanent loss or alteration of 5.6 acres of tidal perennial habitat near the northern limit of the geographic area used by delta smelt and longfin smelt (smelts) for migration, potential spawning, and larval dispersal to the estuary. An additional 1.5 acres within the aquatic footprint will be temporarily impacted. Upstream spawning migration and access to spawning habitat may be blocked, delayed, or impeded due to replacement of low-velocity nearshore habitat at the north Delta intake locations with the cofferdams, fish screens, and associated structures. There is uncertainty about the impact because of the adult smelts' potential use of low-velocity habitat along the opposite riverbank from the cofferdams, deeper water near the river bottom, or velocity refuges created by the flutes of the cofferdams themselves. There is also uncertainty regarding whether either smelt still occurs in this part of the river. Assuming they do, per the BA, 2D modeling of the hydrodynamic effects of the cofferdams indicates that suitably low-velocity habitat would be present even at relatively high river flows. The reduction in the extent of low-velocity shoreline areas and increased predation risk at the intake sites could potentially reduce the number of migrating adults that successfully pass the sites and survive to reach upstream spawning areas. Delta and longfin smelt larvae and early juveniles dispersing from upstream spawning areas to estuarine rearing areas may be subject to an elevated risk of predation as they pass the intake construction sites because of the presence of in-water and overwater structures.

Any delta smelt that successfully spawn in the Sacramento River at or upstream of the proposed construction areas would produce larvae may rear for variable amounts of time before being transported downriver. These young delta smelt would be unlikely to remain in the area past June. Subadult/adult fish would be unlikely to return that far up-estuary until the following December. See Table 12.7-0-1 for a summary of seasonal occurrence relative to construction areas. Thus, if the effects of construction stay within the proposed June-October work window, they would be unlikely to affect delta smelt except possibly small numbers of larvae or early juvenile life stages in June.

If any longfin smelt spawn in the Sacramento River at or upstream of the proposed construction areas, the larvae would be expected to be quickly transported to the estuary and would be unlikely present after April. Subadult/adult fish would be unlikely to return that far up-estuary until the following November or December. See Table 12.7-0-1 for a summary of seasonal occurrence relative to construction areas. Thus, if the effects of construction stay within the proposed June-October work window, they would be unlikely to affect longfin smelt.

Table 12.7-0-1. Summary of Delta Smelt and Longfin Smelt Spawning Seasons and Occurrences in the Action Area

	Delta Smelt	**Longfin Smelt**
Spawning season	February-May though newer information indicates spawning after April was rare in recent decades (e.g., Kurobe *et al*. 2022)	December-April though newer information indicates spawning after March was rare in recent decades (e.g., Eakin 2021; Gross *et al*. 2022)
Core spawning locations	In recent decades, Cache Slough Complex and regions to the west of it (e.g., Kurobe *et al*. 2022)	In recent decades, the estuary's low-salinity zone which was usually centered in Suisun Bay/Marsh or the westernmost part of the Delta during the spawning season (e.g., Grimaldo *et al*. 2020; Gross *et al*. 2022)
Historically observed in the vicinity of the proposed construction sites	Yes – except that Snodgrass Slough was not sampled (Merz *et al*. 2011)	Yes – except that Snodgrass Slough was not sampled (Merz *et al*. 2013)
Observed in vicinity of proposed intake construction site in previous five years	No (Lodi Fish and Wildlife Office, unpublished data)	No (Lodi Fish and Wildlife Office, unpublished data)

For those few individuals that may occur during the work window, in-water construction may result in physical injury or mortality from activities including pile driving, barge/tugboat operations, dredging, enclosing construction areas, riprap placement, and construction water diversion from surface waters. Installation of piles or placement of riprap could involve fish being crushed, although it would be expected that risk would be very low based on the limited

spatial extent of the work, the seasonal work windows and limited if any ongoing use of the area by either smelt species. Further, there is a high probability of fish avoiding such activities; therefore, displacement of fish away from habitat near construction activities seems to be the most likely adverse effect. Dredging activities may crush or entrain fish and aquatic species, although the limited spatial and temporal extent of dredging would limit the potential for these effects.

The total duration of construction work at each intake is 5.5 years. The timing of in-water work during a June–October work window avoids the time of year that longfin smelt might be present and mostly avoids the time of year that delta smelt would be present. Although there is potential temporal overlap of the work window with juvenile delta smelt in the early summer, there would be very limited if any spatial overlap because habitat is usually unsuitable at this time of year so any fish spawned in the affected reach of the river (or above it) would have moved downstream at an earlier life stage. Given that the location of the north Delta intakes is near the northernmost range of the smelts, there would be limited if any exposure to construction impacts.

Turbidity/Suspended Sediments/Contaminants

Construction of the DCP would result in the generation and release of suspended sediments to the water column, temporarily increasing water-column turbidity above ambient levels and altering aquatic habitat conditions. Turbidity-producing construction activities include bed and bank disturbance during cofferdam and log boom installation, dredging prior to riprap placement adjacent to the new intake locations, and the placement of bed and bank riprap armoring at the new intake locations in the north Delta. In-water work associated with riprap would have greater relative effects on turbidity than the other activities but would be limited to one season at each intake. Propeller wash associated with boat traffic at the intake sites during dredging and placement of riprap may also produce localized turbidity pulses, depending on location. Increases in turbidity and suspended sediment levels associated with these activities would be temporary and localized and generally not considered harmful to the smelts.

During in-water construction activities at the proposed intake sites, turbidity and suspended sediment levels in the river are anticipated to be greater than ambient river levels in the immediate vicinity of these activities, creating turbidity plumes that may extend several hundred feet downstream of construction activities. The BA provides the assumption that there could be some effect up to 1,000 feet downstream from each intake, temporarily affect 1.7 acres of tidal perennial habitat at Intake B and 2.5 acres of tidal perennial habitat at Intake C. The proposed work that could generate turbidity plumes would occur at earliest in June and would therefore be very unlikely to have any impact on either smelt species, both of which are not only turbidity-adapted but unlikely to be present in the area during the summer and early fall months.

Construction of the DCP in and near their aquatic habitat poses an exposure risk to the smelts from potential spills of hazardous materials from construction equipment, barges and towing vessels, and other machinery and from potential mobilization of contaminated sediment. The risk of accidental spills of contaminants and other hazardous materials would exist throughout the construction period but would be highest during in-water construction activities due to the proximity of construction activities to the Sacramento River. Once cofferdams are installed and

dewatered at the intakes, any spills within the cofferdam essentially would preclude movement of spill materials into the river because of river water pressure on the cofferdams. Other construction elements that occur in upland areas or are isolated from fish-bearing waters have little potential for accidental spills that could affect the smelts. Additionally, risk of construction-related contaminants is reduced with implementation of proposed pollution-prevention and erosion- and sediment-control avoidance and minimization measures.

Underwater Noise

Underwater noise would be generated by a variety of construction activities, including pile driving, tugboat operations, dredging, geotechnical investigations, riprap placement, and TBM activities. Construction noise, vibration, and increased human activity may interfere with normal behavior, including feeding, sheltering, and other essential behaviors of delta smelt. Intolerable levels of disturbance may force individuals from suitable habitat cover and subject them to predation that otherwise would not occur. However, given the smelts' seasonal to transient use of the locations where the activities will occur and implementation of in-water work windows and measures to minimize underwater noise, few delta smelt and longfin smelt are expected to be exposed to the effects of construction generated underwater noise.

Underwater sound pressure waves can harass and harm fish species (Reyff 2003; Abbott and Bing-Sawyer 2002; California Department of Transportation 2001; Longmuir and Lively 2001; Stotz and Colby 2001). As the pressure wave passes through a fish, the swim bladder is rapidly squeezed due to the high pressure, and then rapidly expanded as the under-pressure component of the wave passes through the fish. This can cause adverse effects including rupture of the swim bladder, rupture of capillaries, internal hemorrhage, neurological stress, and auditory damage. Extreme sound waves can cause instantaneous death, latent death within minutes after exposure, or can occur several days later.

Elevated noise levels can cause sub-lethal injuries affecting survival and fitness. Similarly, if injury does not occur, noise may modify fish behavior that may make them more susceptible to predation. Fish suffering damage to hearing organs may suffer equilibrium problems and may have a reduced ability to detect predators and prey. Other types of sub-lethal injuries can place the fish at increased risk of predation and disease. Adverse effects on survival and fitness can occur even in the absence of overt injury. Exposure to elevated noise levels can cause a temporary shift in hearing sensitivity, decreasing sensory capability for periods lasting from hours to days (Turnpenny *et al.* 1994; Hastings *et al.* 1996).

Among the construction activities likely to generate noise, the use of impact hammers for pile installation poses the greatest risk to fish because the levels of underwater noise produced by impulsive types of sounds can reach levels of sufficient intensity to injure or kill fish (Popper and Hastings 2009). Factors that may influence the potential for injury include species, life stage, and size of fish; type and size of pile and hammer; frequency and duration of pile driving; site characteristics (e.g., water depth); and distance of fish from the source. Dual interim criteria representing the acoustic thresholds associated with the onset of physiological effects in fish have been established to provide guidance for assessing the potential for injury resulting from pile-driving noise (Fisheries Hydroacoustic Working Group 2008) (Table 12.7-0-2). These

criteria have been established only for impact pile driving. Other pile-driving methods such as vibratory, oscillatory, and drilling methods generally produce more continuous, lower energy sounds below the thresholds associated with injury. No established noise thresholds currently are associated with continuous sound waves, and vibratory and oscillation methods generally are considered effective measures for avoiding or minimizing the risk of injury to fish from pile-driving noise.

Table 12.7-0-2 Interim Criteria for Assessing the Potential for Injury to Fish from Pile-Driving Activities

Interim Criteria	Agreement in Principle
Peak sound pressure level (SPL)	206 dB re 1µPa (for all sizes of fish)
Cumulative sound exposure level (SEL)	187 dB re 1µPa2-sec—for fish size ≥ 2 grams 183 dB re 1µPa2-sec—for fish size < 2 grams
Behavioral (RMS)	150 dB re 1µPa (for all sizes of fish)

Source: Fisheries Hydroacoustic Working Group 2008
dB re 1µPa = dB referenced to a pressure of 1 microPascal
dB re 1µPa^2-sec = dB referenced to a pressure of 1 microPascal squared per second RMS = root mean square

The dual criteria are: (1) 206 dB for peak SPL and (2) 187 dB for cumulative SEL for fish larger than 2 grams and 183 dB SEL for fish smaller than 2 grams. The peak SPL threshold is considered the maximum SPL a fish can receive from a single strike without injury. The cumulative SEL threshold is considered the total amount of acoustic energy that a fish can receive from single or multiple strikes without injury. The cumulative SEL threshold is based on the total daily exposure of a fish to noise from sources that are discontinuous (in this case, noise that occurs up to 12 hours a day, with 12 hours between exposures). This assumes that fish are able to recover from any effects during this 12-hour period between exposures. The current estimated threshold for behavioral effects is 150 dB.

The pile-driving analysis for the test-pile program reflected one pile of each type on three separate days at a single site. The analysis indicated that the distance to sound-level thresholds would range from 28 feet (206 dB) to 24,135 feet (150 dB) (Table 12.7-0-3). The area of effect, accounting for attenuation of sound by land at river bends (California Department of Transportation 2020a:4-32 as cited in the BA), ranges from 0.06 acre (206-dB threshold for sheet and steel pipe piles) to ~59 acres (150-dB threshold for H piles) (Table 12.7-0-3). The duration of the test-pile impact driving at a single intake site would be 3 days (one day for each pile type/~ 2 minutes per pile; Table 12.7-0-3).

Table 12.7-0-3. Assumptions and Estimates of Impact Pile-Driving Distance and Area of Acoustic Effect at a Single Intake Site for the Test-Pile Program

Variable	Sheet Pile Pair	Steel Pipe Pile	H Pile
Number of piles	1	1	1
Number of piles per day	1	1	1
Number of days of pile driving	1	1	1
Number of strikes per pile	19	19	19
Number of strikes per day	19	19	19
Peak single-strike sound level at 10 meters [33 feet] (dB)	205	205	208
Sound exposure level at 10 meters [33 feet] (SEL, dB)	180	180	177
Root mean square at 10 meters [33 feet] (RMS, dB)	190	190	193
Distance to 206-dB threshold (feet) [a]	28	28	45
Distance to 187-dB threshold (feet) [a]	80	80	50
Distance to 183-dB threshold (feet) [a]	147	147	93
Distance to 150-dB threshold (feet) [a]	15,228	15,228	24,135
Area of 206-dB threshold (acres)	0.06	0.06	0.15
Area of 187-dB threshold (acres)	0.46	0.46	0.18
Area of 183-dB threshold (acres)	1.28	1.28	0.60
Area of 150-dB threshold (acres)	58.41	58.41	58.64

Note: Assumed testing would occur at Intake B.

[a] Note that this distance does not account for sound attenuation by site configuration (e.g., sound not going round corners at the bends in the river), which is accounted for in the area estimates given in the table.

The pile-driving analysis for construction of the cofferdams and training walls indicated that the distance to sound-level thresholds would range from 28 feet (206 dB) to 15,228 feet (150 dB) Table 12.7-0-4 (206-dB threshold). The area of effect, accounting for attenuation of sound by river bends, ranges from 0.06 acre (206-dB threshold) to 134.10 acres (150-dB threshold at Intake C) (Table 12.7-0-4).

Table 12.7-0-4. Assumptions and Estimates of Impact Pile-Driving Distance and Area of Acoustic Effect at Each Intake for Construction of Cofferdams and Training Walls

Variable	Intake B	Intake C
Number of piles (pairs)	420	410
Number of piles per day	20	20
Number of days of pile driving	21	21
Number of strikes per pile	19	10
Number of strikes per day	380	200
Peak single-strike sound level at 10 meters [33 feet] (dB)	205	205
Sound exposure level at 10 meters [33 feet] (SEL, dB)	180	180
Root mean square at 10 meters [33 feet] (RMS, dB)	190	190
Distance to 206-dB threshold (feet) [a]	28	28
Distance to 187-dB threshold (feet) [a]	588	383
Distance to 183-dB threshold (feet) [a]	1,086	708
Distance to 150-dB threshold (feet) [a]	15,228	15,228
Area of 206-dB threshold (acres)	0.06	0.06
Area of 187-dB threshold (acres)	12.30	6.72
Area of 183-dB threshold (acres)	25.06	18.47
Area of 150-dB threshold (acres)	67.69	134.10

[a] Note that this distance does not account for sound attenuation by site configuration (e.g., sound not going round corners at the bends in the river), which is accounted for in the area estimates given in the table.

To install steel pipe piles to support the floating log boom, 2 to 4 days of pile driving would be required during the final year of construction. Existing geotechnical information suggests that all log-boom piles could be vibrated into place without the need for any impact pile driving, but this analysis used a conservative estimate of impact pile driving that could be required. This analysis indicated that the distance to sound-level thresholds would range from 82 feet (206 dB) to 13,061 feet (150 dB) (Table 12.7-0-5). Accounting for attenuation of sound by land at river bends, the area of effect ranges from 0.5 acre (206-dB threshold at Intakes B and C) to nearly 118 acres (150-dB threshold at Intake C) (Table 12.7-0-5).

Table 12.7-0-5. Assumptions and Estimates of Impact Pile-Driving Distance and Area of Acoustic Effect at Each Intake for Construction of Log Booms

Variable	Intake B	Intake C
Number of piles	32	32
Number of piles per day	10	10
Number of days of pile driving	4	4
Number of strikes per pile	504	66
Number of strikes per day	5,040	660
Peak single-strike sound level at 10 meters [33 feet] (dB)	212	212
Sound exposure level at 10 meters [33 feet] (SEL, dB)	181	181
Root mean square at 10 meters [33 feet] (RMS, dB)	189	189

Variable	Intake B	Intake C
Distance to 206-dB threshold (feet) [a]	82	82
Distance to 187-dB threshold (feet) [a]	3,825	990
Distance to 183-dB threshold (feet) [a]	3,825	1,830
Distance to 150-dB threshold (feet) [a]	13,061	13,061
Area of 206-dB threshold (acres)	0.5	0.5
Area of 187-dB threshold (acres)	66.4	27.2
Area of 183-dB threshold (acres)	66.4	51.7
Area of 150-dB threshold (acres)	69.3	117.9

[a] Note that this distance does not account for sound attenuation by site configuration (e.g., sound not going around corners at the bends in the river), which is accounted for in the area estimates given in the table.

Restricting pile driving to June 1–October 31 at the north Delta intakes would avoid most of the adult smelts' migration period (December–March) and most of the smelts' spawning (February–June) and early life stages (March–June) seasons, although some potential for exposure would occur in June. As noted above, fish smaller than 2 grams are more sensitive to underwater noise than larger individuals and may experience injury at 183 dB (Fisheries Hydroacoustic Working Group 2008). Larval and juvenile delta smelt generally are smaller than 2 grams, whereas adults average 2 to 3 grams (Foott and Bigelow 2010). Because some adult delta smelt are less than 2 grams, the lower injury threshold (183 dB) applies to this life stage, as well. As illustrated above, areas of habitat near the north Delta intakes that could be affected by pile driving at the 183-dB threshold ranges from 0.6 to 1.3 acres for the test-pile program (Table 12.7-0-3), 18.5 to 25.1 acres for construction of cofferdams and training walls (Table 12.7-0-4), and 51.7 to 66.4 acres for construction of log booms (Table 12.7-0-5).

In addition to the timing of the in-water work window to avoid smelts, potential exposure of the population to pile-driving noise would be minimized further by implementation of an underwater sound control and abatement plan (Appendix 3A and AMM-26: *Develop and Implement an Underwater Sound Control and Abatement Plan*) that includes best available and practicable methods such as vibratory pile driving, attenuation devices, and other potential physical and operational measures (e.g., starting impact pile driving at lower levels of intensity to allow fish to leave the area before the intensity is increased) and hydroacoustic monitoring and compliance requirements to avoid or minimize impacts on listed fish.

Pile driving would also be required at two bridge crossings located in Snodgrass Slough in the north Delta and Burns Cutoff in the south Delta. Accounting for attenuation of sound by river bends, the area of effect ranges from 0.04 acre (206-dB threshold at Snodgrass Slough) to 12.37 acres (150-dB threshold at Burns Cutoff) (Table 12.7-0-6). The location of this work likely has very little spatial overlap with delta smelt life stages because the Snodgrass Slough location is located far from the main tidally influenced channels through which most smelts likely move and Burns Cutoff is in the south Delta, an area with few if any smelts occurring during the in-water work window.

Table 12.7-0-6. Assumptions and Estimates of Impact Pile-Driving Distance and Area of Acoustic Effect at Each Bridge Crossing

Variable	Snodgrass Slough	Burns Cutoff
Pile diameter (steel pipe, inches)	16	24
Number of piles	26	50
Number of piles per day	6	6
Number of days of pile driving	5	9
Number of strikes per pile	150	150
Number of strikes per day	900	900
Peak single-strike sound level (dB)	204	212
Sound exposure level (SEL, dB)	179	181
Root mean square (RMS, dB)	189	189
Distance to 206-dB threshold (feet)[a]	24	82
Distance to 187-dB threshold (feet)[a]	896	1,217
Distance to 183-dB threshold (feet)[a]	1,655	2,249
Distance to 150-dB threshold (feet)[a]	13,061	13,061
Area of 206-dB threshold (acres)	0.04	0.47
Area of 187-dB threshold (acres)	4.12	12.38
Area of 183-dB threshold (acres)	7.34	12.36
Area of 150-dB threshold (acres)	25.45	12.37

[a] Note that this distance does not account for sound attenuation by site configuration (e.g., sound not going round corners at the bends in the river), which is accounted for in the area estimates given in the table.

Other noise generating components of the PA could result in temporary behavioral effects on delta smelt in the vicinity above the baseline hydroacoustic conditions, but the implementation of work windows reduces the likelihood of exposure and adverse effects.

Fish Stranding/Rescue

Installation of cofferdams to isolate the construction areas for the proposed intake sites has the potential to strand fish, including delta smelt and longfin smelt, resulting in mortality of fish from dewatering, dredging, and pile driving within the enclosed areas of the channel. To minimize entrapment risk and the number of fish subject to capture and handling, injury, and mortality during fish rescue and salvage operations, cofferdam construction would be limited to the proposed in-water construction period (June 1–October 31) to avoid the peak abundance of the smelts in the reach of the Sacramento River that would be affected by the proposed activities. DWR will prepare and submit a fish rescue and salvage plan (BA Appendix 3A AMM-25: Fish Rescue and Salvage Plan) to the fish and wildlife agencies (i.e., NMFS, Service, and CDFW) for review and approval prior to implementation. The likelihood of smelts being stranded behind the cofferdam is low during the in-water construction window.

Effects to Recovery

The delta smelt now exists as an integrated hatchery population. This means there is no longer a separate wild population that exists independently of the captive broodstock maintained by UC Davis and the Service. The Service and its partners in the Culture and Supplementation of Smelt (CASS) group decide how many delta smelt to produce each year for release into the wild and where to release them.

The longfin smelt DPS is a fully wild population. Some individuals have occasionally migrated up the Sacramento River to and beyond the proposed DCP construction site (Merz et al. 2013) but as reviewed above, no longfin smelt have been captured in the Sacramento River between Isleton and the American River confluence in the past five years, likely due to both habitat constraints and low population densities.

The construction of the DCP would permanently reduce approximately 5.6 acres low-velocity migratory habitat in the northern portion of the smelts' range where few smelts have been detected and none in the previous five years. With implementation of the proposed *Conservation Measures*, the construction activities are expected to result in minimal change in population numbers and distribution.

Delta Smelt Critical Habitat

Construction of the north Delta intakes would result in the permanent loss of approximately 5.6 acres and temporary loss of 1.5 acres of critical habitat for the delta smelt. Based on existing site conditions, none of this habitat is considered preferred spawning habitat for delta smelt; however, the cofferdam and intakes could hinder access to spawning habitat upstream. As described in above, construction activities have the potential for effects because of increased turbidity, suspended sediment, and contaminants, which could affect water quality (PCE 2). These will be minimized by implementation of the *Conservation Measures*. The proposed intakes would affect the river flow PCE 3 by changing water velocity in the vicinity of the north Delta intake fish screens. Construction activities would not affect PCE 4 because there would be no effect on salinity during construction or placement of structures in the water.

12.8 Valley Elderberry Longhorn Beetle

Activities affecting valley elderberry longhorn habitat include the construction of the north Delta intakes, the tunnel shafts at the Twin Cities Complex, the Bethany Complex**,** the CCWD interconnection facilities, and the Bouldin Island and I-5 pond mitigation sites. Activities include the construction of support facilities (e.g., emergency facilities, fuel station), electrical substations, switchyards, and access roads. An estimated 78.03 acres of modeled valley elderberry longhorn beetle riparian habitat would be adversely affected by the PA. According to the BA, implementation of the PA will permanently affect 16.03 acres and temporarily affect 14.33 acres of modeled riparian habitat related to the construction. Habitat creation and enhancement at Bouldin Island and the I-5 ponds would affect 47.67 acres of modeled valley elderberry longhorn beetle riparian habitat. The creation and enhancement actions are assumed to

convert the existing, low-quality habitat to high-quality valley elderberry longhorn beetle habitat and would ultimately offset the modeled habitat impact from construction.

Individual valley elderberry longhorn beetles and their larvae may be directly injured or killed by actions leading to the loss of habitat (*i.e.*, the killing of or damage to elderberry plants) in which they live. Vegetation maintenance could affect shrubs they establish within, or occur adjacent to, through physical damage, trimming, removal or pesticide or herbicide drift. Likewise, maintenance equipment could crush or kill beetles or disrupt normal behaviors (i.e., feeding, breeding, dispersal), especially during the adult flight period (March to July). Similarly, daily and weekly inspections by vehicle could strike flying beetles. The Service views that any ground disturbance within 20 feet of the dripline of an elderberry plant has the potential to adversely affect that plant and may cause mortality to the host plant and subsequently the beetle. Elderberry shrubs may be indirectly affected by actions occurring within 100 feet of the elderberry plant's dripline. These may include dust accumulating on plants, soil compaction, inadvertent herbicide application, and fuel spills. Implementation of conservation measures will minimize indirect effects that may occur outside of the 20-foot buffer around an elderberry plant. In addition, habitat creation and enhancement at the Bouldin Island and I-5 pond mitigation sites would offset the effects, including loss, of riparian habitat.

Effects on Recovery

The PA will result in adverse effects but would not increase the threats currently impacting the valley elderberry longhorn beetle as identified in the recovery plan. Actions including but not limited to dust accumulation, soil compaction, inadvertent herbicide application, and fuel spills also have the potential to cause indirect adverse effects to the valley elderberry longhorn beetle. These effects will be minimized by DWR's proposal to implement avoidance and minimization measures for the valley elderberry longhorn beetle. The approximately 16.03 acres of modeled habitat lost as a result of the construction of the water conveyance facilities will not appreciably alter conditions in the Action Area. The protection, creation and enhancement of riparian habitat may provide relatively greater benefit to the valley elderberry longhorn beetle than provided under existing conditions because of the importance of this habitat type being conserved into perpetuity. With implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in no change in population numbers and distribution.

12.9 Vernal Pool Fairy Shrimp, Vernal Pool Tadpole Shrimp, and Vernal Pool Fairy Shrimp Critical Habitat

Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp

An estimated 15.06 acres of modeled habitat would be adversely affected as a result of project construction; 0.42 acre of which is permanently, directly affected by construction and 14.64 acres of which may be indirectly (within 250 feet of mapped vernal pool habitat) affected. Compensatory mitigation for loss of vernal pool habitat will consist of the preservation of habitat and the creation of habitat, through purchasing of credits at either a Service-approved conservation bank or at a non-bank site approved by the Service supporting habitat for vernal pool species at a 2:1 ratio for direct loss and 1:1 ratio for indirect loss. Reinitiation may be

required if the undetermined site protection instrument results in effects not analyzed in this consultation.

Activities included in the PA that will have adverse effects on vernal pool fairy shrimp and vernal pool tadpole shrimp and their modeled suitable habitat are activities related to the construction of the Bethany Complex. These would include construction of the pumping plant, surge basin, reception shaft, discharge structure, aqueduct, and the construction of a water pipeline, electrical substation, switchyard, and access roads which would be used in support of construction and operations within the Bethany Complex footprint.

Individual vernal pool fairy shrimp and vernal pool tadpole shrimp, and their cysts may be injured or killed through implementation of protocol-level surveys and by actions leading to the loss of habitat (i.e., filling or inundating vernal pools) in which they live. Protocol-level surveys require walking through vernal pool habitat in the wet and dry season capturing and collecting both shrimp and their cysts. Walking through wet pool sediments and substrate can damage branchiopod cysts, vernal pool plants and their seeds and capture/collection results in mortality to individuals. The Service maintains that the partial filling of a vernal pool directly affects the whole vernal pool. Vernal pool habitat indirectly affected includes all habitat supported by impacted upland areas and swales, and all habitat otherwise affected by changes to the watershed, human intrusion, introduced species, and disturbance that will be caused by a PA. Changes in hydrology or the degradation of water quality within vernal pools and seasonal wetlands that are not directly affected by the PA may result in indirect effects to vernal pool fairy shrimp and vernal pool tadpole shrimp habitat and may not currently be fully known or described by the BA.

Effects to Recovery

The PA would not increase the threats currently impacting the vernal pool regions or core areas as identified in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* or preclude implementation of recovery actions. With implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in no change in population numbers and distribution.

Vernal Pool Fairy Shrimp Critical Habitat

The West Tracy Fault work is only expected to result in temporary effects on vernal pool fairy shrimp critical habitat and indirect effects should be reduced because the borings and CPTs would be backfilled with grout and the native soil profile would be restored within the test trenches such that the hydroperiod of the habitat is not expected to be affected. These temporary activities are not expected to result in hydrological changes that could indirectly affect areas outside the field investigations temporary construction footprint.

The temporary ground disturbance related to field investigations is not expected to appreciably reduce the conservation value of critical habitat for vernal pool fairy shrimp because the impact is temporary; the disturbance is a small percentage of total critical habitat; and the impact occurs at the eastern edge of critical habitat unit 19B where the existing condition is degraded due to proximity to agricultural land use.

12.10 Northwestern Pond Turtle

Construction and ground disturbing activities related to the PA are likely to affect northwestern pond turtle. Construction activities at each intake include ground clearing and grading, construction of the intakes and associated facilities, and vehicular use including transport of construction equipment and materials. Northwestern pond turtles may be killed or injured by vehicles and heavy construction equipment used as part of the PA. This effect would be most likely to occur during site clearing (up to several days at each location). Northwestern pond turtles commonly use roadside ditches for movement corridors or for foraging and are known to use roadsides embankments for basking sites. This makes northwestern pond turtles highly vulnerable to vehicle strikes as northwestern pond turtles bask on the road or cross back and forth over roads from the various suitable aquatic and upland habitats.

Associated equipment noise, vibration, and increased human activity may interfere with normal behaviors. These behaviors include feeding, sheltering, movement between refugia and foraging habitats, and other essential behaviors of northwestern pond turtle. Project related activities that occur in areas that have suitable habitat but create intolerable levels of disturbance may force individuals from cover and potentially subject them to circumstances that otherwise would not occur and could result in an increased threat to their survival such as predation.

Natural food sources may also be reduced as a result of habitat disturbance and loss. Short-term temporal effects will occur when vegetative cover is removed within upland habitat during project implementation, which may also subject this species to an increased risk of predation. The PA will likely have some adverse effect by harassing turtles away from suitable habitat or by disrupting brumation/aestivation if turtles are occupying a cavity in the ground or mud shallow. A Brumating/aestivating turtle can be killed from direct contact with construction and maintenance equipment. Turtles in terrestrial habitat may also become entombed under soil, crushed or damaged by equipment or personnel, thereby resulting in harm or mortality to individuals. To minimize these effects, DWR proposes a series of conservation measures such as work windows, exclusionary fencing, biological monitoring and worker awareness training.

An estimated 223.60 acres of modeled northwestern pond turtle habitat would be adversely affected by the PA. The PA is estimated to permanently impact approximately 149.77 acres of modeled habitat throughout the Action Area. The PA is also estimated to temporarily affect approximately 73.83 acres of modeled habitat resulting from construction of permanent facilities such as intake structures and associated electrical buildings and facilities, and permanent access roads. To compensate for the loss of permanent habitat and minimize effects from habitat loss to northwestern pond turtle, DWR proposes to either restore, create, or enhance high quality habitat areas targeted for northwestern pond turtle recovery at an approximately 1:1 ratio. Under full implementation of the Compensatory Mitigation Plan, DWR proposes to restore, create, or enhance approximately 690.04 acres that will benefit the northwestern pond turtle in the Delta. The habitat creation and enhancement at Bouldin Island and the I-5 ponds is expected to offset the permanent loss of wetlands and habitat for special-status species, including northwestern pond turtle.

Effects to Recovery

A recovery plan has yet to be developed for the northwestern pond turtle. The PA could increase the threats currently impacting the northwestern pond turtle as described in the turtle's listing documents and Species Status Assessment (Service 2023e) within the localized Action Area. However, with implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in little to no change in population numbers and distribution.

12.11 Western Spadefoot

Construction activities associated with field investigations, access roads, electrical and SCADA facilities, and the Bethany Complex have the potential to affect the western spadefoot and will impact a total of 37.44 acres of modeled habitat. Per the BA, the PA will result in the permanent loss of 33.10 acres which includes 0.20 acre of aquatic habitat and 32.90 acres of modeled upland habitat. Approximately 4.34 modeled upland acres will be temporarily affected and restored to pre-project conditions. The BA did not include modeled habitat impacts from the I-5 ponds creation and enhancement in the acreage impact assessment above but treated them separately and qualitatively explained why the I-5 ponds do not support western spadefoot habitat. Compensatory mitigation for loss of western spadefoot aquatic and upland habitat will consist of the preservation of habitat and the creation of habitat, through purchasing of mitigation credits, at either a Service-approved conservation bank or at a non-bank site approved by the Service supporting habitat for western spadefoot at a 1:1 ratio. Reinitiation may be required if the undetermined site protection instrument results in effects not analyzed in this consultation.

While there is low potential for an individual to be present in the vicinity of the PA as described above, construction activities will occur over a long period of time which will increase chances of exposure if the western spadefoot establishes within the Action Area. The activities listed above are expected to affect the western spadefoot through mortality, injury, harassment, and harm of individual eggs, larvae, subadults and adults if present. Ground disturbance associated with construction activities will result in removal of vegetation and other materials utilized for cover and aestivation, fill or crush burrows or crevices, and reduce the prey base for the western spadefoot. Since the western spadefoot utilizes small mammal burrows and soil crevices for shelter, individuals may be crushed, buried, or otherwise injured during construction activities. Disturbance caused by construction activities may cause individuals to disperse into areas containing unsuitable habitat and increase the risk of predation or other sources of mortality. Disturbance, injury, or mortality to the animals may result from night-lighting, noise, and vibration, which are further described below. Construction-related contaminants, such as fuels, cement, and oils accidentally discharged or spilled into modeled habitat could expose the species to toxic materials, resulting in injury and mortality, and lead to habitat degradation. These adverse effects would be minimized through implementation of avoidance and minimization measures to reduce the risk of disturbance, injury, and mortality of individuals.

Effects to Recovery

The PA would not increase the threats currently impacting the vernal pool regions or core areas as identified in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern*

Oregon or preclude implementation of recovery actions. Suitable modeled habitat affected is outside of any core recovery area or known population; therefore, with implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in no change in population numbers and distribution.

12.12 Monarch Butterfly

Activities associated with field investigations, north Delta intakes, tunnel shafts, RTM, Bethany Complex, access roads, electrical and SCADA facilities, other construction support facilities, Contra Costa Water District Interconnection, and the CMP overlap with monarch butterfly modeled breeding habitat and will impact a total of 727.3 acres of modeled habitat. An estimated 146.67 acres of modeled monarch butterfly breeding habitat would be permanently impacted and 68.54 acres of modeled habitat would temporarily impacted as a result of DCP construction. Temporarily disturbed grasslands that are revegetated would use a seed mix combination that includes nectar-producing plants, including milkweed. Habitat creation and enhancement of the initial mitigation sites at Bouldin Island and the I-5 ponds would affect 512.09 acres of modeled monarch butterfly breeding habitat from vegetation removal and grading to create the appropriate topography and soil conditions to establish or restore habitats. The creation and enhancement actions are assumed to convert the existing, low- to moderate-quality habitat to high-quality monarch butterfly habitat that will be protected and managed in perpetuity as described in CMP-32: Monarch Butterfly Habitat (BA Attachment 3B.1, Table 3B.1-3). The creation and enhancement actions at Bouldin Island and the I-5 ponds are assumed to have a long-term benefit to the species.

In addition to modeled habitat impacts, the activities listed above are expected to affect the monarch butterfly through mortality, injury, and harm of individuals of eggs, larvae/caterpillars, chrysalids, and adults. Ground clearing and grading, on-land pile driving, excavation, placement of fills, cutoff walls and structures, and drilling would require the use of heavy equipment within the intake construction site as well as along the access roads to the site and could result in injury, mortality, and the disruption of normal behaviors of monarch butterfly. Overland driving and use of heavy equipment has the potential to crush individual monarch adults, eggs, larvae, and chrysalids or result in injury or mortality due to vehicle strikes. Construction-related contaminants, such as fuels, cement, and oils accidentally discharged or spilled into modeled monarch butterfly habitat could expose monarch butterfly eggs, larvae, or chrysalids to toxic materials, resulting in injury and mortality, and lead to habitat degradation. These adverse effects would be minimized through implementation of avoidance and minimization measures to reduce the risk of disturbance, injury, and mortality of individuals.

Effects to Recovery

A recovery plan has yet to be developed for the monarch butterfly. The PA would not increase the threats currently impacting the monarch butterfly and impacts are mainly located in or near agricultural areas with herbicide and pesticide use. With implementation of the proposed Conservation Measures, the PA is expected to ultimately result in no change in population numbers and distribution.

13. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the Action Area considered in this BiOp. Future Federal actions that are unrelated to the PA are not considered in this section; they require separate consultation pursuant to section 7 of the Act.

Major human interactions and uses of the landscape within the Action Area include agricultural use, urbanization, and recreational use.

13.1 Agriculture

Farming occurs throughout the Delta and its watershed, including on lands adjacent to many waterways used by smelts and giant garter snakes. Conversion of existing suitable habitat to agriculture results in habitat destruction, degradation, and fragmentation. Habitat loss through agricultural conversion has been identified as a primary threat to giant garter snake (Service 2017c), monarch butterfly (Service 2024d), northwestern pond turtle (Service 2023d) vernal pool branchiopods (Service 2024c), and western spadefoot (Service 2023f). Agricultural practices are a major cause of the current loss of biodiversity. Levees are reinforced with continual vegetation removal and over time, riprapping has accumulated as a commonly deployed method to stabilize the levees and protect the land behind the levees for agricultural purposes. Agricultural practices can lead to habitat degradation and other impacts by introducing nitrogen, phosphorous and other nutrients into the watershed, which then flow into receiving waters, adding to other inputs such as wastewater treatment (Lehman *et al.* 2013); however, urban wastewater treatment provides the bulk of ammonium loading (Jassby 2008). Stormwater and irrigation discharges related to both agricultural and urban activities contain numerous pesticides and herbicides that may negatively affect the smelts' reproductive success and survival rates (Dubrovsky *et al.*1998; Kuivila *et al.* 2004; Scholz *et al.* 2012). Discharges occurring outside the Action Area that flow into the Action Area also contribute to contaminant exposure.

Water diversions for irrigated agriculture, municipal and industrial use, and managed wetlands are found throughout the Action Area, and many of them remain unscreened. Depending on the size, location, and season of operation, these unscreened diversions have the potential to entrain many life stages of aquatic species, including delta smelt (Nobriga *et al.* 2004). Most diversions of any substantial size and cost along the Sacramento River have been screened, and in the Delta, newer municipal water diversions and are routinely screened per existing BiOps. Private irrigation diversions in the Delta are mostly unscreened, but the total amount of water diverted onto Delta farms and waterfowl clubs has remained stable for decades (Culberson *et al.* 2008) so the cumulative impact should remain similar to baseline.

13.2 Urbanization and Industry

Increases in urbanization and housing development can impact habitat by altering watershed characteristics and changing both water use and stormwater runoff patterns. Increased growth will place additional burdens on resource allocations, including natural gas, and electricity, as

well as on infrastructure such as wastewater sanitation plants, roads and highways, and public utilities. Some of these actions will not require consultation.

Adverse effects on listed species and their critical habitat may result from urbanization-induced point and non-point source chemical contaminant discharges within the Action Area. These contaminants include, but are not limited to, ammonia, numerous pesticides and herbicides, pharmaceuticals and their degredates, personal care products, vehicle and roadway-derived copper, and oil and gasoline product discharges. Oil and gasoline product discharges may be introduced into Delta waterways from shipping and boating activities and from urban activities and runoff. Implicated as potential stressors to delta smelt, these contaminants may adversely affect delta smelt reproductive success, survival rates, and food supply.

Other future, non-Federal actions within the Action Area that are likely to occur and may adversely affect listed species and their designated critical habitats include: the dumping of domestic and industrial garbage that decreases water quality; oil and gas development and production that may affect aquatic habitat and may introduce pollutants into the water; and State or local levee maintenance that may also destroy or adversely affect habitat and interfere with natural, long-term habitat-maintaining processes.

13.3 Green House Gas Emissions

The world's climate is warming (IPCC 2001; 2007a, b; 2014) due in large part to emissions of carbon dioxide and other greenhouse gases in the atmosphere as a result of human activities, particularly the use of fossil fuels (IPCC 2007b; Solomon *et al.* 2009). Scientists use a variety of climate models, which include consideration of natural processes and variability, as well as scenarios incorporating current and potential future greenhouse gas emissions to predict how the climate will change and what the consequences will before global weather patterns, ocean current systems, the global hydrologic cycle (including polar ice), and aquatic and terrestrial ecosystems (e.g., Meehl *et al*. 2007; Ganguly *et al*. 2009; Thompson *et al*. 2021). Global climate models have been downscaled so they can be applied to particular locations, for instance, to the western U.S. (Dettinger *et al*. 2015) and the Central Valley (Dettinger 2005; Dettinger *et al*. 2016). All combinations of climate models and emissions scenarios yield very similar projections for the Bay-Delta region, consistently predicting increases in sea level and air temperature, with higher uncertainty in predictions of average precipitation. However, there is also increasing scientific recognition that weather in California will become more variable and include a higher frequency of drought conditions (Swain *et al*. 2018).

The changing climate affects listed species not evolutionarily adapted to rapid change. Species dependent on ephemeral wetlands (e.g., vernal pool branchiopods and western spadefoot), riparian corridors (e.g., valley elderberry longhorn beetle), aquatic habitats (e.g., northwestern pond turtle and giant garter snake), and pollinator habitat (e.g., monarch butterfly) are especially vulnerable. Please refer to the 2024 LTO BiOp for a specific discussion on how climate change is affecting the delta smelt.

14. CONCLUSION

After reviewing the current *Status of Species* for the San Joaquin kit fox, least Bell's vireo, western yellow-billed cuckoo, California red-legged frog, California tiger salamander, giant garter snake, delta smelt, longfin smelt, valley elderberry longhorn beetle, vernal pool fairy shrimp, vernal pool tadpole shrimp, northwestern pond turtle, western spadefoot, and monarch butterfly, the *Environmental Baseline* for the Action Area, the *Effects of the Proposed Action*, and the *Cumulative Effects*, it is the Service's biological and conference opinion that the Delta Conveyance Project, as proposed, is not likely to jeopardize the continued existence of these species. The Service reached this conclusion because the construction-related effects to the species, when added to the environmental baseline and analyzed in consideration of the cumulative effects, will not rise to the level of precluding recovery or reducing the likelihood of survival of the species based on the following:

1. The construction-related components of the PA are extensive in scale and scope but are located in areas of fragmented habitat of varying quality and quantity. The PA includes conservation measures to avoid, minimize, and mitigate the adverse effects to the species. Measures such as training construction personnel, implementing pre-construction surveys for species, installing exclusion fencing, etc., will serve to avoid and minimize the specific loss of, injury to, and impairment of individuals of each species. Additionally, proposed compensatory mitigation measures will offset the loss of, disturbance to, and indirect effects to on-site habitats for all of the species.

2. Because the range of each species extends variably beyond the Action Area and are not restricted only to the construction footprint, the resulting adverse effects of the PA (reduced by the aforementioned conservation measures) are not expected to appreciably diminish the likelihood of both the survival and recovery of the listed species in the wild by reducing their reproduction, numbers, or distribution.

After reviewing the current *Status of the Critical Habitat* for delta smelt, California red-legged frog, and vernal pool fairy shrimp critical habitat, the *Environmental Baseline* for the Action Area, the *Effects of the Action*, and the *Cumulative Effects*, it is the Service's biological opinion that the Delta Conveyance Project is not likely to result in destruction or adverse modification to these designated critical habitats based on the following:

1. The small size of the temporary and permanent impacts will not diminish the value of critical habitat as a whole for the conservation of these species.

15. INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm in the definition of "take" in the Act means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Harass in the definition of "take" in the

Act means an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering (50 CFR 17.3). Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not the purpose of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the proposed protective measures and the terms and conditions of an incidental take statement and occurs as a result of the action as proposed.

The measures described below are non-discretionary and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(4)].

The prohibitions against taking found in section 9 of the Act do not apply to the northwestern pond turtle, western spadefoot, and monarch butterfly until the species are listed. However, the Service advises the Corps to consider implementing the following Reasonable and Prudent Measures for these species. If this conference opinion is adopted as a biological opinion following a listing, the Reasonable and Prudent Measures, with their implementing Terms and Conditions, will be non-discretionary.

15.1 Amount or Extent of Take

Due to the implementation of the standard consultation components of the PA, the Service anticipates the following levels of incidental take. Upon implementation of the Reasonable and Prudent Measures and Terms and Conditions, incidental take associated with the Project will become exempt from the prohibitions described under section 9 of the Act.

15.1.1 San Joaquin Kit Fox

The Service anticipates that incidental take of the San Joaquin kit fox will be difficult to detect due to their rare sightings in the northern part of their range, nocturnal behavior and propensity to seek refuge within dens if injured, disturbed or startled. For these reasons, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individual San Joaquin kit foxes. Due to the difficulty in quantifying the number of San Joaquin kit foxes that will be subject to incidental take as a result of the PA, the Service is using modeled suitable habitat as a surrogate to quantify incidental take of the species. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all San Joaquin kit foxes within the 55.90 acres of modeled suitable habitat identified in the DCP BA to be permanently or temporarily affected by the construction elements will be subject to incidental take in the form of harm, injury, and death. The amount of habitat disturbance is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain

features that San Joaquin kit fox use for feeding and sheltering (such as burrows and foraging habitat containing prey) and the anticipated take is caused by such disturbance activities. Injury and mortality are anticipated to be low because of the proposed *Conservation Measures* which include limiting noise and lighting impacts and avoidance of occupied dens. The Service will consider the amount or extent of incidental take to be exceeded if modeled suitable habitat is impacted beyond the 55.90 acres identified.

15.1.2 Least Bell's Vireo

The Service anticipates that incidental take of the least Bell's vireo will be difficult to detect due to their elusive nature and sensitivity to disturbance. Losses of this species may also be difficult to quantify due to a lack of project-specific species and habitat survey data, the long-term nature of the project, and seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. For these reasons, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individual least Bell's vireo. Due to the difficulty in quantifying the number of vireos that will be taken as a result of the PA, the Service is using modeled suitable habitat affected as a surrogate to quantify incidental take of the species. The amount of suitable habitat as a surrogate is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain features that vireos use for migrating, feeding, nesting, and sheltering and the anticipated take is caused by such disturbance activities. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all cuckoos within the 17.44 acres of modeled suitable habitat identified in the DCP BA to be permanently or temporarily affected by pre-construction and construction activities will be subject to incidental take in the form of harm, injury, or mortality. The Service will consider the amount or extent of incidental take to be exceeded if modeled suitable habitat is impacted beyond the 17.44 acres identified.

15.1.3 Western Yellow-Billed Cuckoo

The Service anticipates that incidental take of the western yellow-billed cuckoo will be difficult to detect due to their elusive nature and sensitivity to disturbance. Losses of this species may also be difficult to quantify due to a lack of project-specific species and habitat survey data, the long-term nature of the project, and seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. For these reasons, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individual western yellow-billed cuckoos. Due to the difficulty in quantifying the number of cuckoos that will be taken as a result of the PA, the Service is using modeled suitable habitat as a surrogate to quantify incidental take of the species. The amount of suitable habitat as a surrogate is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain features that cuckoos use for migrating, feeding, and sheltering and the anticipated take is caused by such disturbance activities. This is also likely an overestimate as DWR's modeled habitat and Action Area extend far beyond the actual project footprint. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all cuckoos within the 17.34 acres of modeled suitable habitat identified in the DCP BA to be permanently or temporarily affected by pre-construction and construction activities will be subject to incidental take in the form of harm, injury, or mortality. The Service will consider the

amount or extent of incidental take to be exceeded if modeled suitable habitat is impacted beyond the 17.34 acres identified.

15.1.4 California Red-Legged Frog

The Service anticipates that incidental take of the California red-legged frog will be difficult to detect due to their cryptic nature and wariness of humans. Losses of this species may also be difficult to quantify due to a lack of project-specific species and habitat survey data, the long-term nature of the project, and seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. For these reasons, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individual California red-legged frogs. Due to the difficulty in quantifying the number of California red-legged frogs that will be taken as a result of the PA, the Service is using modeled suitable habitat as a surrogate to quantify incidental take of the species. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all California red-legged frogs within the 421.57 acres of modeled suitable habitat identified in the BA to be permanently or temporarily affected by pre-construction and construction activities will be subject to incidental take in the form of harm, injury, or mortality. The amount of habitat disturbance is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain features that California red-legged frogs use for breeding, feeding, and sheltering (such as aquatic features and burrows) and the anticipated take is caused by such disturbance activities. Injury and mortality are anticipated to be low because of the proposed conservation measures which include confining activities to the dry season, limiting light disturbance, and providing escape ramps. The Service will consider the amount or extent of incidental take of California red-legged frog to be exceeded if modeled suitable habitat is impacted beyond the 421.57 acres identified.

15.1.5 California Tiger Salamander

The Service anticipates that incidental take of the Central California tiger salamander will be difficult to detect due of its cryptic and fossorial nature, and predominantly nocturnal behavior. Losses of this species may also be difficult to quantify due to a lack of project-specific species and habitat survey data, the long-term nature of the project, and seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. For these reasons, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individual Central California tiger salamanders. Due to the difficulty in quantifying the number of Central California tiger salamanders that will be taken as a result of the PA, the Service is using modeled suitable habitat as a surrogate to quantify incidental take of the species. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all Central California tiger salamanders within the 79.49 acres of modeled suitable habitat identified in the BA to be permanently or temporarily affected by the standard consultation elements will be subject to incidental take in the form of harm, injury, or mortality. The amount of habitat disturbance is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain features that California tiger salamanders use for breeding, feeding, and sheltering (such as aquatic features and burrows) and the anticipated take is caused by such disturbance activities. Injury and mortality are anticipated to

be low because of the proposed conservation measures which include confining activities to the dry season, limiting light disturbance, and providing escape ramps. The Service will consider the amount or extent of incidental take of Central California tiger salamander to be exceeded if modeled suitable habitat is impacted beyond the 79.49 acres identified.

15.1.6 Giant Garter Snake

The Service anticipates that incidental take of the giant garter snake will be difficult to detect due to their elusive nature, sensitivity to disturbance, and difficulty in detecting them in aquatic environments. Losses of this species may also be difficult to quantify due to a lack of project-specific species and habitat survey data, the long-term nature of the project, and seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. For these reasons, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individual giant garter snake. Due to the difficulty in quantifying the number of snakes that will be taken as a result of the PA, the Service is using modeled suitable habitat as a surrogate to quantify incidental take of the species. The amount of suitable habitat as a surrogate is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain features that snakes use for movement between habitats, feeding, breeding, and sheltering (brumation and aestivation) and the anticipated take is caused by such disturbance activities. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all snakes within the 132.47 acres of modeled suitable habitat identified in the DCP BA to be permanently or temporarily affected by pre-construction and construction activities will be subject to incidental take in the form of harm, injury, or mortality. The Service will consider the amount or extent of incidental take to be exceeded if modeled suitable habitat is impacted beyond the 132.47 acres identified.

Injury or mortality of giant garter snakes as a result of contact with construction equipment and/or vehicles on the roadways within the modeled suitable habitat can be quantified and monitored. The Service expects that no more than two (2) giant garter snakes will be killed or injured in a single construction year by contact with construction equipment and/or vehicles. The Service will consider the amount or extent of incidental take of giant garter snake to be exceeded if a total of three (3) or more giant garter snakes are killed or injured in a single construction year.

15.1.7 Delta Smelt and Longfin Smelt

The Service anticipates incidental take of delta and longfin smelt adults, juveniles, larvae, and/or eggs will be difficult to detect and quantify because of the species' small size and cryptic nature and therefore it is not possible to provide precise numbers of smelts that could be harmed, injured, or killed from construction. There are numerical limitations with respect to detecting individual smelts in the wild, for that reason, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individual smelts. Due to the difficulty in quantifying the number of smelts that will be taken as a result of the PA, the Service is using habitat within the area of hydroacoustic effects to behavior (as described in the *Effects of the Action* section for impact pile-driving for cofferdams and bridge crossings) as a surrogate to quantify incidental take of the species. Therefore, to quantify the level of incidental

take associated with the construction-related activities, the Service anticipates that all smelts within approximately 240 acres of aquatic habitat near the intakes and bridge crossings will be subject to incidental take in the form of harm from interference or impairment of essential behavior patterns, injury, or mortality. Injury and mortality are anticipated to be low because of the in-water work window restrictions for the smelts. The Service will consider the amount or extent of incidental take of delta smelt to be exceeded if aquatic habitat is impacted beyond the 240 acres identified.

15.1.8 Valley Elderberry Longhorn Beetle

Valley elderberry longhorn beetles are small in size, and their life cycles and patchy habitats make detection difficult and the quantification of impacts to individual valley elderberry longhorn beetles impractical in addition to a lack of project-specific species and habitat survey data. Due to the difficulty in quantifying the number of valley elderberry longhorn beetles that will be subject to incidental take as a result of the PA, the Service is using modeled suitable habitat as a surrogate to quantify incidental take of the species. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all valley elderberry longhorn beetles within the 78.03 acres of modeled suitable habitat identified in the BA to be permanently or temporarily affected by pre-construction and construction activities will be subject to incidental take in the form of harm, harassment, and mortality. The amount of habitat disturbance is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain elderberry shrubs that valley elderberry longhorn beetle use for breeding, feeding, and sheltering and the anticipated take is caused by such disturbance activities. Injury and mortality are anticipated to be low because of the proposed conservation measures which include avoiding disturbance to (if possible) or transplanting elderberry shrubs and avoiding construction activities during the active season (if possible). The Service will consider the amount of extent of incidental take to be exceeded if modeled suitable habitat is impacted beyond the 78.03 acres identified.

15.1.9 Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp

The Service uses habitat as a surrogate to quantify the amount of take when assessing the impacts of actions to both vernal pool fairy shrimp and vernal pool tadpole shrimp. The amount of habitat disturbance is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain the features that vernal pool fairy shrimp and vernal pool tadpole shrimp use for breeding, feeding, and sheltering and the anticipated take is caused by such disturbance activities. Both species of vernal pool crustaceans are small in size, and their complex life cycles and ephemeral habitats make detection difficult and the quantification of impacts to individual vernal pool fairy shrimp and vernal pool tadpole shrimp impractical. Due to the difficulty in quantifying the number of vernal pool fairy shrimp and vernal pool tadpole shrimp that will be taken as a result of the PA, the Service is quantifying incidental take of the fairy shrimp and tadpole shrimp in the form of harm, capture, collect, and mortality as all fairy and tadpole shrimp within the 15.06 acres of modeled suitable habitat identified in the BA to be permanently or temporarily affected by pre-construction and construction activities. The Service will consider the amount or extent of incidental take to be exceeded if modeled suitable habitat is impacted beyond the 15.06 acres identified.

15.1.10 Northwestern Pond Turtle

The Service anticipates that incidental take of the northwestern pond turtle will be difficult to detect due to their elusive nature, sensitivity to disturbance, and difficulty in detecting them in aquatic environments. Losses of this species may also be difficult to quantify due to a lack of project-specific species and habitat survey data, the long-term nature of the project, and seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. For these reasons, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individual northwestern pond turtle. Due to the difficulty in quantifying the number of turtles that will be taken as a result of the PA, the Service is using modeled suitable habitat as a surrogate to quantify incidental take of the species. The amount of suitable habitat as a surrogate is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain features that turtles use for movement between habitats, feeding, breeding, nesting, and sheltering (brumation and aestivation) and the anticipated take is caused by such disturbance activities. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all turtles within the 223.60 acres of modeled suitable habitat identified in the DCP BA to be permanently or temporarily affected by pre-construction and construction activities will be subject to incidental take in the form of harm, injury, or mortality. The Service will consider the amount or extent of incidental take of northwestern pond turtles to be exceeded if modeled suitable habitat is impacted beyond the 223.60 acres identified.

Injury or mortality of northwestern pond turtles as a result of contact with construction equipment and/or vehicles on the roadways within the modeled suitable habitat can be quantified and monitored. The Service expects that no more than two (2) northwestern pond turtles will be killed or injured in a single construction year by contact with construction equipment and/or vehicles. The Service will consider the amount or extent of incidental take of northwestern pond turtles to be exceeded if a total of three (3) or more northwestern pond turtles are killed or injured in a single construction year. Additionally, nest failure may occur from construction activities or nest relocation. The Service expects no more than eggs in one (1) nest will be killed in a single construction year. The Service will consider the amount or extent of incidental take of northwestern pond turtles to be exceeded if eggs in a total of two (2) nests or more are killed or injured in a single construction year

15.1.11 Western Spadefoot

The Service anticipates that incidental take of the western spadefoot will be difficult to detect due to their cryptic nature and wariness of humans. Losses of this species may also be difficult to quantify due to a lack of project-specific species and habitat survey data, the long-term nature of the project, and seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. For these reasons, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individual western spadefoots. Due to the difficulty in quantifying the number of western spadefoots that will be taken as a result of the PA, the Service is using modeled suitable habitat as a surrogate to quantify incidental take of the species. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all western spadefoots within the 37.44 acres of modeled suitable habitat identified in the DCP BA to be permanently or temporarily affected

by pre-construction and construction activities will be subject to incidental take in the form of harm, injury, or mortality. The amount of habitat disturbance is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain features that western spadefoots use for breeding, feeding, and sheltering (such as aquatic features and burrows) and the anticipated take is caused by such disturbance activities. Injury and mortality are anticipated to be low because of the proposed conservation measures which include confining activities to the dry season, limiting light disturbance, and providing escape ramps. The Service will consider the amount or extent of incidental take of western spadefoots to be exceeded if modeled suitable habitat is impacted beyond the 37.44 acres identified.

15.1.12 Monarch Butterfly

The Service anticipates that incidental take of the monarch butterfly will be difficult to estimate since the number of individuals in each life stage could vary from a few individuals to hundreds. Losses of this species may also be difficult to quantify due to a lack of project-specific species and habitat survey data, the long-term nature of the project, and seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. For these reasons, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individuals. Due to the difficulty in quantifying the number of monarch butterflies that will be taken as a result of the PA, the Service is using modeled suitable habitat as a surrogate to quantify incidental take of the species. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all monarch butterflies (all life stages) within the 727.3 acres of modeled suitable habitat identified in the DCP BA to be permanently or temporarily affected by pre-construction and construction activities will be subject to incidental take in the form of harm, injury, or mortality. The amount of habitat disturbance is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain features that monarch butterflies use for their life cycle and the anticipated take is caused by such disturbance activities. The Service will consider the amount or extent of incidental take of monarch butterflies to be exceeded if modeled suitable habitat is impacted beyond the 727.3acres identified.

15.2 Effect of the Take

In the accompanying biological and conference opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the San Joaquin kit fox, least Bell's vireo, western yellow-billed cuckoo, California red-legged frog, California tiger salamander, giant garter snake, delta smelt, longfin smelt, valley elderberry longhorn beetle, vernal pool fairy shrimp, vernal pool tadpole shrimp, northwestern pond turtle, western spadefoot, and monarch butterfly.

15.3 Reasonable and Prudent Measures

All necessary and appropriate measures to avoid or minimize effects on the San Joaquin kit fox, least Bell's vireo, western yellow-billed cuckoo, California red-legged frog, California tiger salamander, giant garter snake, delta smelt, longfin smelt, valley elderberry longhorn beetle, vernal pool fairy shrimp, vernal pool tadpole shrimp, northwestern pond turtle, western

spadefoot, and monarch butterfly resulting from construction of the DCP have been incorporated into the proposed conservation measures. Therefore, the Service believes the following reasonable and prudent measure is necessary and appropriate to minimize incidental take of the San Joaquin kit fox, least Bell's vireo, western yellow-billed cuckoo, California red-legged frog, California tiger salamander, giant garter snake, delta smelt, longfin smelt, valley elderberry longhorn beetle, vernal pool fairy shrimp, vernal pool tadpole shrimp, northwestern pond turtle, western spadefoot, and monarch butterfly:

1. All *Conservation Measures* and reporting, as described in the BA and appendices and restated/summarized here in the *Description of the Proposed Action* section of this biological opinion, shall be fully implemented and adhered to. Further, this reasonable and prudent measure shall be supplemented by the terms and conditions below.

15.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Corps shall ensure DWR, as the applicant, complies with the following terms and conditions, which implement the reasonable and prudent measure described above. These terms and conditions are nondiscretionary.

1. The following Terms and Conditions implement Reasonable and Prudent Measure 1:

    a. The Corps and/or DWR shall educate and inform personnel involved in the PA as to the *Conservation Measures* as referenced above and *Term and Condition* in this biological opinion and ensure compliance with this BiOp.
    b. The Corps and/or DWR shall notify the Service at least 30 days in advance of commencement of in-water work associated with construction activities. This notification shall include details regarding timing, duration, location, and extent of activities.
    c. At least 45 days prior to the onset of any construction-related activities, the Corps or DWR shall submit to the Service, for approval, the name(s) and credentials of biologist(s) it requests to conduct activities specified for this project. Information included in a request for authorization must include, at a minimum: (1) relevant education; (2) relevant training on species identification, survey techniques, handling individuals of different age classes, and handling of different life stages by a permitted biologist or recognized species expert authorized for such activities by the Service; (3) a summary of field experience conducting requested activities (to include project/research information and actual experience with the species); (4) a summary of biological opinions and/or informal consultations under which they were authorized to work with the listed species and at what level (such as construction monitoring versus handling), this should also include the names and qualifications of persons under which the work was supervised as well as the amount of work experience on the actual project including detail on whether the species was encountered or not; and (5) a list of Federal Recovery Permits [10(a)1(A)] if any, held or under which individuals are authorized to work with the species (to include permit number, authorized activities, and name of permit holder). No project

activities shall begin until DWR and/or the Corps has received written Service approval for biologists to conduct specified activities.

d. The Corps and/or DWR shall provide the Service and appropriate agencies a draft of any Site Protection Instrument for review and approval. Any Site Protection Instrument for federally-listed species shall adhere to the Service's current guidance and policy regarding compensatory mitigation and shall include a management plan and financial assurances to manage the property in perpetuity.
e. The Corps and/or DWR, shall ensure its contractors comply with the *Reporting Requirements* below.

15.5 Reporting Requirements

In order to monitor whether the amount or extent of incidental take anticipated from implementation of the PA is approached or exceeded, the Corps, through DWR and through DWR's contractors, shall adhere to the following reporting requirements. Should this anticipated amount or extent of incidental take be exceeded, the Corps must reinitiate formal consultation as per 50 CFR 402.16.

1. The Service must be notified within 24 hours of the finding of any injured or dead listed species or any unanticipated damage to its habitat associated with the PA. When an injured or dead individual of the listed species is found, the Corps shall follow the steps outlined in the *Salvage and Disposition of Individuals Taken* section below.

2. Sightings of any listed or sensitive animal species shall be reported to the Service and CNDDB (https://www.wildlife.ca.gov/Data/BIOS).

15.6 Salvage and Dispositions of Individuals

Injured listed species must be cared for by a licensed veterinarian or other qualified person(s), such as the Service-approved biologist. Dead individuals must be sealed in a resealable plastic bag containing a paper with the date and time when the animal was found, the location where it was found, and the name of the person who found it, and the bag containing the specimen frozen in a freezer located in a secure site, until instructions are received from the Service regarding the disposition of the dead specimen. The Service contact person is the Assistant Field Supervisor of the Endangered Species Division at (916) 930-2664.

16. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a PA on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service recommends the following actions:

1. Participate in recovery planning and implementation of conservation actions consistent with recovery planning documents.

2. Evaluate mitigation sites for long-term viability under projected climate change scenarios to ensure sustainable conservation outcomes.

3. Define measurable performance standards (e.g., habitat function, species presence) for all compensatory mitigation projects to assess ecological success effectively.

4. Foster partnerships with other agencies and entities to align mitigation efforts and reduce duplication or conflict.

5. Develop an Integrated Pest Management (IPM) approach for managing invasive species (e.g., bullfrogs, non-native fish, invasive plants) that degrade habitat quality for listed species as part of restoration designs for future projects. Coordinate with California Department of State Parks Division of Boating and Waterways to establish an IPM program for managing invasive plant species within restoration sites.

6. In support of monarch butterfly conservation, the Corps and DWR are encouraged to plant native milkweed and regionally appropriate nectar sources in non-operational or mitigation lands and along rights-of-way. Use of herbicides and insecticides should be avoided and minimized in these areas to reduce harm to pollinators.

7. To improve conservation outcomes, the agencies are encouraged to collaborate with the Service and local conservation partners on species and habitat monitoring efforts, data sharing, and adaptive management approaches that respond to observed trends.

8. The Corps and DWR are encouraged to design future studies and monitoring modifications to existing monitoring programs to maximize multi-species benefits, including integrating habitat, water quality, and biological metrics that can inform conservation and recovery efforts for multiple listed species and species of concern simultaneously.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

17. REINITIATION — CLOSING STATEMENT

This concludes formal consultation and conference on the Delta Conveyance Project. You may ask the Service to confirm the conference opinion as a biological opinion issued through formal consultation if the northwestern pond turtle, or monarch butterfly, is listed. The request must be in writing. If the Service reviews the PA and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference opinion as the biological opinion on the proposed project and no further section 7 consultation will be necessary. As provided in 50 CFR §402.16,

(a) Reinitiation of consultation is required and shall be requested by the Federal agency, where discretionary Federal involvement or control over the action has been retained or is authorized by law and:

(1) If the amount or extent of taking specified in the incidental take statement is exceeded;

(2) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;

(3) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or

(4) If a new species is listed or critical habitat designated that may be affected by the identified action.

(b) An agency shall not be required to reinitiate consultation after the approval of a land management plan prepared pursuant to 43 U.S.C. 1712 or 16 U.S.C. 1604 upon listing of a new species or designation of new critical habitat if the land management plan has been adopted by the agency as of the date of listing or designation, provided that any authorized actions that may affect the newly listed species or designated critical habitat will be addressed through a separate action-specific consultation. This exception to reinitiation of consultation shall not apply to those land management plans prepared pursuant to 16 U.S.C. 1604 if:

(1) Fifteen years have passed since the date the agency adopted the land management plan prepared pursuant to 16 U.S.C. 1604; and

(2) Five years have passed since the enactment of Public Law 115-141 [March 23, 2018] or the date of the listing of a species or the designation of critical habitat, whichever is later.

The incidental take statement provided in this conference opinion for the northwestern pond turtle, western spadefoot, and monarch butterfly does not become effective until the northwestern pond turtle, western spadefoot, or monarch butterfly is listed and the conference opinion is adopted as the biological opinion issued through formal consultation. At that time, the PA will be reviewed to determine whether any take of the northwestern pond turtle, western spadefoot, or monarch butterfly, has occurred or will occur. Modifications of the opinion and incidental take statement may be appropriate to reflect that take. No take of the northwestern pond turtle, western spadefoot, or monarch butterfly may occur between the listing of species and the adoption of the conference opinion through formal consultation, or the completion of a subsequent formal consultation.

Please address any questions or concerns regarding this biological opinion to Kim Squires, Section 7 Division Manager, at Kim_Squires@fws.gov. Please refer to Service file number 2024-0029957-S7-001 in any future correspondence regarding this project.

Sincerely,

HEATHER SWINNEY

Digitally signed by HEATHER SWINNEY
Date: 2026.03.09 09:35:40 -07'00'

Heather Swinney
Acting Field Supervisor

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