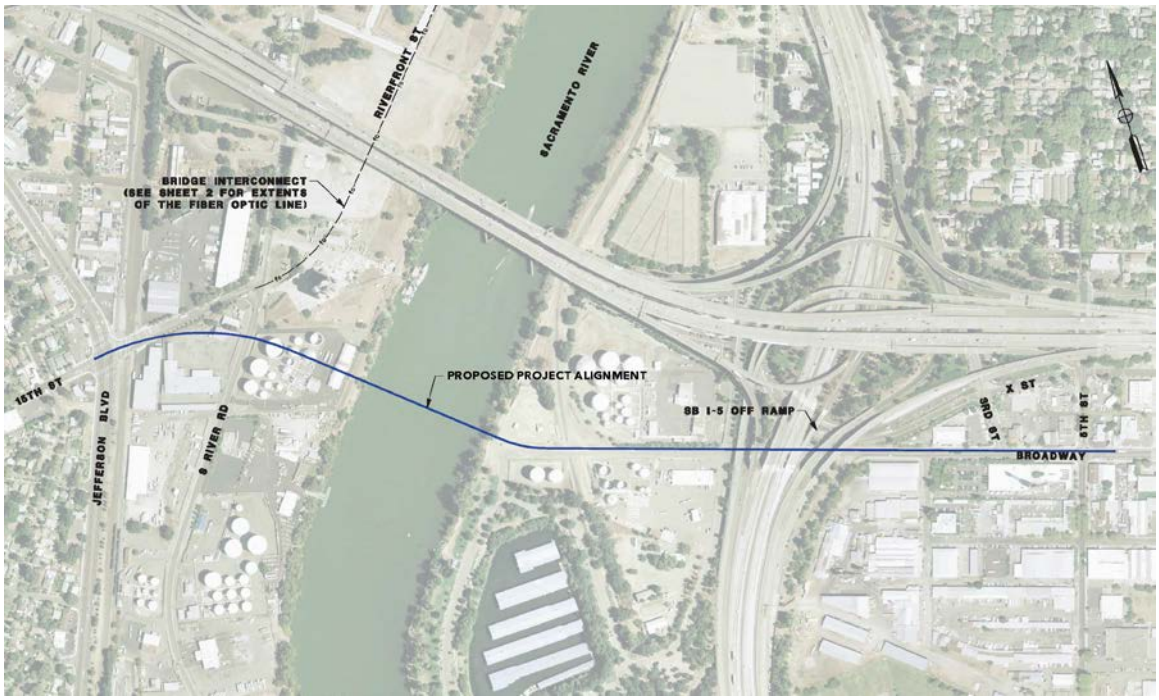

Biological Assessment

Broadway Bridge Project

City of West Sacramento and City of Sacramento, California

Federal Project No.: TGR2DGL 5447(043)

December 2020

The environmental review, consultation, and any other actions required by applicable Federal environmental laws for this project are being, or have been, carried out by Caltrans pursuant to 23 USC 327 and the Memorandum of Understanding dated December 23, 2016 and executed by FHWA and Caltrans.

Caltrans
CALIFORNIA DEPARTMENT OF TRANSPORTATION

Biological Assessment

A new bridge across the Sacramento River between the cities of West Sacramento and Sacramento, downstream of the Pioneer Bridge. The bridge will connect South River Road on the west landing and Broadway on the east landing.

Federal Project No.: TGR2DGL 5447(043)

December 2020

STATE OF CALIFORNIA
Department of Transportation
City of West Sacramento/City of Sacramento

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Acronyms and Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
AIS	aquatic invasive species
aquatic resources delineation	delineation of waters of the United States
BA	biological assessment
BMPs	best management practices
BSA	biological study area
Cal-IPC	California Invasive Plant Council
Caltrans	California Department of Transportation
CCV	California Central Valley
CDFA	California Department of Food and Agriculture
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFGC	California Fish and Game Code
CISS	cast-in-steel shell
CNPPA	California Native Plant Protection Act of 1977
CNPS	California Native Plant Society
CV	Central Valley
CVFPB	Central Valley Flood Protection Board
CVP	Central Valley Project
CWA	Clean Water Act
dB	decibel
dbh	diameters at breast height
Delta	Sacramento-San Joaquin River Delta
DOI	Department of Interior
DPS	distinct population segment
dsh	diameter at standard height
DWR	California Department of Water Resources
E	endangered
EFH	essential fish habitat
EIR	Environmental Impact Report
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESA	federal Endangered Species Act

ESU	evolutionarily significant unit
F	Fahrenheit
FHWA	Federal Highway Administration
FMP	Fishery Management Plan
GHG	greenhouse gas
HAPCs	habitat areas of particular concern
HCP/NCCP	Habitat Conservation Plan/Natural Communities Conservation Plan
HUC	hydrologic unit code
I-5	Interstate 5
IPaC	Information for Planning and Conservation
Jorjani Opinion	U.S. Department of the Interior Office of the Solicitor issued a memorandum: M-37050 The Migratory Bird Treaty Act Does Not Prohibit Incidental Take
LSAA	Lake or Streambed Alteration Agreement
MBTA	Migratory Bird Treaty Act
MOU	Memorandum of Understanding
MSA	Magnuson-Stevens Fishery Management and Conservation Act
msl	mean sea level
NCCP	Natural Community Conservation Plan
NCDDB	California Natural Diversity Database
NEPA	National Environmental Policy Act
NES	Natural Environment Study
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NTUs	nephelometric turbidity units
OHWM	ordinary high water mark
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PE	proposed endangered
PFMC	Pacific Fisheries Management Council
PG&E	Pacific Gas and Electric Company
PJD	preliminary jurisdictional determination
Porter-Cologne Act	Porter-Cologne Water Quality Control Act
ppt	parts per thousand
PT	proposed threatened
RHA	River and Harbors Appropriation Act of 1899
RM	river mile
RMS	root mean square
RSP	rock slope protection
RWQCB	Central Valley Regional Water Control Board
SEL	sound exposure level
SPL	sound pressure level
SRA	shaded riverine aquatic
State Water Board	State Water Resources Control Board
SWP	State Water Project
SWPPP	Storm Water Pollution Prevention Plan
T	threatened
TCEs	temporary construction easements
TIGER	Transportation Investment Generating Economic Recovery
Tompkins Opinion	The Jorjani Opinion withdrew and replaced Solicitor's Opinion M-37041—Incidental Take Prohibited Under the Migratory Bird Treaty Act

ULDC	Urban Levee Design Criteria
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VELB	Valley elderberry longhorn beetle
WDRs	waste discharge requirements

Executive Summary

The purpose of this biological assessment (BA) is to provide technical information and to review the proposed project in sufficient detail to determine to what extent the proposed project may affect threatened, endangered, or proposed species. The California Department of Transportation (Caltrans), as assigned by the Federal Highway Administration (FHWA), has prepared this BA under its assumption of responsibility at 23 U.S. Code 327(a)(2)(A). The BA also is prepared in accordance with 50 Code of Federal Regulations 402, legal requirements found in Section 7 (a)(2) of the Endangered Species Act (16 U.S. Code 1536[c]) and with FHWA and Caltrans regulation, policy, and guidance. The document presents technical information upon which later decisions regarding project effects will be developed.

The City of West Sacramento, in cooperation with the City of Sacramento and Caltrans, proposes to construct a new bridge over the Sacramento River south of the Pioneer Bridge (US 50) to provide local interconnectivity across the river and between neighborhoods. The new connection would serve multiple modes of transportation and comply with current American Association of State Highway and Transportation Officials, Caltrans, and local agency design standards. The project would be located over the Sacramento River between the cities of West Sacramento and Sacramento, approximately 1,000 feet south of the existing Pioneer Bridge. The proposed project would realign 15th Street to connect to Jefferson Boulevard in West Sacramento and connect to Broadway at 5th Street in Sacramento. The project would require modification to the planned mobility network for South River Road and 15th Street in the Pioneer Bluff area of West Sacramento.

The purpose of the project is to construct a new bridge to increase the number of river crossings, meet current design standards, increase options for emergency response teams, improve connectivity and accessibility to businesses and recreation opportunities on both sides of the river, reduce traffic on local streets, reduce greenhouse gas emissions, and meet the requirements of Sacramento's Neighborhood Friendly Bridge policy.

The project is needed to reduce trip lengths and encourage walking and bicycling, reduce health effects from pollution, reduce emergency response times, create economic activity and social exchanges, achieve planned urban development and redevelopment of opportunity sites identified in the adopted plans of Sacramento and West Sacramento, use the riverfront for enjoyment and recreation, and reduce congestion during commuting hours.

The proposed action would be funded by the FHWA and therefore requires compliance with both the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). The federal lead agency for NEPA compliance is FHWA in conjunction with Caltrans; the lead agency for CEQA compliance is the City of West Sacramento.

U.S. Fish and Wildlife Service and National Marine Fisheries Service species lists were obtained for the proposed actions, and the species and critical habitats on those lists are presented in Table ES-1, along with the effect determinations made in this BA and essential fish habitat assessment.

Table ES-1. Summary of Potential Effects on Listed Species and Designated Critical Habitat

Common Name	Scientific Name	Status	Determination
Birds			
Least Bell's vireo	*Vireo bellii pusillus*	Endangered	No effect [a]
Reptiles			
Giant garter snake	*Thamnophis gigas*	Threatened	No effect [a]
Amphibians			
California red-legged frog	*Rana draytonii*	Threatened	No effect [a]
California tiger salamander	*Ambystoma californiense*	Threatened	No effect [a]
Fishes			
Sacramento River winter-run Chinook salmon	*Oncorhynchus tshawytscha*	Endangered	May Affect, Likely to Adversely Affect
Central Valley spring-run Chinook salmon	*Oncorhynchus tshawytscha*	Threatened	May Affect, Likely to Adversely Affect
California Central Valley steelhead Distinct Population Segment (DPS)	*Oncorhynchus mykiss*	Threatened	May Affect, Likely to Adversely Affect
Southern DPS of North American green sturgeon	*Acipenser medirostris*	Threatened	May Affect, Likely to Adversely Affect
Delta smelt	*Hypomesus transpacificus*	Threatened	May Affect, Likely to Adversely Affect
Invertebrates			
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	Threatened	May Affect, Not Likely to Adversely Affect
Vernal pool fairy shrimp	*Branchinecta lynchi*	Threatened	No effect [a]
Vernal pool tadpole shrimp	*Lepidurus packardi*	Endangered	No effect [a]
Critical Habitat			
Sacramento River winter-run Chinook salmon			May Affect, Likely to Adversely Affect
Central Valley spring-run Chinook salmon			May Affect, Likely to Adversely Affect
California Central Valley steelhead DPS			May Affect, Likely to Adversely Affect
Southern DPS of North American green sturgeon			May Affect, Likely to Adversely Affect
Delta smelt			May Affect, Likely to Adversely Affect
Essential Fish Habitat			
Chinook salmon			May Adversely Affect

[a] Either the action area lacks potentially suitable habitat or the action area is outside of the range of the species.

Chapter 1 Introduction

1.1 Purpose and Need of the Proposed Action

The City of West Sacramento, in cooperation with the City of Sacramento and the California Department of Transportation (Caltrans), proposes to construct a new bridge over the Sacramento River south of the Pioneer Bridge (US 50) to provide local interconnectivity across the river and between neighborhoods. The new connection would serve multiple modes of transportation and comply with current American Association of State Highway and Transportation Officials, Caltrans, and local agency design standards.

The project would be located over the Sacramento River between the cities of West Sacramento and Sacramento, approximately 1,000 feet south of the existing Pioneer Bridge (Figure 1, Appendix A). In general, the project limits start in West Sacramento, along 15th Street at Jefferson Boulevard, continuing east and over the Sacramento River into the City of Sacramento along Broadway to the 5th Street intersection. The project limits also extend along Jefferson Boulevard approximately 1,300 feet south of the 15th Street intersection to Alameda Boulevard, along South River Road approximately 1,300 feet south and 650 feet north of 15th Street, along Marina View Drive approximately 400 feet south of Broadway, along Front Street approximately 350 feet north and south of Broadway, along 3rd Street approximately 350 feet north of Broadway to X Street, and along 5th Street approximately 200 feet north and south of Broadway. The project limits include proposed improvements to the northbound Interstate 5 (I-5) off-ramp to Broadway.

The limits of the installation of a proposed fiber optic line that would be placed in West Sacramento to connect communications of the Broadway Bridge with the proposed replacement for the I Street Bridge–the future connection over the river between C Street and Railyards Boulevard–and the existing Tower Bridge are depicted in Figure 1 (Appendix A) as extending north along Riverfront Street to Tower Bridge Gateway and 3rd Street, ending at the intersection of 3rd Street and C Street. Last, staging areas that would be accessed via South River Road in West Sacramento and Front Street in Sacramento also are proposed and included in the project limits.

1.1.1 Purpose

The primary purpose of the project is to increase the number of river crossings over the Sacramento River between West Sacramento and Sacramento. The objectives of the project are listed below.

- Increase the number of river crossings that meet current design standards and encourage travel by walking, bicycling, low-energy vehicles, and public transit.
- Increase the number of persons that can safely, efficiently, and reliably cross the river.
- Increase options for emergency response teams to cross the river.

- Increase options for evacuations.
- Improve the connectivity to, and accessibility of, business, recreational areas, and new or redevelopment opportunity sites located in the urban core of Sacramento and West Sacramento without affecting the use of Miller Regional Park or the Sacramento Marina and without precluding, or negatively restricting, redevelopment options in the Pioneer Bluff or West Broadway areas of the cities.
- Reduce trip length distances across the river between major origins and destinations.
- Reduce the growth in transportation-related energy use, air pollution emissions, and greenhouse gas (GHG) emissions.
- Reduce the growth in vehicle traffic on local neighborhood streets, especially cut-through traffic.
- Alleviate the growth of local trips on the State Highway System.
- Provide a project design that does not preclude the future addition of light-rail, streetcar, or other mass transit mode as a separate stand-alone project.
- Provide a new public crossing that meets the requirements of Sacramento's Neighborhood Friendly Bridge policy that the Sacramento City Council adopted by resolution on October 18, 2011.

1.1.2 Need

The project is needed for the following reasons.

- Limited connectivity across the river creates longer trip lengths, which discourages walking and bicycling.
- Longer trip lengths create dependence on automobile use that generates negative public health effects and adverse environmental effects such as emissions of air pollutants and GHGs.
- Limited connectivity across the river creates concentrated vehicle traffic flows on existing bridges and their connecting approach roadways, resulting in undesirable travel delays for vehicular traffic, including public bus transit during weekday peak periods and special events.
- Limited connectivity across the river reduces options for emergency response teams, thereby increasing response times and limiting alternatives for evacuations.
- Limited connectivity across the river is a barrier to economic activity, social exchanges, recreational opportunities, and access to jobs within the urban core of Sacramento and West Sacramento.
- Limited connectivity to the riverfront reduces the potential to achieve planned urban development and redevelopment of opportunity sites identified in the adopted plans of Sacramento and West Sacramento.

- Limited connectivity reduces the opportunities to use the riverfront for enjoyment and recreation.
- Peak AM/PM congestion is caused by local intercity commuters using the State Highway System as a result of having few local river crossing options.

Construction of the proposed project has independent utility because it can provide a local roadway connection between West Sacramento and Sacramento and their existing roadway networks that does not rely on construction of other facilities to operate. The project would meet the purpose and need without being dependent on construction of other projects or improvements.

1.2 Species and Critical Habitats Assessed

A species list was provided by the U.S. Fish and Wildlife Service (USFWS) on September 30, 2020, and the National Marine Fisheries Service (NMFS) on October 21, 2020, for the action area, consisting of all areas to be affected directly or indirectly by the proposed action (see Section 2.4, *Define Action Area*, of this biological assessment [BA]) for this project (see Appendix B).

1.2.1 Threatened and Endangered Species

The following species, which are listed as threatened (T), endangered (E), proposed threatened (PT), or proposed endangered (PE) under the federal Endangered Species Act (ESA) and for which designated or proposed critical habitats were identified on the corresponding federal species lists were considered during this analysis.

- Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), E;
- Central Valley (CV) spring-run Chinook salmon (*Oncorhynchus tshawytscha*), T;
- California Central Valley (CCV) steelhead distinct population segment (DPS) (*Oncorhynchus mykiss*), T;
- Southern DPS of North American green sturgeon (*Acipenser medirostris*), T;
- Delta smelt (*Hypomesus transpacificus*), T;
- Valley elderberry longhorn beetle (VELB) (*Desmocerus californicus dimorphus*), T;
- Vernal pool fairy shrimp (*Branchinecta lynchi*), T;
- Vernal pool tadpole shrimp (*Lepidurus packardi*), E;
- California red-legged frog (*Rana draytonii*), T;
- California tiger salamander (*Ambystoma californiense*), T;
- Giant garter snake (*Thamnophis gigas*), T; and
- Least Bell's vireo (*Vireo bellii pusillus*), E.

1.2.2 Critical Habitat

The proposed action falls within designated critical habitat for the following listed species.

- Sacramento River winter-run Chinook salmon;
- CV spring-run Chinook salmon;
- CCV steelhead;
- Southern DPS of North American green sturgeon; and
- Delta smelt.

1.2.3 Proposed Species

No species proposed for federal listing may be affected by the proposed action.

1.2.4 Candidate Species

The following federal candidate species may be affected by the proposed action:

- San Francisco Bay Delta DPS of longfin smelt (*Spirinchus thaleichthys*). Longfin smelt was listed as a threatened species under the California Endangered Species Act (CESA) on June 26, 2009.

1.2.5 Proposed Critical Habitat

The proposed action does not fall within proposed critical habitat for any federally listed species.

Table 1-1 shows all species on the lists obtained from NMFS and USFWS. Six species are considered unlikely to occur in the action area because of the lack of potentially suitable habitat or because the action area is outside the range of the species (i.e., vernal pool fairy shrimp, vernal pool tadpole shrimp, California tiger salamander, California red-legged frog, giant garter snake, and least Bell's vireo); therefore, the proposed action would not affect these species. Because longfin smelt is a candidate species for protection under the ESA, it currently receives no statutory protection under the ESA and is not discussed further in this BA. Nevertheless, the conservation measures proposed to avoid and minimize potential impacts and compensate for effects on the federally listed fish species addressed in this BA also would be expected to protect and compensate for impacts on longfin smelt (see Section 2.5, *Conservation Measures*).

Table 1-1. Threatened, Endangered and Proposed Species and Designated and Proposed Critical Habitat and Effect Determinations

Common Name	Scientific Name	Listing Status	General Habitat Description	Presence of Species in the Action Area? (Yes/No)	Presence of Critical Habitat in the Action Area? (Yes/No)	Rationale	Determination
Vernal pool fairy shrimp	*Branchinecta lynchi*	T	Found in Central Valley, central and south Coast Ranges from Tehama to Santa Barbara County; isolated populations also in Riverside County; common in vernal pools; also found in sandstone rock outcrop pools.	No	No	No suitable vernal pool habitat present in the action area.	No effect
Vernal pool tadpole shrimp	*Lepidurus packardi*	E	Found from Shasta County south to Merced County; occurs in vernal pools and ephemeral stock ponds	No	No	No suitable vernal pool habitat present in the action area.	No effect
Valley elderberry longhorn beetle (VELB)	*Desmocerus californicus dimorphus*	T	Current presumed range extends throughout the Central Valley; range extends from approximately Shasta County to Fresno County, including valley floor and lower foothills. Majority of occurrences are below 500 feet (152 meters) in elevation (USFWS 2017:4). Elderberry shrubs (*Sambucus* sp.) are the host plant.	Yes	No	One elderberry shrub was observed in the action area in an area of ruderal vegetation. There were no exit holes on the shrub. The shrub is within160 feet of riparian habitat along the Sacramento River. The shrub occurs within the general location of a 1949 CNDDB record for the species. Riparian habitat also is within the action area. According to the USFWS 2017 Framework, this shrub represents potential habitat for VELB	May Affect, Not Likely to Adversely Affect

Common Name	Scientific Name	Listing Status	General Habitat Description	Presence of Species in the Action Area? (Yes/No)	Presence of Critical Habitat in the Action Area? (Yes/No)	Rationale	Determination
Sacramento River winter-run Chinook salmon	*Oncorhynchus tshawytscha*	E	Mainstem Sacramento River below Keswick Dam (Moyle 2002); occurs in well-oxygenated, cool, riverine habitat with water temperatures from 8.0 to 12.5 °Celsius (°C); habitat types are riffles, runs, and pools (Moyle 2002); adults and juveniles migrate in the lower Sacramento River and through the Delta.	Yes	Yes	Sacramento River within the action area provides migration and seasonal rearing habitat, based on trawl surveys at Sherwood Harbor and presence of spawning adults in upper watershed.	May Affect, Likely to Adversely Affect
Central Valley spring-run Chinook salmon	*Oncorhynchus tshawytscha*	T	Upper Sacramento River, Feather River, and Yuba River and several perennial tributaries of the Sacramento River (Battle, Butte, Clear, Deer, and Mill Creeks); has the same general habitat requirements as winter-run Chinook salmon; coldwater pools are needed for holding adults (Moyle 2002); adults and juveniles migrate in the lower Sacramento River and through the Delta.	Yes	Yes	Sacramento River within the action area provides migration and seasonal rearing habitat, based on trawl surveys at Sherwood Harbor and presence of spawning adults in upper watershed.	May Affect, Likely to Adversely Affect
California Central Valley steelhead	*Oncorhynchus mykiss*	T	Sacramento and San Joaquin Rivers and tributary Central Valley streams and rivers below impassable barriers; occurs in well-oxygenated, cool, riverine habitat with water temperatures from 7.8 to 18 °C; habitat types are riffles, runs, and pools; adults spawn at head of riffles/tails of pools; young rear year-round for 1–4 years before emigrating to the ocean (Moyle 2002).	Yes	Yes	Sacramento River within the action area provides migration and seasonal rearing habitat, based on trawl surveys at Sherwood Harbor and presence of spawning adults in upper watershed.	May Affect, Likely to Adversely Affect

Common Name	Scientific Name	Listing Status	General Habitat Description	Presence of Species in the Action Area? (Yes/No)	Presence of Critical Habitat in the Action Area? (Yes/No)	Rationale	Determination
North American Green sturgeon (southern distinct population segment)	*Acipenser medirostris*	T	Occurs in Sacramento, Klamath, and Trinity Rivers (Moyle 2002); spawns in large river systems with well-oxygenated water, with temperatures from 8.0 to 14 °C, including the upper Sacramento River.	Yes	Yes	Sacramento River within the action area provides migration and seasonal rearing habitat, based on presence of spawning adults in upper watershed.	May Affect, Likely to Adversely Affect
Delta smelt	*Hypomesus transpacificus*	T	Found primarily in the Sacramento-San Joaquin estuary but has been found as far upstream as the mouth of the American River on the Sacramento River and Mossdale on the San Joaquin River; range extends downstream to San Pablo Bay; occurs in estuary habitat in the Delta where fresh and brackish water mix in the salinity range of 2–7 parts per thousand (Moyle 2002).	Yes	Yes	Sacramento River within the action area provides migration and seasonal rearing habitat, based on trawl surveys at Sherwood Harbor.	May Affect, Likely to Adversely Affect
California red-legged frog	*Rana draytonii*	T	Found along the coast and coastal mountain ranges of California from Mendocino to San Diego County and in the Sierra Nevada from Butte to Tuolumne County; occurs in permanent and semipermanent aquatic habitats, such as creeks and ponds, with emergent and submergent vegetation; uses upland areas for cover (burrows, logs, rocks, and crevices) and dispersal.	No	No	No suitable habitat for the species is present in the action area, and the action area is outside the known distribution of the species.	No effect

Common Name	Scientific Name	Listing Status	General Habitat Description	Presence of Species in the Action Area? (Yes/No)	Presence of Critical Habitat in the Action Area? (Yes/No)	Rationale	Determination
California tiger salamander	*Ambystoma californiense*	T	Breeds during the wet season in vernal pools and ponds, with a minimum 10-week inundation period; adults spend most of the year in grassland oak woodland habitat, primarily in small mammal burrows; occurs from Yolo to Kern County in the Central Valley and in the Sierra Nevada foothills from Amador to Tulare County, and from Sonoma to Santa Barbara County on the coast.	No	No	No suitable habitat for the species is present in the action area, and the action area is outside the known distribution of the species.	No effect
Giant garter snake	*Thamnophis gigas*	T	Sloughs, canals, low-gradient streams, and freshwater marsh habitats with a prey base of small fish and amphibians; also found in irrigation ditches and rice fields; requires grassy banks and emergent vegetation for basking and areas of high ground protected from flooding during winter.	No	No	The Sacramento River is not considered suitable aquatic habitat for the species. No other suitable habitat is present in the action area.	No effect
Least Bell's vireo	*Vireo bellii pusillus*	E	Historically nested in riparian habitat throughout the Central Valley, but the majority of the population now occurs in southern California; recently documented nesting on the San Joaquin River west of Modesto; requires dense riparian vegetation for nesting and a dense, stratified canopy for foraging	No	No	The action area lacks dense riparian vegetation with a stratified canopy	No effect

Common Name	Scientific Name	Listing Status	General Habitat Description	Presence of Species in the Action Area? (Yes/No)	Presence of Critical Habitat in the Action Area? (Yes/No)	Rationale	Determination
Essential Fish Habitat							
Chinook salmon				Present	NA	The Sacramento River within the action area provides migration and seasonal rearing habitat for all four races (winter-, spring-, fall-, late fall–run) of Chinook salmon.	May Adversely Affect

Sources: Moyle 2002; U.S. Fish and Wildlife Service 2017

CNDDB = California Natural Diversity Database.
Delta = Sacramento-San Joaquin River Delta
USFWS = U.S. Fish and Wildlife Service

Six federally listed species—VELB, Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead DPS, the Southern DPS of North American green sturgeon, and delta smelt—may be affected by the proposed action and are evaluated further in this BA to determine potential impacts on the species and their habitat. In addition, essential fish habitat (EFH) for Chinook salmon may be affected by the proposed action and is evaluated further in the EFH assessment (see Chapter 5) to determine potential impacts on Chinook salmon EFH. It has been determined that the proposed action **may affect, is likely to adversely affect** VELB. It has been determined that the proposed action **may affect, is likely to adversely affect** Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, the Southern DPS of North American green sturgeon, and delta smelt, and designated critical habitat for these species. Lastly, it has been determined that the project may adversely affect EFH for Chinook salmon.

1.3 Authorities and Discretion

The project is subject to state and federal environmental review requirements because of use of 2014 Transportation Investment Generating Economic Recovery (TIGER) Discretionary Grant funds from the Federal Highway Administration (FHWA). Accordingly, project documentation is being prepared in compliance with both the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). The City of West Sacramento is the lead agency under CEQA, with the City of Sacramento as a responsible agency, and Caltrans is the lead agency under NEPA. The FHWA's other responsibilities for environmental review, consultation, and any other action required in accordance with applicable federal laws for this project will be carried out by Caltrans under its assumption of responsibility pursuant to 23 U.S. Code (USC) 327 and the Memorandum of Understanding (MOU) dated December 23, 2016, executed by FHWA and Caltrans.

This section summarizes the federal, state, and local authorities, policies, and ordinances under which the project is being proposed, implemented, maintained, regulated, or otherwise affected—including regulations that protect biological resources and federally listed species potentially affected by the proposed action.

1.3.1 Federal Regulations

1.3.1.1 Federal Endangered Species Act

The ESA of 1973, and subsequent amendments, provides regulations for the conservation of endangered and threatened species and the ecosystems on which they depend. USFWS (with jurisdiction over plants, wildlife, and resident fish) and NMFS (with jurisdiction over anadromous fish and marine fish and mammals) oversee the ESA. Section 7 of the ESA mandates all federal agencies to consult with USFWS and NMFS if they determine that a proposed project may affect a listed species or destroy or adversely modify designated critical habitat. Section 7 requirements do not apply to nonfederal actions. A Clean Water Act (CWA) Section 404 permit from the U.S. Army Corps of Engineers (USACE) will be required for

project construction. Consequently, consultation under Section 7 for effects on federally listed species will be required. Under Section 7, the federal lead agency must obtain incidental take authorization or a letter of concurrence stating that the proposed project is not likely to adversely affect federally listed species.

Section 9 of the ESA prohibits the take of any fish or wildlife species listed as endangered, including destruction of habitat that prevents the species' recovery. *Take* is defined as any action or attempt to hunt, harm, harass, pursue, shoot, wound, capture, kill, trap, or collect a species. Section 9 prohibitions also apply to threatened species unless a special rule has been defined with regard to take at the time of listing. Under Section 9, the take prohibition applies only to wildlife and fish species. However, Section 9 does prohibit the unlawful removal and possession, or malicious damage or destruction, of any endangered plant from federal land. Section 9 prohibits acts to remove, cut, dig up, damage, or destroy an endangered plant species in nonfederal areas in knowing violation of any state law or in the course of criminal trespass. Candidate species and species that are proposed for or under petition for listing receive no protection under Section 9.

Federally listed species identified with the potential to occur in the action area for the proposed project include VELB, Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, North American green sturgeon, and delta smelt. In addition, designated critical habitat for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, North American green sturgeon, and delta smelt occurs in the action area.

1.3.1.2 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Management and Conservation Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires federal agencies to consult with NMFS on activities that may adversely affect EFH. The purpose of the MSA is to conserve and manage the fishery resources of the United States and to promote the protection of EFH. EFH is the aquatic habitat necessary for fish to spawn, breed, feed, or grow to maturity that will allow a level of production needed to support a long-term, sustainable commercial fishery and contribute to a healthy ecosystem (Pacific Fishery Management Council 2016). Important components of EFH include substrate, water quality, water quantity, depth, velocity, channel gradient and stability, food, cover, habitat complexity, space, access and passage, and habitat connectivity. EFH is described for Pacific salmon fisheries, specifically, Chinook salmon. The MSA requires the following.

- Federal agencies undertaking, permitting, or funding activity that may adversely affect EFH are required to consult with NMFS.
- NMFS provides conservation recommendations for any federal or state activity that may adversely affect EFH.
- Within 30 days of receiving conservation recommendations from NMFS, federal agencies must provide a detailed response in writing to NMFS regarding the conservation recommendations. The response must include a description of measures proposed by the

agency for avoiding, mitigating, or offsetting the impact of the activity on EFH or reasons for not following the recommendations.

An EFH assessment has been prepared jointly with this BA to address potential effects on Pacific salmon fisheries, specifically Chinook salmon, and is included in Chapter 5.

1.3.1.3 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) domestically implements a series of international treaties that provide for migratory bird protection. The MBTA authorizes the Secretary of the Interior to regulate the taking of migratory birds. The act further provides that it is unlawful, except as permitted by regulations, "to pursue, take, or kill any migratory bird, or any part, nest or egg of any such bird…" (16 USC 703). This prohibition includes both direct and indirect acts, although harassment and habitat modification are not included unless they result in direct loss of birds, nests, or eggs. The current list of species protected by the MBTA can be found in the November 1, 2013, Federal Register (78 FR 65844). This list comprises several hundred species, including essentially all native birds. Permits for take of nongame migratory birds can be issued only for specific activities, such as scientific collecting, rehabilitation, propagation, education, taxidermy, and protection of human health and safety and of personal property.

Executive Order (EO) 13186 (January 10, 2001) directs each federal agency taking actions having or likely to have a negative impact on migratory bird populations to work with USFWS to develop an MOU to promote the conservation of migratory bird populations. Protocols developed under the MOU must include the following agency responsibilities.

- Avoid and minimize, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions.
- Restore and enhance habitat of migratory birds, as practicable.
- Prevent or abate the pollution or detrimental alteration of the environment for the benefit of migratory birds, as practicable.

The EO is designed to assist federal agencies in their efforts to comply with the MBTA and does not constitute any legal authorization to take migratory birds.

On December 22, 2017, the Department of Interior's (DOI's) solicitor-issued Opinion M-37050, which formally revises the DOI's interpretation of the MBTA's prohibition on the take of migratory bird species. Opinion M-37050 concludes that "consistent with the text, history, and purpose of the MBTA, the statute's prohibitions on pursuing, hunting, taking, capturing, killing, or attempting to do the same apply only to affirmative actions that have as their purpose the taking or killing of migratory birds, their nests, or their killing of migratory birds, their nests, or their egg."

On December 22, 2017, the DOI's solicitor issued Memorandum M-37050 – The Migratory Bird Treaty Act Does Not Prohibit Incidental Take (referred to as the Jorjani Opinion). The Jorjani Opinion withdrew and replaced solicitor's Opinion M-37041 – Incidental Take Prohibited under the Migratory Bird Treaty Act (referred to as the Tompkins Opinion), issued on January 10,

2017. The Jorjani Opinion concludes that "the MBTA's prohibitions on pursuing, hunting, taking, capturing, killing, or attempting to do the same only criminalize affirmative actions that have as their purpose the taking or killing of migratory birds, their nests, or their eggs." USFWS issued guidance on the Jorjani Opinion on April 11, 2018, to clarify what constitutes prohibited take and what actions must be taken when conducting lawful intentional take. The guidance interprets the Jorjani Opinion to mean that the MBTA's prohibitions on take apply when the purpose of an action is to take migratory birds, their eggs, or their nests. The take of birds, eggs, or nests that results from an activity, the purpose of which is not to take birds, eggs, or nests, is not prohibited by the MBTA. In May and September 2018, three lawsuits were filed challenging the Jorjani Opinion's interpretation of the MBTA. On August 11, 2020, the United States District Court Southern District of New York concluded that the Jorjani Opinion is contrary to the plain meaning of the MBTA and therefore must be vacated. The court vacated the Jorjani Opinion and remanded the case to DOI and USFWS for further action.

1.3.1.4 Clean Water Act

The CWA was passed by Congress in 1972 with a broad mandate "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The chief purpose of the CWA is to establish the basic structure for regulating discharges of pollutants into waters of the United States. The CWA authorizes the U.S. Environmental Protection Agency (EPA) to set national water quality standards and effluent limitations, and includes programs addressing both point-source and nonpoint-source pollution. *Point-source pollution* is pollution that originates or enters surface waters at a single, discrete location, such as an outfall structure or an excavation or construction site. *Nonpoint-source pollution* originates over a broader area and includes urban contaminants in storm water runoff and sediment loading from upstream areas. The CWA operates on the principle that all discharges into the nation's waters are unlawful unless specifically authorized by a permit; permit review is the CWA's primary regulatory tool. One aquatic resource, the Sacramento River, is present in the action area and will be regulated under CWA Section 404 (described below).

Section 401: Water Quality Certification

Under CWA Section 401, applicants for a federal license or permit to conduct activities that may result in the discharge of a pollutant into waters of the United States must apply for water quality certification from the State. Therefore, all projects with a federal component that may affect state water quality (including projects that require federal agency approval, such as a Section 404 permit) must comply with CWA Section 401. The Sacramento River, a water of the United States, is present in the action area.

As currently designed, roadway and bridge construction associated with the proposed project is expected to result in a discharge of pollutants into the Sacramento River, which is a water of the United States; therefore, a Section 401 water quality certification from the Central Valley Regional Water Control Board (RWQCB) will be required for the proposed project.

Section 402: Permits for Stormwater Discharge

CWA Section 402 regulates construction-related storm water discharges to surface waters through the National Pollutant Discharge Elimination System (NPDES) program, administered by EPA. In California, the State Water Resources Control Board (State Water Board) is authorized by EPA to oversee the NPDES program through the RWQCB.

NPDES permits are required for projects that disturb more than 1 acre of land. The NPDES permitting process requires the applicant to file a public notice of intent to discharge storm water and to prepare and implement a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP must include a site map, a description of proposed construction activities, and the BMPs that will be implemented to prevent soil erosion and discharge of other construction-related pollutants (e.g., petroleum products, solvents, paints, and cement) that could contaminate nearby water resources. Permittees are required to conduct annual monitoring and reporting to ensure that BMPs are correctly implemented and effective in controlling the discharge of storm water-related pollutants. Because the proposed project would disturb more than 1 acre of land, the project proponent will prepare a SWPPP and apply for an NPDES permit.

Section 404: Permits for Fill Placement in Waters of the United States (Including Wetlands)

Waters of the United States (including wetlands) are protected under Section 404 of the CWA. Any activity that involves a discharge of dredged or fill material into waters of the United States, including wetlands, is subject to regulation by the USACE. *Waters of the United States* is defined to encompass navigable waters of the United States; interstate waters; all other waters where their use, degradation, or destruction could affect interstate or foreign commerce; tributaries of any of these waters; and wetlands that meet any of these criteria or are adjacent to any of these waters or their tributaries. *Wetlands* are defined under Section 404 as those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Jurisdictional wetlands must meet three wetland delineation criteria: (1) support hydrophytic vegetation (i.e., plants that grow in saturated soil); (2) have hydric soil types (i.e., soils that are wet or moist enough to develop anaerobic conditions); and (3) have wetland hydrology.

No wetlands were identified in the action area, but roadway and bridge construction associated with the proposed project would result in a discharge of fill material into the Sacramento River, a non-wetland water of the United States. Therefore, a Section 404 CWA permit will be required for the proposed project. A delineation of waters of the United States (aquatic resources delineation) has been completed for the project. The aquatic resources delineation report will be submitted to the USACE to support a preliminary jurisdictional determination for the project.

1.3.1.5 Rivers and Harbors Appropriation Act of 1899

The River and Harbors Appropriation Act of 1899 (RHA) addresses activities that involve the construction of dams, bridges, dikes, and other structures across any navigable water. Placing obstructions to navigation outside established federal lines and excavating from or depositing

material in such waters require permits from the USACE. The Sacramento River is a navigable water subject to the requirements of the RHA.

Section 9 and the General Bridge Act of 1946

Section 9 (33 USC 403) of the RHA and the General Bridge Act of 1946 require that the location and plans of bridges and causeways across navigable waters be submitted to and approved by the Secretary of Homeland Security prior to their construction. Under the authority of these acts, the U.S. Coast Guard (USCG) regulates the placement of bridges across navigable waters, such as the Sacramento River. Construction of the proposed bridge will require a bridge permit from the USCG District 11.

Section 10

Section 10 (33 USC 403) of the RHA prohibits the unauthorized obstruction or alteration of any navigable water of the United States. Under Section 10, a permit is required for work or structures in, over, or under navigable waters of the United States. Construction of the proposed bridge will require a Section 10 permit from the USACE.

Section 14 of the Rivers and Harbors Act of 1899

Through the Civil Works program, the USACE serves the public by providing the nation with quality and responsive management of the nation's water resources. The sole authority to grant permission for temporary or permanent alterations is contained in Section 14 of the RHA and codified in 33 USC 408 (Section 408). Approval for any modifications, alterations, or occupation of public works projects is granted through the USACE District's Section 408 program. The USACE Sacramento District Engineer has the authority to approve most relatively minor, low-impact alterations/modifications to the public works facilities. However, some requests that involve significant modifications, raisings, or realignments may need to be approved at USACE Headquarters. Therefore, any project in USACE jurisdiction must comply with the Section 408 permission process. Construction of the project may require a Section 408 permit. When the Section 404 application is submitted, the 404 division will forward it to the 408 division as necessary.

1.3.1.6 Executive Order 11990: Protection of Wetlands

EO 11990, signed May 24, 1977, directs all federal agencies to refrain from assisting in or giving financial support to projects that encroach on publicly or privately owned wetlands. It further requires that federal agencies support a policy to minimize the destruction, loss, or degradation of wetlands. Such a project (that encroaches upon wetlands) may not be undertaken unless the agency has determined that: (1) there are no practicable alternatives to such construction; (2) the project includes all practicable measures to minimize harm to wetlands that would be affected by the project; and (3) the impact would be minor. The proposed project would affect wetlands; thus, federal agencies are required to consider this EO prior to issuing permits.

1.3.1.7 Executive Order 13112: Prevention and Control of Invasive Species

EO 13112, signed February 3, 1999, directs all federal agencies to prevent and control the introduction of invasive species in a cost-effective and environmentally sound manner. The EO established the National Invasive Species Council, which is composed of federal agencies and departments, and a supporting Invasive Species Advisory Committee composed of state, local, and private entities. In 2008, the Council released an updated national invasive species management plan (National Invasive Species Council 2008) that recommends objectives and measures to implement the EO and to prevent the introduction and spread of invasive species. The EO requires consideration of invasive species in NEPA analyses, including their identification and distribution, their potential impacts, and measures to prevent or eradicate them.

The proposed project may introduce or spread invasive species into the action area; therefore, federal agencies are required to consider this EO prior to issuing permits. Conservation measures identified in Chapter 2 will avoid or minimize the introduction and spread of invasive species as a result of project activities.

1.3.2 State Regulations

1.3.2.1 California Endangered Species Act

The California Endangered Species Act (CESA) (California Fish and Game Code [CFGC] Section 2050 et seq.) establishes state policy to conserve, protect, restore, and enhance threatened or endangered species and their habitats. CESA mandates that state agencies should not approve projects that jeopardize the continued existence of threatened or endangered species if reasonable and prudent alternatives are available that would avoid jeopardy. For projects that would affect a species on the federal and state lists, compliance with ESA satisfies CESA if the California Department of Fish and Wildlife (CDFW) determines that the federal incidental take authorization is consistent with CESA under CFGC Section 2080.1 (a *consistency determination*). Consistency determinations allow an applicant who has obtained a federal incidental take statement (Section 7 consultation) or a federal Section 10(a) incidental take permit to submit the federal incidental take statement or permit to the CDFW Director for a determination whether the federal document is consistent with CESA. However, consistency determinations can be used only for species that are listed under both the federal ESA and CESA, and cannot be applied to species that are listed by the state but are not federally listed. For projects that would result in take of a species that is only state listed, the project proponent must apply for a take permit under Section 2081(b).

Five state-listed species—Swainson's hawk (*Buteo swainsoni*), Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, delta smelt, and longfin smelt (*Spirinchus thaleichthys*)—are known or have the potential to occur in the action area and be affected by the proposed project (Swainson's hawk and longfin smelt are only state listed). Chapter 4 describes potential project-related impacts and identifies avoidance and minimization measures that will avoid direct impacts and minimize indirect impacts on these species. Because CDFW's Bay Delta Region is no longer issuing consistency determinations and two species (Swainson's hawk and longfin smelt) are only state listed, a Section 2081 Incidental Take Permit Application may

be required to address the potential for take of Swainson's hawk, Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, delta smelt, and longfin smelt.

1.3.2.2 California Environmental Quality Act

CEQA is the regulatory framework by which California public agencies identify and mitigate significant environmental impacts. A project normally is considered to cause a significant environmental impact on biological resources if it would substantially affect a rare or endangered species or the habitat of that species; substantially interfere with the movement of resident or migratory fish or wildlife; or substantially diminish habitat for fish, wildlife, or plants. The State CEQA Guidelines define *rare, threatened, and endangered species* as those listed under the ESA and CESA and any other species that meets the criteria of the resource agencies or local agencies (e.g., CDFW-designated species of special concern). The State CEQA Guidelines state that the lead agency preparing an Environmental Impact Report (EIR) must consult with and receive written findings from CDFW concerning project impacts on species listed as endangered or threatened. The impacts of a proposed project on these resources are important in determining whether the project would result in significant environmental impacts under CEQA. The project proponent is preparing an EIR to comply with the State CEQA Guidelines.

1.3.2.3 California Native Plant Protection Act

The California Native Plant Protection Act of 1977 (CNPPA) prohibits importation of rare and endangered plants into California, take of rare and endangered plants, and sale of rare and endangered plants. CESA defers to the CNPPA, which ensures that state-listed plant species are protected when state agencies are involved in projects subject to CEQA. In this case, plants listed as rare under the CNPPA are not protected under CESA but rather under CEQA. One special-status plant species (Mason's lilaeopsis [*Lilaeopsis masonii*]) is listed as rare under the CNPPA, has suitable habitat in the action area, and is known to occur in the project region (i.e., within a 10-mile radius of the action area). This species was not observed in the action area during the field surveys.

1.3.2.4 California Fish and Game Code

Several sections of the CFGC apply to the proposed project, as described below.

Lake or Streambed Alteration (Section 1602)

CDFW regulates activities that would interfere with the natural flow of—or substantially alter the channel, bed, or bank of—a lake, river, or stream, including disturbance of riparian vegetation, under CFGC Sections 1600–1616. CDFW requires a Lake or Streambed Alteration Agreement (LSAA) permit for these activities. Requirements to protect the integrity of biological resources and water quality often are conditions of LSAAs. CDFW may establish conditions that include avoiding or minimizing vegetation removal, using standard erosion control measures, limiting the use of heavy equipment, limiting work periods to avoid impacts on fisheries and wildlife resources, and restoring degraded sites or compensating for permanent habitat losses. The Sacramento River and the adjacent riparian forest are regulated by CDFW. The proposed

project is expected to result in modification of the bed, bank, or channel of the river and removal of adjacent riparian vegetation; therefore, an LSAA will be required.

Protection of Birds and Raptors (Sections 3503 and 3503.5)

Section 3503 of the CFGC prohibits killing of birds and destruction of bird nests. Section 3503.5 prohibits killing of raptor species and destruction of raptor nests. Typical violations include destruction of active bird and raptor nests as a result of tree removal, and failure of nesting attempts (loss of eggs or young) as a result of disturbance of nesting pairs caused by nearby human activity.

The proposed project has the potential to adversely affect birds and raptors protected under Sections 3503 and 3503.5 of the CFGC. The project proponent will avoid violation of CFGC Sections 3503 and 3503.5 by implementing measures to protect birds and bird nests, which will be formalized in the CEQA document being prepared for the project.

Fully Protected Species (Sections 3511, 3513, 4700, and 5050)

CFGC Sections 3511, 3513, 4700, and 5050 pertain to fully protected wildlife species (birds in Sections 3511 and 3513, mammals in Section 4700, and reptiles and amphibians in Section 5050) and strictly prohibit take of these species. CDFW cannot issue a take permit for fully protected species, except under narrow conditions for scientific research or the protection of livestock, or if a Natural Community Conservation Plan (NCCP) has been adopted. Specifically, Section 3513 prohibits any take or possession of birds designated by the MBTA as migratory nongame birds except as allowed by federal rules and regulations pursuant to the MBTA.

One fully protected bird species, white-tailed kite (*Elanus leucurus*), has the potential to nest in the action area and to be affected by the proposed project. The project proponent would avoid take of white-tailed kite by implementing measures to protect nesting birds, which will be formalized in the CEQA document being prepared for the project.

1.3.2.5 Porter-Cologne Water Quality Control Act

The California Water Code addresses the full range of water issues in the state and includes Division 7, known as the Porter-Cologne Water Quality Control Act (Porter-Cologne Act) (California Water Code Sections 13000–16104). Section 13260 requires “any person discharging waste, or proposing to discharge waste, within any region that could affect the quality of the waters of the state” to file a report of discharge (an application for waste discharge requirements [WDRs]). Section 13050 of the Porter-Cologne Act authorizes the State Water Board and the relevant RWQCB to regulate biological pollutants. The California Water Code generally regulates more substances contained in discharges and defines discharges to receiving waters more broadly than does the CWA.

Pursuant to CWA Section 401, an applicant for a Section 404 permit to conduct any activity that may result in discharge into navigable waters must provide a certification from the RWQCB that such discharge will comply with state water quality standards. Each Basin Plan sets forth water quality standards for surface water and groundwater, as well as actions to control nonpoint and

point sources of pollution. Projects that affect waters of the State must meet the WDRs of the applicable RWQCB. As part of the permitting process under Section 404, the project proponent will be required to apply for water quality certification from the Central Valley RWQCB.

As currently designed, roadway and bridge construction associated with the proposed project is expected to result in a discharge of fill material into the Sacramento River, which is both a water of the State and a water of the United States. Because the project would obtain Section 401 certification for discharge into a water of the United States, the RWQCB would not need to additionally issue WDRs under the Porter-Cologne Act for discharge into a water of the State.

1.3.2.6 Central Valley Flood Protection Plan: Levee Vegetation Management Strategy

Under the Central Valley Flood Protection Act of 2008, the California Department of Water Resources (DWR) developed the 2012 Central Valley Flood Protection Plan as the foundation for the statewide FloodSAFE California initiative (California Department of Water Resources 2012a). Part of the flood protection plan is a strategy for managing levee vegetation. Based on this strategy, existing trees on levees will be allowed to live out their normal life cycles unless they pose an unacceptable threat to levee integrity.

1.3.2.7 Urban Levee Design Criteria

The Urban Levee Design Criteria (ULDC) are intended to supply engineering guidance and criteria for levees required to provide an urban level of flood protection (200-year flood) (California Department of Water Resources 2012b). The ULDC also correspond to the CVFPP Levee Vegetation Management Strategy. With regard to levee improvements, the ULDC state the following.

> In cases of levee repair or improvement, vegetation shall be removed as required to meet objectives of the specific project. Vegetation removed as part of direct construction activities may not be replaced in the vegetation management zone. However, vegetation on other sections of the levee, not affected by the construction activity may remain in place, natural revegetation may be allowed outside of the vegetation management zone, and replanting may be allowed… Trees and other woody vegetation may be: (1) planted, and (2) allowed to naturally revegetate on a landside planting berm. Only the portion of the landside planting berm that is both 15 feet or more from the landside levee slope and 15 feet or more from the landward top of the planting berm may be planted and allowed to naturally revegetate.

1.3.3 Local Regulations

1.3.3.1 Yolo Habitat Conservation Plan/Natural Communities Conservation Plan

The Yolo Habitat Conservation Plan/Natural Communities Conservation Plan (HCP/NCCP) covers 12 sensitive species and the natural communities and agricultural land on which they depend. The HCP/NCCP covers Yolo County and the cities of Davis, Woodland, Winters, and West Sacramento through the Yolo Habitat Conservancy. Resources in the action area that would be covered by the HCP/NCCP include riparian habitat, VELB, and Swainson's hawk.

1.3.3.2 City of West Sacramento General Plan

Goals and policies in the *City of West Sacramento General Plan 2035 Policy Document* (City of West Sacramento 2016) apply to biological resources in the action area that would be affected by implementation of the project. These policies include preservation, enhancement, and creation of connected open space; development setbacks from significant habitat; mitigation of adverse impacts on rare, threatened, and endangered species; preservation and enhancement of riparian and wetland habitats; no net loss of wetlands and other waters; requirements for site-specific wildlife habitat and vegetation surveys; avoidance of adverse effects on fish in the Sacramento River; minimization of recreational use effects on riparian habitat; and promotion of using native plants for landscaping near the Sacramento River.

1.3.3.3 City of Sacramento General Plan

Goals and policies in the *City of Sacramento 2030 General Plan* (Part 2, Environmental Resources section) (City of Sacramento 2015) apply to biological resources in the action area that would be affected by implementation of the project. These policies include conservation of open space areas to protect creeks and the Sacramento River; preservation of natural habitats; retention of sensitive habitats and species; preservation of riparian habitats or mitigation by preservation and/or restoration at a 1:1 ratio; preservation of wetlands or mitigation for no-net-loss of value and/or function; preservation of wildlife corridors or replacement with habitat of equivalent value; performance of sensitive species surveys and/or habitat assessments and, if suitable habitat is present for a species, performance of either protocol-level or industry-recognized species surveys or assumption of species presence and consultation with appropriate resource agencies and mitigation in compliance with state and federal laws; and retention of heritage trees.

1.3.3.4 City of West Sacramento Tree Preservation Ordinance

The City's Tree Preservation Ordinance is found in the West Sacramento Municipal Code, Title 8 (Health and Safety), Chapter 24 (Tree Preservation). The City protects heritage and landmark trees, as defined in the ordinance, and requires tree permits for activities that would affect such trees.

A *heritage tree* is defined as follows.

- Any living tree with a trunk circumference of 75 inches (diameter of 24 inches) or more, or
- Any living native oak (any species of the genus *Quercus*) with a trunk circumference of 50 inches (diameter of 16 inches) or more, both measured 4.5 feet above ground level. The circumference of multi-trunk trees is based on the sum of the circumference of each trunk.

A *landmark tree* is defined as a tree or stand of trees that is especially prominent, stately, or of historical significance as designated by the City Council. Trees that are too small in diameter to meet the size threshold of a heritage or landmark tree but are located within the public right-of-way (typically 12.5 feet from the curb) (referred to as *street trees*) also are protected by the ordinance.

It is unlawful in West Sacramento to perform any of the following acts with respect to a heritage or landmark tree without a tree permit issued by the City's tree administrator.

- Move, remove, cut down, poison, set fire to or permit fire to burn in proximity to, or perform or fail to perform any act that results in the unnatural death or destruction of a landmark or heritage tree.
- Perform any activity that will interfere with or retard the natural growth of any landmark or heritage tree.
- Perform any work or permit any work to be performed within the dripline area of a landmark or heritage tree.
- Trim or prune any branch of a landmark or heritage tree that is 5 inches or more in diameter.
- Change the appropriate amount of irrigation or drainage water provided to any landmark, heritage, or street tree. Trench, grade, pave, or otherwise damage or disturb any exposed roots within 1 foot outside the dripline area of any landmark, heritage, or street tree.
- Park or operate any motor vehicle within 1 foot outside the dripline area of any landmark, heritage, or street tree.
- Place or store any equipment or construction materials within 1 foot outside the dripline area of any landmark, heritage, or street tree.
- Place, apply, or attach any signs, ropes, cables, or other items to any landmark, heritage, or street tree.
- Place or allow to flow any oil, fuel, concrete mix, or other deleterious substance into or over within 1 foot outside the dripline area of any landmark, heritage, or street tree.

Tree permits require the applicant to replace a removed tree with a living tree on the property or within West Sacramento in a location approved by the tree administrator. The applicant also must replace the replacement tree if it dies any time within 3 years of the initial planting. Replacement is not required if a tree is removed because it poses a risk or hosts a plant parasite.

Replacement trees are required at a ratio of 1:1 (i.e., 1-inch diameter of replacement plant for every 1-inch diameter of tree removed). Replacement trees may be a combination of 15-gallon trees, which are the equivalent of a 1-inch-diameter tree, or 24-inch box trees, which are the equivalent of a 3-inch-diameter tree. If a property owner is unable to replace the tree on his or her property, or within an area approved by the tree administrator, the tree administrator will require the property owner to pay an in-lieu fee to the City. An in-lieu fee payment is not required if the tree needs to be removed solely because it poses a risk to persons or property, or if the tree acts as a host for a plant that is parasitic. In-lieu fees are set by City Council resolution and are used to purchase and plant trees elsewhere in West Sacramento.

The action area supports heritage trees in West Sacramento that would be affected by implementation of the project and would be subject to the City of West Sacramento Tree Preservation Ordinance.

1.3.3.5 City of Sacramento Tree Conservation

The City of Sacramento protects trees on city property and private property (Sacramento Municipal Code, Title 12, Chapter 12.56). All city street trees and trees on city property are protected. On private property, protected trees include the following.

- A valley oak (*Quercus lobata*), blue oak (*Q. douglasii*), interior live oak (*Q. wislizenii*), coast live oak (*Q. agrifolia*), California buckeye (*Aesculus californica*), or California sycamore (*Platanus racemosa*) tree with a diameter at standard height (dsh) of 12 inches or more.
- A tree of any species with a dsh of 24 inches or more on an undeveloped lot or a lot that does not have a single unit or duplex dwelling.
- A tree of any species with a dsh of 32 inches or more on a lot that has a single unit or duplex dwelling.

The code regulates all activities that could adversely affect the health of a protected tree, including the following.

- Tree removal.
- Tree pruning.
- Attaching any signs, lights, or hardware to a city tree.
- Grading, clearing, excavating, adding fill, trenching, boring, compacting, or paving within the tree protection zone (the outermost edge of the canopy).
- Placing or storing construction equipment or material within the tree protection zone.
- Application of any harmful substance within the tree protection zone.
- Topping a tree.

The City requires that public projects avoid removal of or damage to city trees to the extent feasible and requires a tree protection plan for retained trees. For projects that require City Council approval and that will remove city trees with a dsh of 4 inches or more, written justification to the Department of Public Works Director and subsequent City Council approval are required. The City requires a tree permit from the Director and a tree replacement plan to provide for replacement at a ratio of 1:1 (1-inch dsh of tree replaced for each 1 inch of dsh removed).

The action area supports protected city trees in the City of Sacramento that would be affected by implementation of the project and would be subject to the required permitting and replacement standards.

1.4 Consultation History

To date, there has been no formal or informal consultation or other correspondence between Caltrans and NMFS or USFWS for the proposed action. A list of all proposed and listed

endangered, threatened, and proposed species; designated critical habitat; and EFH under the jurisdiction of NMFS that could occur in the vicinity of the proposed action was obtained from the NMFS' California Species List Tools website by Caltrans on October 21, 2020, (National Marine Fisheries Service 2020; Appendix B). An official list of federally endangered, threatened, and proposed species and critical habitat under the jurisdiction of USFWS having the potential to occur in the vicinity of the proposed action was obtained from the Sacramento Fish and Wildlife Office and the San Francisco Bay–Delta Fish and Wildlife office through the USFWS Information for Planning and Conservation (IPaC) website on September 30, 2020 (U.S. Fish and Wildlife Service 2020; Appendix B).

1.5 Resource Agency Coordination and Professional Contacts

The following agency coordination has been conducted for the project.

1.5.1 U.S. Army Corp of Engineers

A delineation of aquatic resources letter report and request for a preliminary jurisdictional determination (PJD) was submitted to the USACE on November 5, 2019, and was confirmed as received by USACE Senior Project Manager Mary Pakenham-Walsh on November 12, 2019. Ms. Pakenham-Walsh assigned the request an existing file number (SPK-2015-00634), which was used during the feasibility stage of the Broadway Bridge Project. Ms. Pakenham-Walsh requested and received additional contact information on November 19, 2019, and clarification of acreage information on January 6, 2020. The PJD was issued on June 18, 2020.

1.5.2 California Department of Fish and Wildlife

There has been no consultation with CDFW to date, but an LSAA will be required and a Section 2081 Incidental Take Permit Application may be required for the project to address the potential for take of Swainson's hawk, Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, delta smelt, and longfin smelt.

1.5.3 California State Lands Commission

There has been no consultation with the California State Lands Commission to date, but a Land Use Lease will be required for bridge construction in the Sacramento River.

1.6 Study Methods

Potential biological resource issues associated with the proposed project were identified through review of existing information and field surveys. It was determined that the following studies and surveys would be required to document natural resources in the action area.

- General habitat evaluation to determine whether suitable habitat exists for special-status plant and animal species.
- Botanical field surveys to map land cover types, including natural communities, and surveys for special-status plant species.
- Delineation of aquatic resources (waters of the United States) and waters of the State.
- General river habitat survey to evaluate the occurrence and extent of shaded riverine aquatic (SRA) cover that exists for special-status fish species in the action area.

To prepare for the field surveys, biologists reviewed existing resource information related to the project to evaluate whether special-status species or other sensitive biological resources (e.g., waters of the United States) could occur in the action area. As this document was prepared and revised, updated versions of the resources were obtained, reviewed, and incorporated. The sources listed below were reviewed.

- California Native Plant Society's (CNPS's) online Inventory of Rare and Endangered Plants of California records search of the Sacramento West, Clarksburg, Saxon, Rio Linda, Sacramento East, Florin, Taylor Monument, Grays Bend, and Davis U.S. Geological Survey (USGS) 7.5-minute quadrangles (California Native Plant Society 2019) (Appendix B).
- California Natural Diversity Database (CNDDB) records search of the Sacramento West, Clarksburg, Saxon, Rio Linda, Sacramento East, Florin, Taylor Monument, Grays Bend, and Davis USGS 7.5-minute quadrangles (California Department of Fish and Wildlife 2019) (Appendix B).
- A list of endangered and threatened species that may occur in or be affected by projects within the Sacramento West USGS 7.5-minute quadrangle and Yolo and Sacramento Counties (National Marine Fisheries Service 2020; U.S. Fish and Wildlife Service 2020) (Appendix B).
- Lists of plants identified as noxious weeds or invasive plants by the U.S. Department of Agriculture (USDA) (Natural Resources Conservation Service 2010), the California Department of Food and Agriculture (CDFA) (Natural Resources Conservation Service 2003) and the California Invasive Plant Council (Cal-IPC) (2018).
- Soil map unit descriptions for the action area (Natural Resources Conservation Service 2019).

This information was used to develop lists of special-status species and other sensitive biological resources that could be present in the project region. Species from the lists were considered if they were known to occur in the project region or had potential habitat in the action area and the action area was within the species' range.

1.6.1 Personnel and Survey Dates

ICF biologists conducted biological surveys in the accessible parcels in the action area in 2017, 2018, and 2019 (Table 1-2). Methods and personnel involved in documenting wetlands and other

waters of the United States and in conducting botanical, wildlife, and SRA cover habitat surveys are described below. Representative photographs taken during field surveys are provided in Appendix C.

Table 1-2. Biological Survey Personnel and Dates

Survey Type	Survey Date	Surveyor
Natural communities and habitat-based assessment for special-status species	August 24, 2017; February 6 and 9, 2018	Lisa Webber, ICF Botanist/Wetland Ecologist, 25 years experience
Botanical surveys	August 24, 2017; February 6 and 9, 2018	Lisa Webber
Tree survey	February 6 and 9, 2018	Kristin Lantz, ICF Certified Arborist, 14 years experience
Delineation of waters of the United States and waters of the State	August 24, 2017; February 6 and 9, 2018	Lisa Webber
Shaded riverine aquatic cover habitat survey, fish passage reconnaissance assessment, riparian tree assessment, and general river habitat survey	August 24, 2017	Lisa Webber Jeff Kozlowski, ICF Fish Biologist, 31 years experience
Reconnaissance-level wildlife survey and elderberry shrub survey	October 29, 2019; November 5, 2019	John Howe, ICF Wildlife Biologist, 23 years experience

1.6.1.1 Wetlands and Non-Wetland Waters of the United States

ICF botanist/wetland ecologist Lisa Webber conducted the delineation field work in the action area on August 24, 2017, and on February 6 and 9, 2018. The delineation was conducted using the routine onsite determination method described in the *U.S. Army Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987); the supplemental procedures and wetland indicators provided in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (U.S. Army Corps of Engineers 2008); *Ordinary High Water Mark Identification*, USACE Regulatory Guidance Letter No. 05-05, dated December 7, 2005 (U.S. Army Corps of Engineers 2005), and *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (Lichvar and McColley 2008).

1.6.1.2 Botanical Resources

ICF botanist Lisa Webber conducted botanical surveys in the action area on August 24, 2017, and on February 6 and 9, 2018. The 2017 summer survey coincided with the identification periods of special-status plants with potential to occur in the project region. No spring survey was conducted, but no suitable habitat for spring-blooming special-status plants occurs in the action area. During the February 2018 surveys, the botanist walked all accessible parts of the action area and compiled lists of plants species observed. For the August 24, 2017 survey, the banks of the Sacramento River were surveyed via boat and onshore to assess potential special-status plant habitat and riparian trees. The species, approximate diameters at breast height (dbh), and approximate locations were recorded for riparian trees. ICF certified arborist Kristin Lantz recorded species and approximate dbh of trees outside of the riparian habitat in accessible parts of the action area on February 6 and 9, 2018. Street trees in Sacramento were not included in the tree survey.

Natural communities in the action area also were identified and mapped during the botanical field surveys. The results of these surveys are presented in Chapter 3.

1.6.1.3 Wildlife Resources

ICF wildlife biologist John Howe conducted a reconnaissance-level wildlife survey on October 29, 2019, that focused on identifying areas of suitable habitat for special-status wildlife. On November 5, 2019, an elderberry shrub (host plant of the federally threatened VELB) survey was conducted in the action area. The results of the elderberry shrub survey are presented in Chapter 3.

1.6.1.4 Fisheries Resources

On August 24, 2017, ICF fish biologist Jeff Kozlowski, accompanied by Lisa Webber, mapped SRA cover habitat and conducted a fish passage reconnaissance assessment and a general reconnaissance-level field survey of the Sacramento River within the action area via boat. The reconnaissance-level field survey focused on evaluating existing habitat conditions within the action area relative to the needs of special-status fish species. No special-status fish surveys were conducted for the proposed project.

1.6.2 Limitations and Assumptions That May Influence Results

The botanical surveys were conducted during the reported blooming periods for all of the special-status plants identified with potential habitat in the action area. Although not all parcels in the action area were accessible for botanical surveys, the potential for occurrence of special-status plants in the action area is generally low, due to historical and ongoing disturbance of the area for development, agriculture, and flood control. The tree survey was not complete, and there is potential for protected non-riparian trees on parcels that were not accessible for surveys.

At the time of the delineation fieldwork, indicators of hydrophytic vegetation, hydric soils, wetland hydrology, and the mean high-water line were evident and identifiable. Aerial photographs of the inaccessible parcels in the action area were reviewed, with no evidence of supporting wetland or non-wetland waters. Therefore, there were no limitations on the survey for wetlands and non-wetland waters in the action area.

Focused fish surveys were not conducted as part of the river habitat survey. The potential for occurrence of special-status fish in the action area is high. The assumed presence of, and the impact assessment on, special-status fish species relied heavily on previously collected data; literature reviews; and current information on fish species distribution, habitat requirements, and life history accounts.

Chapter 2 Proposed Agency Action

2.1 Proposed Action Location

The proposed action is located in both Yolo and Sacramento Counties and includes a new bridge over the Sacramento River between the cities of West Sacramento and Sacramento (Figures 1 and 2, Appendix A). The proposed bridge would be located approximately 1,000 feet south of the Pioneer Bridge (Figure 2, Appendix A). The proposed action is located within the New Helvetia and Wetlands land grants of the Sacramento West 7.5-minute USGS quadrangle (38°34' 9.43"N, 121°31'5.78"W). Elevations in the action area (defined below) range from approximately 10 to 35 feet above mean sea level (msl). Representative photos of the action area are shown in Appendix C.

In general, the project limits start in West Sacramento, along 15th Street at Jefferson Boulevard, continuing east and over the Sacramento River into the City of Sacramento along Broadway to the 5th Street intersection. The project limits also extend along Jefferson Boulevard approximately 1,300 feet south of the 15th Street intersection to Alameda Boulevard, along South River Road approximately 1,300 feet south and 650 feet north of 15th Street, along Marina View Drive approximately 400 feet south of Broadway, along Front Street approximately 350 feet north and south of Broadway, along 3rd Street approximately 350 feet north of Broadway to X Street, and along 5th Street approximately 200 feet north and south of Broadway. The project limits include proposed improvements to the northbound Interstate 5 (I-5) off-ramp to Broadway.

The limits of the installation of a proposed fiber optic line that would be placed in West Sacramento to connect communications of the Broadway Bridge with the proposed replacement for the I Street Bridge–the future connection over the river between C Street and Railyards Boulevard–and the existing Tower Bridge are depicted in Figures 1 and 3 (Appendix A) as extending north along Riverfront Street to Tower Bridge Gateway and 3rd Street, ending at the intersection of 3rd Street and C Street. Last, staging areas that would be accessed via South River Road in West Sacramento and Front Street in Sacramento also are proposed and included in the project limits.

2.2 Description of Proposed Action

The City of West Sacramento, in cooperation with the City of Sacramento and Caltrans, proposes to construct a new bridge over the Sacramento River and roadway modifications in West Sacramento and Sacramento. Figure 2 (Appendix A) depicts the location of the proposed alignment. The project may be constructed in two phases or in a single phase (see below under *Sequencing and Schedule*). At the interim year, the new bridge across the Sacramento River would be constructed and open to traffic. By the design year, the remaining improvements and roadway connections proposed as part of the project would be constructed to allow the full, final design of the proposed project to be operational. If the project is constructed in a single phase,

the efforts needed to construct the new bridge and the ultimate (design year) roadway alignment configuration would be completed at the same time.

Permanent property acquisitions or permanent easements would be necessary to construct the proposed project. Temporary construction easements (TCEs) also would be needed. The acquisitions described below assume that the project is constructed in two phases. The acquisitions that would be needed for the interim and ultimate design years are identified in Table 2-1.

Table 2-1. Property Acquisitions Needed for the Proposed Action

Assessor's Parcel Number	Total Parcel Size (acres)	Interim Year Permanent Acquisition (acres)	Design Year Permanent Acquisition (acres)	Interim Year TCE (acres)	Design Year TCE (acres)	Business Relocation Necessary? (yes, no)
West Sacramento						
058-027-006	2.579		0.023		0.013	No
058-027-014	7.568	0.120		0.015		No
058-028-003	3.530	1.005	0.056	0.089	0.012	No
058-028-005	6.010	2.920	0.200	0.325	0.065	No
058-028-006	0.473	0.056		0.055		Yes
058-028-007	0.911	0.177		0.027		Yes
843-57-5-7	6.477	0.064		0.019		No
Sacramento						
009-0012-008	1.598	0.220		0.074		Yes*
009-0012-038	0.033	0.033				No
009-0012-064	2.673	2.673				No
009-0012-065	0.793	0.793				No
009-0012-071	2.494	0.378		0.159		Yes*
009-0012-072	6.903	0.049		0.068		Yes*
009-0020-001	1.525	0.605		0.083		No
009-0030-054	5.616	0.657		0.274		Yes*

TCE = temporary construction easement.

* Assumes the fill slopes shown along realigned Broadway in Figure 3, Appendix A. No business relocation would be necessary if retaining walls were constructed instead of fill slopes to support the increase in elevation and widening of Broadway between the bridge and Front Street.

The total length of the new bridge would measure approximately 845 feet long, with an up to 83-foot-wide deck consisting of two vehicle lanes, a median, on-street Class II buffered bike lanes, and sidewalks along both sides of the bridge. The bridge would include two fixed-span approach structures that tie into the banks of the river; the structures would be approximately 200 feet in length on the West Sacramento bank and approximately 450 feet in length on the Sacramento bank. The center span of the bridge would be movable (see below under *Bridge Type* for more information on the movable span). The bridge soffit elevation would be set a minimum of 3 feet above the 200-year water surface elevation to comply with the Central Valley Flood Protection Board (CVFPB) freeboard requirements. Rock slope protection (RSP) (assumed 1/4 ton stone weight, machine positioned [i.e., Method B]) would be installed on the river side of the bridge abutments both above and below the ordinary high-water mark (OHWM) to stabilize approximately 400 linear feet of shoreline on each side of the river.

The required length of the movable span portion of the bridge was determined through coordination with the USCG. The movable span would provide a 170-foot clear channel opening that would line up with the western pier of the existing Pioneer Bridge (US 50 bridge) located upstream. The new bridge would have the same minimum vertical clearance of 59 feet above the maximum river elevation of 31 feet in the open position that the existing Pioneer Bridge provides (measured to the 29 National Geodetic Vertical Datum).

2.2.1 Bridge Type

One of three movable span types would be constructed: a vertical lift span, a swing span, or a bascule span. The bridge could be built as any one of the three types. To address the possible impacts of the bridge type that ultimately is built, the largest in- and over-water footprint and the greatest number of construction-related impacts of the three types were assumed for the analysis.

After the project is approved, final aesthetic design criteria would be developed in cooperation with the selected bridge architect. Some of the guiding principles of the bridge aesthetics will be how the bridge fits within the surrounding setting and within the overall Sacramento region history, values, and vision. Selection of the type of movable span would be part of the aesthetic design of the bridge.

Regardless of the bridge type that is constructed over the Sacramento River as part of the proposed project, a bridge fender system would be installed around the movable span piers to protect the piers from errant watercrafts that are navigating along the river.

A brief description of each of the three movable span types follows.

- *Vertical lift span* bridges have a movable span that is lifted vertically to permit passage of boats beneath it. The Tower Bridge over the Sacramento River upstream of the proposed Broadway Bridge is an example of a vertical lift span bridge.
- *Swing span* bridges rotate the movable span on a center pivot pier, allowing navigational traffic to pass the bridge on either side of the center pier. Because of the span lengths required by the USCG for the proposed project and the requirement of creating a neighborhood-friendly river crossing with low vertical grades, the superstructure of a swing span most likely would be a through-truss design (the truss would be cross-braced above and below vehicular traffic). The existing I Street Bridge is an example of a swing span bridge.
- *Bascule span* bridges operate by raising into the air one side of a counterweighted movable span while the other side rotates on a horizontal axis. The rotating axis could be fixed (like a hinge) or rolling (like a rocking chair). A bascule bridge can be designed with a single movable span or two movable spans (double bascule bridge). The Freeport Bridge over the Sacramento River in the town of Freeport is a double bascule span bridge.

The proposed project would realign 15th Street between Jefferson Boulevard and South River Road in West Sacramento consistent with the approved mobility network planned as part of redevelopment of the Pioneer Bluff area (see greyed roadway network in Figure 3c, Appendix

A), to connect the new bridge to the roadway network. The bridge would connect to Broadway on the Sacramento side.

2.2.2 Interim Year Features

Project features that would be constructed and in operation by 2030 include the following.

- New bridge and roadway modifications, including a redesigned intersection connection for the bridge at 15th Street and new turn pockets on South River Road to facilitate traffic turning movements at the bridge connection in West Sacramento.
- Stormwater drainage management features.
- Utility relocations.
- Fiber optic cable installation for operational communications.

In West Sacramento, modifications to the approved mobility network would be necessary for construction. These modifications include the following.

- Constructing a northbound right-turn pocket on South River Road at 15th Street.
- Constructing a southbound right-turn pocket on South River Road at 15th Street.

In Sacramento, the following modifications to the existing (or planned opening day) conditions would be required.

- Reconstructing 350 feet of Marina View Drive to provide for a new connection to Broadway.
- Modifying property access along Broadway west of I-5.

The existing at-grade State Parks railroad crossing at Broadway would remain in the same location.

Construction of the interim year design would create 2.0 acres of new impervious surface.

RSP would be installed on the river side of the bridge abutments both above and below the OHWM to stabilize the shoreline on each side of the river. The estimated linear feet and area and volume above and below the OHWM are shown in Table 2-2.

Table 2-2. Estimated Rock Slope Protection Needed for Proposed Action

Location	Linear Feet of Shoreline	Area (square feet)	Area below OHWM (square feet)	Volume below OHWM (cubic yards)	Volume above OHWM (cubic yards)
West Sacramento shoreline	426	31,033	12,833	1,569	2,224
Sacramento shoreline	398	27,589	11,293	1,380	1,992
Total	**824**	**58,622**	**24,126**	**2,949**	**4,216**

OHWM = ordinary high water mark.

2.2.3 Design Year Features

Project features that would be constructed by 2040 include the following.

- Roadway alignment modifications in West Sacramento necessary to shift the alignment of South River Road and connection of the new bridge to the east to conform with the approved mobility network alignment of South River Road.
- Roadway striping and turn pocket additions on Jefferson Boulevard, South River Road, and Alameda Boulevard.

In both West Sacramento and Sacramento, no additional modifications to the assumed design year conditions without the project would be needed.

Construction of the design year features would not increase impervious surface area from that created during the interim year phase.

2.2.4 Utility Relocations

The proposed location of the eastern bridge abutment conflicts with the location of the Kinder Morgan gas transmission line. The under-river portion of the line would remain in place; however, the proposed project would require relocation of a portion of gas line located under Broadway. The project's bridge alignment does not conflict with the location of the Pacific Gas and Electric Company (PG&E) gas transmission line.

The proposed project also conflicts with the location of a communication line at the eastern bridge abutment. Similar to the Kinder Morgan gas line, the under-river portion of the communication line would remain in place, but the project would require relocation of a portion of the communication line under Broadway.

2.3 Deconstruct the Proposed Action

2.3.1 Construction Scenario Summary

2.3.1.1 New Bridge Construction and Roadway Modifications

Over-Water Construction Site Access

Temporary trestles and barges would be used to provide the contractor with access to the river portion of the project area. Together, the trestles and barges would be used to stage construction materials, to provide a working platform for cranes, and for general construction support. The temporary trestles would consist of steel piles that would be driven into place with an impact hammer. Although the temporary work platforms would be removed at the end of the first construction season before the onset of winter, the temporary trestle piles could remain in place for the duration of construction. The barges would be anchored to the river bottom with piles that would be driven into place with an impact hammer. Up to two barges would be anchored in the river at one time. The barges would be repositioned in the channel throughout construction only as needed to complete the work. The barges and temporary piles would be removed after bridge construction is completed.

In-Water Construction Activities

In-water construction activities consist of those that would occur below the OHWM. The activities would be limited to the period of May 1 to November 30 during the two construction seasons. The in-water construction window allows sufficient time for most in-water work to be completed within the first "in-water work season," thus limiting potential impacts on fish and other species from the activities to primarily one construction season. The in-water work window was selected after consideration of agency in-water work restrictions, timing of the presence of multiple special-status fish species, timing of breeding seasons for other special-status species in the project area, and other constraints. Other construction activities occurring above the OHWM (e.g., work on the abutments and approach superstructure) would not be limited to the in-water window of May 1 to November 30. Additional information on sequencing of construction activities is provided in Figure 4 (Appendix A).

Temporary falsework platforms would be required to construct the proposed bridge foundations and approach structures. The platforms would be constructed using temporary piles within the river. In addition, temporary cofferdams would be required to construct the bridge piers within the water. The cofferdams would consist of temporary sheet piles installed around the individual piers. Dewatering inside the cofferdams would be required. In-water construction activities would include the following.

- Installation and removal of steel piles with a vibratory hammer and an impact hammer for the temporary falsework platforms (trestles).
- Installation and removal of steel piles with an impact hammer for anchoring barges.
- Installation of steel sheet piles with a vibratory driver for temporary cofferdams.

- Installation of steel piles for the piers with an impact hammer for the new bridge (although work would occur within dewatered cofferdams, underwater sound would propagate beyond the dewatered cofferdams).
- Installation of steel casings for the piers with a vibratory hammer or hydraulic oscillator/ rotator system for the new bridge.
- Installation of concrete piles with an impact hammer for the new bridge fender system.

Above-Water Construction Activities

After the temporary cofferdams are installed around the piers, forms would be constructed and concrete poured into the dewatered cofferdams to construct the pile caps. Work then would focus on the pier column construction. After the casings are installed, a rebar cage would be placed into the pile, and concrete would be poured into the steel shell. A cast-in-place concrete pier cap would be placed atop the columns to serve as the substructure.

Work then would focus on constructing the approach superstructure. The movable span superstructure likely would be constructed offsite, floated in, and erected when construction of the foundations is completed.

Roadway Modifications

Proposed roadway modifications are described below.

City of West Sacramento

In West Sacramento, a new intersection for the bridge roadway at South River Road would be constructed.

City of Sacramento

In Sacramento, common roadway modifications include repaving and reconstructing the sidewalk along Broadway from the new bridge east to 5th Street. Roadway modifications also would include a modified intersection at Marina View Drive and Broadway; widening of the northbound I-5 off-ramp at Broadway to two left-turn lanes and one right-turn lane; and improvements at intersections of Broadway and Front Street, 3rd Street (south), 3rd Street (north), and 5th Street to transition bridge traffic into the roadway network.

Class I Bikeway Improvements

City of West Sacramento

A future Class I River Walk trail extension is planned in West Sacramento. The trail is proposed within the levee setback. As part of the proposed project, the grade of the trail would be separated to allow it to pass under the proposed bridge structure. Cyclists and pedestrians approaching Broadway Bridge in either direction from the trail would have the option to continue along the trail under the new structure, avoiding the need to cross the roadway, or to

connect to the structure and cross the river into Sacramento or travel westward in West Sacramento.

City of Sacramento

The existing Class I Sacramento River Bike Trail would be reconstructed approximately 1,000 feet north and 300 feet south of Broadway as part of the proposed project. In order to reconstruct the trail, permanent right-of-way acquisition from four adjacent private parcels would be necessary (acquisitions and easements are discussed in detail in Section 2.2, *Description of Proposed Action*). The trail would be grade-separated under the proposed bridge structure. Cyclists and pedestrians approaching Broadway in either direction would have the option to continue along the trail under the new structure, avoiding the need to cross the roadway, or to connect to the structure and cross the river into West Sacramento or travel westward on Broadway in Sacramento.

Bridge Communication Fiber Optic Line

A fiber optic cable is proposed to interconnect operational communications of the proposed project (the new Broadway Bridge), the Tower Bridge, and the I Street Replacement bridge. The fiber optic line would be placed in West Sacramento under Riverfront Street. From the proposed project, the fiber optic line would run north until Riverfront Street turns into 3rd Street and would end at the intersection of 3rd Street and C Street (see Appendix A, Figure 3). The fiber optic line would be installed within an existing City of West Sacramento-owned conduit along Riverfront Street to Tower Bridge Gateway. North of Tower Bridge Gateway, a new conduit would be placed within the 3rd Street right-of-way north to the intersection of 3rd Street and C Street. The new conduit would be placed within existing paved areas using a horizontal drilling machine.

2.3.1.2 Stormwater Drainage Management

During construction, as is standard with all construction projects that disturb soil, the construction contractor would be required to install temporary best management practices (BMPs) to control any runoff or erosion from the project site into the surrounding storm drain systems and waterways in order to be compliant with local, state, and federal water quality regulations. Temporary BMPs would be installed prior to any construction operations and would be in place for the duration of the contract. Removal of the temporary BMPs would be the final operation, along with project site cleanup.

Stormwater and road runoff drainage for operation of the proposed roadway would be conveyed in a new storm drain system installed approximately 5 feet below the finished road grade of South River Road, 15th Street, and Circle Street in West Sacramento and of Broadway in Sacramento. New storm drain outfalls into the Sacramento River would be constructed near each of the bridge abutments in West Sacramento and Sacramento.

2.3.1.3 Staging, Storage, and Proposed Access during Construction

Staging areas would be used to store materials and equipment during construction, such as pipe materials, precast manholes and drop inlets, steel girders, piles, and rebar, along with construction equipment when not in use. In West Sacramento, staging area options are the West Sacramento Corporation Yard (1951 South River Road) or the Shell property recently purchased by the Port of West Sacramento (1509 South River Road). Both staging areas in West Sacramento would be accessed via South River Road and are options on the condition that they are still available (have not been redeveloped) at the time the proposed project is constructed.

In Sacramento, one option for a staging area would be closing Broadway to traffic west of Front Street and using the road as a staging area with access via Broadway to the east. This option would require a traffic detour for continued access to Marina View Drive using Front Street and Miller Park Circle. Another staging area option in Sacramento is use of a vacant lot north of the California Automobile Museum with access via Front Street.

Staging areas would be in use throughout the construction duration. The staging areas consist of areas already developed, and no ground-disturbing activities will take place at these locations.

2.3.1.4 Utility Relocations

A number of public and private utilities would need to be relocated or adjusted to the new ground elevation as part of the project, including existing water, sewer, gas, overhead and underground electric, and communication facilities within Broadway, South River Road, 15th Street, and Jefferson Boulevard.

Two existing gas transmission lines, Kinder Morgan and PG&E, and a communication line run under the Sacramento River. The proposed action could conflict with the locations of the utility lines and require relocation of the utilities. Known conflict locations are discussed in Section 2.2, *Description of Proposed Action*. Utility relocations and adjustments would be conducted prior to or during construction. As part of the final project design process, prior rights would be used to determine who is responsible for the utility relocations.

2.3.1.5 Traffic Management and Detours during Construction

While most of the project would be constructed outside of existing roadways, some project construction areas would require temporary detours or staged construction.

In West Sacramento, in order to construct the proposed project—including the new intersection at South River Road, a portion of South River Road would be closed to traffic. Closure of 15th Street also may be necessary. Travelers on South River Road south of the project area needing to get to South River Road north of the project area would be detoured around the project to the south and directed to travel over the Mike McGowan Bridge, turn right onto Locks Drive, right onto Jefferson Boulevard, right onto Tower Bridge Gateway, and then right onto 5th Street that becomes South River Road. The detour would be repeated in reverse for travelers on South River Road north of the project area wanting to travel south on South River Road.

In Sacramento, construction of street widening and sidewalk improvements under the I-5 viaduct structures would be phased to allow traffic access to Front Street for the duration of construction. Miller Park and Sacramento Marina traffic would travel on westbound Broadway, turn left onto southbound Front Street, right onto Miller Park Circle, and then left onto Marina View Drive. About 3,400 feet of the Sacramento River Bike Trail would be closed north and south of Broadway and detoured to the bike lane on Front Street between the Sacramento Marina and where the Sacramento River Bike Trail meets the R Street bicycle/pedestrian bridge.

2.3.2 Project Operation and Maintenance

During operation of the project, the bridge would open and close to allow boat passage along the river, just like bridges upstream and downstream. Motor vehicle traffic, as well as pedestrians and people on bicycles and other modes of active transportation, would use the bridge deck and adjoining roadways. Routine maintenance of project roadways, the bridge structure, and mechanical features of the bridge would occur at intervals determined by the performance and maintenance standards of the local jurisdictions and the USCG.

2.3.3 Sequencing and Schedule

The project may be constructed in two phases or in a single phase. The decision to construct in one or two phases will be driven by the extent of redevelopment and implementation of the approved mobility network in the Pioneer Bluff area of West Sacramento at the time project construction starts. If constructed in two phases, an interim (opening day) design phase for the proposed project would include constructing the new bridge and approach roadways with temporary pavement transitions along the existing alignment of South River Road. Construction of this first phase is expected to take approximately 36 months, with two seasons of in-water work. A subsequent phase, the design year phase, would take approximately 6 months and would complete the remaining project roadway construction consistent with full buildout of the approved mobility network. The roadway connection to the bridge and all other project improvements in Sacramento would be constructed during the first phase. If the project is built in a single phase, construction is expected to take 36 months. Information on the sequencing of construction activities is provided in Figure 4 (Appendix A). All in-water work would be conducted between May 1 and November 30.

2.4 Define Action Area

The *action area*, as defined by ESA regulations, consists of all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area includes all terrestrial and aquatic areas disturbed by project activities, including the project footprint (areas proposed for staging, trestle construction, barge anchoring, new bridge construction) and all areas potentially affected by construction activities (e.g., general construction noise, visual disturbance) and by pile driving-related noise and water quality impacts in excess of ambient conditions. Accordingly, the action area includes the Sacramento River and adjacent upland and urban areas in the vicinity of the proposed action.

The action area is encompassed by the biological study area (BSA), which was previously identified for the Broadway Bridge Project during preparation of the Natural Environment Study (NES) for the project (ICF 2020) and includes all terrestrial areas within 165 feet of the limits of permanent and temporary disturbance and portions of the Sacramento River that could be affected by elevated turbidity, sediment deposition, and underwater noise generated by in- and near-water construction activities (Figure 5, Appendix A). The proposed staging areas and the area for the installation of the fiber optic conduit on Tower Bridge Gateway, 3rd Street, and C Street were not buffered by 165 feet because all of this work would take place within existing developed areas already subject to high levels of pedestrian and vehicle traffic, and no effects are anticipated on species covered in this BA. Because pile-driving effects are anticipated to extend beyond water quality effects (with BMPs in place), the action area includes areas both upstream and downstream from pile-driving activity in which pile-driving noise may have a physical or behavioral effect on listed species. Based on an analysis of sound expected to be generated by driving up to 18 60-inch-diameter cast-in-steel shell piles for piers 2 and 3 without an attenuation device, the cumulative sound exposure level (SEL) interim criteria of 183 decibels (dB) could be exceeded for a distance of up to 7,067 feet (2,154 meters) upstream and downstream from the source pile. Although noise levels could exceed background levels beyond that point, a distance to any lesser threshold (i.e., 150 dB root mean square, which is sometimes used as a behavioral threshold) cannot be realistically predicted because of the physical geography of the river. The Sacramento River has river channel bends, and the straight-line distance of open water is 6,000 feet upstream and 1,900 feet downstream of the proposed bridge crossing. These distances are considerably shorter than the calculated distance (6.25 miles) to which the 150-dB threshold could be exceeded. Consequently, to account for the diffraction and attenuation of sound levels beyond the major river bends upstream and downstream from the proposed bridge crossing, the action area for this project is defined as the entire width of the Sacramento River channel and extending 2,000 feet beyond the straight-line, open-water distances (i.e., a buffer) upstream and downstream of the proposed bridge, or 8,000 feet upstream and 3,900 feet downstream from the proposed bridge crossing (i.e., from approximately river mile [RM] 57 to approximately RM 59.5).

2.5 Conservation Measures

Below is a description of the conservation measures proposed to avoid and minimize potential effects on the federally listed species addressed in this BA.

2.5.1 Project Design Modifications for Avoidance and Minimization

Implementation of the following measures would ensure that the proposed project minimizes and avoids effects on the environment within the action area.

Measure 1: Install Orange Construction Fencing between the Construction Area and Adjacent Sensitive Biological Resources

The project proponent or their contractor will install orange construction fencing between the construction area and adjacent sensitive biological resource areas. Sensitive biological resources

that occur adjacent to the construction area that could be directly affected by the project include sensitive natural communities; special-status wildlife habitats, such as nest sites of Swainson's hawk and migratory birds; and protected trees.

Barrier fencing around sensitive biological resource areas will be installed as one of the first orders of work and prior to equipment staging. Before construction begins, the construction contractor will work with the project engineer and a resource specialist to identify the locations for the orange construction fencing and will place stakes around the sensitive resource sites to indicate these locations. The protected areas will be designated as environmentally sensitive areas and clearly identified on the construction plans and described in the specifications. To minimize the potential for snakes and other ground-dwelling animals from being caught in the orange construction fencing, the fencing will be placed with at least a 1-foot gap between the ground and the bottom of the fencing. The exception to this condition is where construction barrier fencing overlaps with erosion control fencing and must be secured to prevent sediment runoff. Barrier fencing will be installed before construction activities are initiated, maintained throughout the construction period, and removed after completion of construction.

Measure 2: Conduct Environmental Awareness Training for Construction Employees

The project proponent will retain a qualified biologist to conduct environmental awareness training for construction crews before project implementation. The awareness training will be provided to all construction personnel and will brief them on the need to avoid effects on sensitive biological resources (e.g., native trees, sensitive natural communities, and special-status species habitats in and adjacent to the construction area). The education program will include a brief review of the special-status species with the potential to occur in the action area (including their life history, habitat requirements, and photographs of the species). The training will identify the portions of the action area in which the species may occur, as well as their legal status and protection. The program also will cover the restrictions and guidelines that must be followed by all construction personnel to reduce or avoid effects on these species during project implementation. This will include the steps to be taken if a sensitive species is found within the construction area (i.e., notifying the crew foreman, who will call a designated biologist). In addition, construction employees will be educated about the importance of controlling and preventing the spread of invasive plant infestations. An environmental awareness handout that describes and illustrates sensitive resources to be avoided during project construction and identifies all relevant permit conditions will be provided to each crew member. The crew foreman will be responsible for ensuring that crew members adhere to the guidelines and restrictions. Education programs will be conducted for appropriate new personnel as they are brought on the job during the construction period.

Measure 3: Conduct Periodic Biological Monitoring

The project proponent will retain a qualified biological monitor for the project who will visit the site a minimum of once per week to ensure that fencing around environmentally sensitive areas is intact and that activities are being conducted in accordance with the agreed upon project schedule and agency conditions of approval. The monitor will provide the project proponent with a monitoring log for each site visit.

Certain activities will require the presence of a biological monitor for the duration of the activity or during the initial disturbance of an area to ensure that impacts on special-status species are avoided. The activities that require specific monitoring are identified below in Measure 8.

Measure 4: Monitor Turbidity in the Sacramento River

The project proponent will require their contractor to monitor turbidity levels in the Sacramento River during in-water construction activities (e.g., pile driving, extraction of temporary sheet piles used for cofferdams, and placement of RSP). Turbidity will be measured using standard techniques upstream and downstream of the construction area to determine whether changes in ambient turbidity levels exceed the thresholds derived from the *Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region* (Central Valley Regional Water Quality Control Board 2018). If it is determined that turbidity levels exceed the Basin Plan thresholds, the project proponent or their contractor will adjust work to ensure that turbidity levels do not exceed the Basin Plan thresholds.

2.5.2 Species Specific Conservation Measures – Valley Elderberry Longhorn Beetle

Measure 5: Avoid and Minimize Effects on Valley Elderberry Longhorn Beetle

The following measures from the *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle* (U.S. Fish and Wildlife Service 2017) have been slightly modified for this project.

- Fencing. The elderberry shrub will be fenced and/or flagged as close to construction limits as feasible.
- Avoidance area. Activities that may damage or kill an elderberry shrub (e.g., trenching, paving) may need an avoidance area of at least 6 meters (20 feet) from the dripline, depending on the type of activity.
- Worker education. A qualified biologist will provide training for all contractors, work crews, and any onsite personnel on the status of the VELB, its host plant and habitat, the need to avoid damaging the elderberry shrubs, and the possible penalties for noncompliance.
- Construction monitoring. At a minimum, a qualified biologist will monitor the work area on a weekly basis to ensure that all avoidance and minimization measures are implemented.

- Timing. As much as feasible, all activities that could occur within 50 meters (165 feet) of the elderberry shrub will be conducted outside of the flight season of the VELB (March–July).

2.5.3 Species Specific Conservation Measures – Fish

Measure 6: Conduct All In-Water Construction Activities between May 1 and November 30 and Only during Daylight Hours

The project proponent will conduct all in-water construction work, including pile driving (in-water and shore-based within 250 feet of the Sacramento River), installation of cofferdams, removal of temporary sheet piles, and placement of rock revetment, between May 1 and November 30 to avoid or minimize causing disturbance and injury to, or mortality of, special-status fish species in the affected reaches of the Sacramento River. In addition, in-water work will be conducted only during daylight hours to provide fish in the affected reaches of the Sacramento River an extended quiet period during nighttime hours for feeding and unobstructed passage.

Limiting in-water construction to the May 1–November 30 period would achieve several goals.

- In-water construction activities with the potential to generate harmful levels of underwater noise (e.g., driving piles with an impact hammer) would avoid the primary migration periods of adults and juveniles of special-status fish species.
- The length of the in-water work window will allow most of the in-water construction work to be completed during the first construction season, thereby limiting the number of year classes of fish species that potentially would be exposed to in-water construction effects.

Measure 7: Implement Measures to Minimize Exceedance of Interim Threshold Sound Levels during Pile Driving

The project proponent will require their contractor to implement the following measures to minimize the exposure of listed fish species to potentially harmful underwater sounds.

- The contractor will vibrate all piles to the maximum depth possible before using an impact hammer.
- No more than 20 piles will be driven per day.
- During impact driving, the contractor will limit the number of strikes per day to the minimum necessary to complete the work and will limit the total number of hammer strikes to 32,000 strikes per day (i.e., 1,600 hammer strikes per pile, per day) for piles for the temporary trestles, 20,000 strikes per day (i.e., 1,000 hammer strikes per pile, per day) for the piles for the bridge fender system, 12,800 strikes per day (i.e., 1,600 hammer strikes per pile, per day) for piles for the fixed span piers, and 6,000 strikes per day (i.e., 1.500 strikes per pile, per day) for the cast-in-steel shell piles for the movable span piers.
- During impact driving, the project proponent will require their contractor to use a bubble curtain or dewatered cofferdam to minimize the extent to which the interim peak and cumulative SEL thresholds are exceeded (see Section 4.4, *Effects of the Action*).

- No pile-driving activity will occur at night, thereby providing fish with an extended quiet period during nighttime hours on days that pile driving is being conducted for feeding and unobstructed passage.

Measure 8: Develop and Implement a Hydroacoustic Monitoring Plan

The project proponent or their contractor will develop and implement a hydroacoustic monitoring plan. The monitoring plan will be submitted to the resource agencies (CDFW, NMFS, and USFWS) for approval at least 60 days before the start of project activities. The plan will include the following requirements.

- The project proponent or their contractor will monitor underwater noise levels during all impact pile-driving activities on land and in water to ensure that peak and cumulative SELs do not exceed estimated values (Tables 4-10 through 4-14).
- The monitoring plan will describe the methods and equipment that will be used to document the extent of underwater sounds produced by pile driving, including the number, location, distances, and depths of the hydrophones and associated monitoring equipment.
- The monitoring plan will include a reporting schedule for daily summaries of the hydroacoustic monitoring results and for more comprehensive reports to be provided to the resource agencies on a monthly basis during the pile-driving season.
- The daily reports will include the number of piles installed per day; the number of strikes per pile; the interval between strikes; the peak sound pressure level (SPL), SEL, and root mean square (RMS) per strike; and the accumulated SEL per day at each monitoring station.
- The project proponent or their contractor will ensure that a qualified fish biologist is onsite during impact pile driving to document any occurrences of stressed, injured, or dead fish. If stressed, injured, or dead fish are observed during pile driving, the project proponent or their contractor will reduce the number of strikes per day to ensure that fish are no longer showing signs of stress, injury, or mortality.

Measure 9: Implement Cofferdam Restrictions

The following restrictions will be implemented during installation of the cofferdams and cofferdam dewatering.

- The extent of cofferdam footprints will be limited to the minimum necessary to support construction activities.
- Sheet piles used for cofferdams will be installed and removed using a vibratory pile driver.
- Cofferdams will be installed and removed only during the proposed in-water work window (between May 1 and November 30).
- Cofferdams will not be left in place over winter where they could be overtopped by winter/spring flows and when juveniles of listed species are most likely to be present in the construction area.

- All pumps used during dewatering of cofferdams will be screened according to CDFW and NMFS guidelines for pumps.
- Cofferdam dewatering and fish rescue/relocation from within cofferdams will commence immediately following cofferdam closure to minimize the duration that fish are trapped in the cofferdam.

Measure 10: Prepare and Implement a Fish Rescue and Relocation Plan

The project proponent or their contractor will develop and implement a fish rescue and relocation plan to recover any fish trapped in cofferdams. The fish rescue and relocation plan will be submitted to the resource agencies (CDFW, NMFS, and USFWS) for approval at least 60 days before initiating activities to install cofferdams. At a minimum, the plan will include the following.

- A requirement that fish rescue and relocation activities will commence immediately after cofferdam closure and that dewatering has sufficiently lowered water levels inside cofferdams to make it feasible to rescue fish.
- A description of the methods and equipment proposed to collect, transfer, and release all fish found trapped within cofferdams. Capture methods may include seining, dip netting, and electrofishing, as approved by CDFW, NMFS, and USFWS. The precise methods and equipment to be used will be developed cooperatively by CDFW, NMFS, USFWS, and the project proponent or their contractor.
- A requirement that only CDFW-, NMFS-, and USFWS-approved fish biologists will conduct the fish rescue and relocation.
- A requirement that fish biologists will contact CDFW, NMFS, and USFWS immediately if any listed species are found dead or injured.
- A requirement that a fish rescue and relocation report be prepared and submitted to CDFW, NMFS, and USFWS within 5 business days following completion of the fish relocation. Data will be provided in tabular form and at a minimum will include the species and number rescued and relocated, approximate size of each fish (or alternatively, approximate size range if a large number of individuals are encountered), date and time of their capture, and general condition of all live fish (e.g., good–active with no injuries; fair–reduced activity with some superficial injuries; poor–difficulty swimming/orienting with major injuries). For dead fish, additional data will include fork length and description of injuries and/or possible cause of mortality if it can be determined.

Measure 11: Develop and Implement a Barge Operations Plan

The project proponent or their contractor will develop and implement a barge operations plan. The barge operations plan will be submitted to the resource agencies (CDFW, NMFS, and USFWS) for approval at least 60 days before the start of project activities. The plan will address the following.

- Bottom scour from propeller wash.

- Bank erosion or loss of submerged or emergent vegetation from propeller wash or excessive wake.
- Accidental material spillage.
- Sediment and benthic community disturbance from accidental or intentional barge grounding or deployment of barge spuds (extendable shafts for temporarily maintaining barge position) or anchors.
- Hazardous materials spills (e.g., fuel, oil, and hydraulic fluids).

The barge operations plan will serve as a guide to barge operations and to a biological monitor who will evaluate barge operations during construction with respect to stated performance measures. This plan, when approved by the resource agencies, will be read by barge operators and kept aboard all vessels operating at the construction site.

Measure 12: Prevent the Spread or Introduction of Aquatic Invasive Species

The project proponent or their contractor will implement the following actions to prevent the potential spread or introduction of aquatic invasive species (AIS) associated with the operation of barges and other in-water construction activities. Species of concern related to the operation of barges and other equipment in the lower Sacramento River include invasive mussels (e.g., quagga mussels [*Dreissena bugensis*] and zebra mussels [*Dreissena polymorpha*]) and aquatic plants (e.g., Brazilian waterweed [*Egeria densa*] and hydrilla [*Hydrilla verticillata*]) (California Department of Fish and Game 2008).

- Coordinate with the CDFW Invasive Species Program to ensure that the appropriate BMPs are implemented to prevent the spread or introduction of AIS.
- Educate construction supervisors and managers about the importance of controlling and preventing the spread of AIS.
- Train vessel and equipment operators and maintenance personnel in the recognition and proper prevention, treatment, and disposal of AIS.
- If feasible, prior to departure of vessels from their place of origin and before in-water construction equipment is allowed to operate within the waters of the Sacramento River, thoroughly inspect and remove and dispose of all dirt, mud, plant matter, and animals from all surfaces that are submerged or may become submerged, or places where water can be held and transferred to the surrounding water.

Measure 13: Minimize or Avoid Permanent Bridge Lighting from Directly Radiating on Water Surfaces of the Sacramento River

The project proponent or their contractor will minimize or avoid the effects of permanent bridge lighting on special-status fish species by implementing the following actions.

- Minimize nighttime lighting of the bridge structure for aesthetic purposes.
- Use the minimal amount of lighting necessary to safely and effectively illuminate vehicular, bicycle, and pedestrian areas on the bridge.

- Shield and focus lights on vehicular, bicycle, and pedestrian areas and away from the water surface of the Sacramento River, to the maximum extent practicable.

2.6 Compensation

Measure 14: Compensate for Temporary Effects on and Permanent Loss of Cottonwood Riparian Forest (Including SRA Cover)

The project proponent will compensate for the permanent loss of up to 1.273 acres of riparian forest. In addition, any unavoidable temporary loss of riparian forest will be mitigated. The project proponent will implement onsite and, if necessary, offsite compensation measures and/or purchase mitigation bank credits to compensate for losses of cottonwood riparian forest on the waterside slope of the existing levees, including riparian forest supporting SRA cover habitat (as described in Section 3.4.2.4, *Survey Results*, portions of the cottonwood riparian forest in the action area also provide SRA cover habitat for fish). Onsite compensation will be used to the maximum extent practicable. Compliance with the USACE levee vegetation policy (U.S. Army Corps of Engineers 2014), the ULDC (California Department of Water Resources 2012b), or other engineering constraints may limit the ability to achieve full onsite compensation. Therefore, offsite compensation and/or purchase of mitigation bank credits may be needed to achieve no net loss of existing in-kind riparian and SRA cover habitat values. Each of these options is discussed below.

1. **Onsite and/or Offsite Restoration and/or Enhancement along the Sacramento River.** Riparian habitat restoration and/or enhancement onsite or offsite should occur in the same year construction is completed. For onsite or offsite replacement plantings, the project proponent will prepare a mitigation planting plan, including a species list and number of each species, planting locations, and maintenance requirements. Plantings will consist of cuttings taken from local plants or plants grown from local material. Planted species for the mitigation plantings will be similar to those removed from the project area and will include native species, such as Fremont's cottonwood, valley oak, black willow, boxelder, Oregon ash, and black walnut. The final planting plan will be developed based on results of the arborist survey for species to be removed (see additional discussion below). All plantings will be fitted with exclusion cages or other suitable protection from herbivory. Plantings will be irrigated for up to 3 years or until established. Plantings will be monitored annually for 3 years or as required in the project permits. If 75% of the plants survive at the end of the monitoring period, the revegetation will be considered successful. If the survival criterion is not met at the end of the monitoring period, planting and monitoring will be repeated after mortality causes have been identified and corrected.
2. **Mitigation Bank Credit Purchase.** If this option is chosen, the project proponent will provide written evidence to the resource agencies that compensation has been established through the purchase of mitigation credits. The amount to be paid will be the fee that is in effect at the time the fee is paid. The mitigation will be approved by CDFW and may be modified during the permitting process. Mitigation can be in the form of creation and/or preservation credits. If mitigation is in the form of restoration/creation credits, the mitigation will be at a minimum ratio of 1:1 (1 acre of restored or created riparian habitat for each acre of riparian habitat removed). If mitigation is in the form of preservation credits, the

mitigation will be at a minimum ratio of 2:1 (2 acres of preserved riparian habitat for each acre of riparian habitat removed). The final compensation ratio will be approved by CDFW in order to result in no net loss of riparian habitat. The project proponent will purchase riparian habitat credits from an approved mitigation bank near the project, such as the Liberty Island Conservation Bank, Cosumnes Floodplain Mitigation Bank, Fremont Landing Conservation Bank, Elsie Gridley Mitigation Bank, River Ranch Wetland Mitigation Bank, or other approved bank with available riparian forest credits at the time of project permitting. Replacement riparian forest habitat will include tree species that would support nesting Swainson's hawk (i.e., oak, cottonwood) and will occur within the range of nesting Swainson's hawk within the Sacramento Valley.

To provide a current and accurate estimate of tree loss, an arborist survey will be conducted upon completion of 90% design plans for the project and no more than 2 years prior to project construction. In addition to a description of the tree, the arborist survey report will include the precise location of the trunk and size of the dripline for all trees whose trunk or canopy overlap with the project footprint. Riparian forest compensation will be consistent with the requirements of the City of West Sacramento and City of Sacramento tree ordinances to ensure compensation for losses of individual protected trees.

In addition to mitigating the loss of riparian forest habitat, specific measures will be included to satisfy NMFS requirements and compensate for the loss of SRA cover (area and linear feet). The acreage will not be duplicated, such that the acreage of riparian forest habitat restored for SRA cover mitigation will apply toward riparian forest habitat mitigation requirements. SRA cover mitigation will include the following riparian replacement requirements:

- Replace the permanent loss of 302 linear feet and up to 0.368 acre of affected SRA cover vegetation (see description of temporary and permanent loss of riparian vegetation [including SRA cover] in Section 4.4.2.5, *Habitat Impacts*) at a 3:1 replacement ratio (i.e., 3 linear feet replaced for every 1 foot affected and 3 acres replaced for every 1 acre affected) by planting native riparian trees in temporary impact areas and along existing onsite or offsite unshaded banks along the Sacramento River.
- Plant native riparian trees onsite to the maximum extent practicable, followed by planting on adjacent reaches of the Sacramento River to minimize the need for purchasing offsite mitigation bank credits.
- Plant riparian trees that are intended to provide SRA cover along the water's edge at summer low flows up to the OHWM and at sufficient densities to provide shade along at least 85% of the bank's length when the trees reach maturity. This will ensure that riparian plantings intended for SRA cover mitigation will contribute to instream SRA cover when they are inundated during winter/spring flows and overhead cover (shade) during summer flows when they approach maturity.
- Monitor and evaluate the revegetation success of riparian plantings intended for SRA cover mitigation as described above.
- If mitigation for SRA cover is in the form of offsite mitigation bank credits, credits will need to be purchased from an approved mitigation bank within the approved service area for the project that provides riparian forest floodplain conservation credits as offsite compensation

for impacts on state- and federally listed fish species, designated critical habitat, and EFH for Pacific salmon.

Measure 15: Compensate for Loss of Perennial Stream

The project proponent will comply with any regulatory requirements determined as part of the state (Section 401 Water Quality Certification or WDRs and LSAA) and federal (Section 404 and Section 10 permits) processes for the work that would occur in the Sacramento River. The project proponent will compensate for the permanent fill of up to 0.87 acre of non-wetland waters of the United States in the Sacramento River by purchasing mitigation bank credits, which can be in the form of preservation and/or creation credits using the following minimum ratios.

- A minimum of 2:1 (2 acres of mitigation for each acre filled), for a total of up to 1.74 acres, if credits are for preservation of habitat; or
- A minimum of 1:1 (1 acre of mitigation for each acre filled), for a total of up to 0.87 acre, if credits are for creation of habitat.

The actual compensation ratios will be determined through coordination with the Central Valley RWQCB and USACE as part of the permitting process. The project proponent will compensate for permanent loss of perennial stream by implementing one or a combination of the following options.

- Purchase credits for created riparian stream channel at a USACE-approved mitigation bank with a service area that encompasses the project area, such as the Liberty Island Conservation Bank, Cosumnes Floodplain Mitigation Bank, Fremont Landing Conservation Bank, Elsie Gridley Mitigation Bank, River Ranch Wetland Mitigation Bank, or other approved bank with available riparian stream credits. The project proponent will provide written evidence to the resource agencies that compensation has been established through the purchase of mitigation credits.
- Compensate out-of-kind for loss of perennial stream by implementing compensatory mitigation for cottonwood riparian forest impacts described in Measure 14. The acreage restored or created to compensate for loss of perennial stream will be added to the acreage restored or created for loss of riparian habitat.

Measure 16: Purchase Channel Enhancement Credits for Impacts on Critical Habitat

Permanent impacts on critical habitat (bank and substrate below the OHWM and water column habitat), totaling 1.87 acres (up to 57,600 square feet [1.32 acre] from bridge shading of aquatic habitat and new bridge piers; 24,126 square feet [0.55 acre] from RSP; and 84 square feet (0.002 acre) from bridge fender system) will be mitigated at a 3:1 ratio. The project proponent proposes to mitigate the permanent loss of critical habitat for listed fish species through purchase of 5.61 acres of mitigation credits at a NMFS- and USFWS-approved anadromous fish and delta smelt conservation bank.

Chapter 3 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 proposed action. 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 that are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

3.1 Summary of Environmental Baseline

The action area consists of the Sacramento River, riparian forest along the Sacramento River, local roads, and commercial development; the area has a relatively high level of historical and ongoing disturbance. Despite the historical and ongoing disturbance, the action area supports numerous listed species, including VELB, Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, North American green sturgeon, and delta smelt. Representative photographs of the action area are provided in Appendix C.

3.2 Description of the Action Area

3.2.1 Physical Conditions

The action area is located in the Sacramento Valley subregion of the California Floristic Province (Baldwin et al. 2012:43). The topography in the action area varies from relatively level to moderate slopes on the Sacramento River levees, and elevations range from approximately 0 to 35 feet above msl.

According to soil data from the Natural Resources Conservation Service, the action area contains the following five soil map units and water (Natural Resources Conservation Service 2019).

- Lang sandy loam (Yolo County).
- Lang sandy loam, deep (Yolo County).
- Sycamore silt loam, 0 to 1 percent slopes, MLRA 17 (Yolo County).
- Columbia sandy loam, drained, 0 to 2 percent slopes, occasionally flooded (Sacramento County).
- Urban land (Sacramento County).

The soil profile has been disturbed by development in the action area.

The action area is within the Lower Sacramento watershed hydrologic unit (hydrologic unit code [HUC] 18020109) (U.S. Environmental Protection Agency 2018). The primary river in the delineation area is the Sacramento River, a traditional navigable water that qualifies as another water of the United States (which also is considered a water of the State). The specific characteristics of waters of the United States (including wetlands) in the action area are further described below. The Sacramento River, beginning at the I Street Bridge, falls within the legal description of the Sacramento-San Joaquin River Delta (Delta) (California Department of Water Resources 1995).

The climate of Sacramento is Mediterranean, which is characterized as damp to wet mild winters and hot, dry summers. The rainy season generally occurs between October and April, and the total average annual rainfall is 17.24 inches (Table 3-1). The annual mean temperature is 61.0 °Fahrenheit (F), with the monthly daily average temperature ranging from 45.7 °F in January to 75.5 °F in July. Summer heat generally is moderated by the "Delta breeze" coming from the Delta and ultimately the San Francisco Bay, and temperatures cool down sharply at night. (Western Regional Climate Center 2012)

Table 3-1. Monthly Average Precipitation at the Sacramento Executive Airport

Monthly Average Total Precipitation (inches)												Total Annual
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
3.56	3.07	2.44	1.17	0.50	0.18	0.03	0.06	0.25	0.93	2.04	3.02	17.24

Source: Western Regional Climate Center 2016

3.2.2 Biological Conditions

3.2.2.1 Land Cover Types

Five land cover types were identified and mapped in the action area: cottonwood riparian forest, ruderal, perennial stream, landscaped, and developed/graded. Figure 5 (Appendix A) shows the locations of land cover types and other biological resources in the action area.

The action area supports both common vegetation communities and natural communities of special concern. *Common vegetation communities* are habitats with low species diversity that are widespread, reestablish naturally after disturbance, or support primarily non-native species. These communities generally are not protected by agencies unless the specific site is habitat for or supports special-status species (e.g., raptor foraging or nesting habitat, upland habitat in a wetland watershed). Common vegetation communities in the action area are ruderal and landscaped areas.

Natural communities of special concern are habitats considered sensitive because of their high species diversity, high productivity, unusual nature, limited distribution, or declining status. Local, state, and federal agencies consider these habitats important. The CNDDB contains a current list of rare natural communities throughout the state. USFWS considers certain habitats, such as wetlands and riparian communities, important to wildlife; and the USACE and EPA consider wetland habitats important for water quality and wildlife. The habitats in the action area that meet criteria for natural communities of special concern are cottonwood riparian forest and

perennial stream. Perennial stream, although not a vegetation community, is included as a natural community of special concern because it is important wildlife and fish habitat and is regulated by resource agencies.

The distribution, representative vegetation, and typical wildlife species found in land cover types within the action area are described below. Representative photographs of the land cover types within the action area are provided in Appendix C.

Cottonwood Riparian Forest

Cottonwood riparian forest in the action area occurs along the banks of the Sacramento River (Appendix A, Figure 5). The overstory of riparian forest is predominantly mature Fremont's cottonwood (*Populus fremontii*) and Goodding's black willow (*Salix gooddingii*) trees associated with valley oak (*Quercus lobata*) and black locust (*Robinia pseudoacacia*). Other riparian tree species observed include boxelder (*Acer negundo* var. *californicum*), white alder (*Alnus rhombifolia*), Oregon ash (*Fraxinus latifolia*), northern California black walnut (*Juglans californica* var. *hindsii*), and western sycamore (*Platanus racemosa*). The riparian understory on the waterside of the levee is primarily rip-rap with non-native annual grasses and forbs; however, there are also patches of more typical riparian species, such as narrow-leaf willow (*Salix exigua*) and Himalayan blackberry (*Rubus armeniacus*). The invasive red sesbania (*Sesbania punicea*) shrub was observed in the riparian forest on both sides of the river. Riparian forest associated with the Sacramento River in the action area is depicted in Photos 1–4 in Appendix C.

Riparian habitats are sensitive natural communities that provide important habitat for wildlife and SRA cover habitat for fish. Local, state, and federal agencies recognize riparian habitats as sensitive natural communities.

Riparian habitats provide cover, provide foraging and nesting habitat, and serve as migration and dispersal corridors for several bird and mammal species in the region. Common wildlife species that may occur in these habitats include black phoebe (*Sayornis nigricans*), yellow-rumped warbler (*Dendroica coronata*), house finch (*Carpodacus mexicanus*), American goldfinch (*Carduelis tristis*), yellow-billed magpie (*Pica nuttalli*), pocket gopher (*Thomomys bottae*), fox squirrel (*Sciurus niger*), common muskrat (*Ondatra zibethicus*), and raccoon (*Procyon lotor*).

Ruderal

Both the West Sacramento and Sacramento sides of the action area include areas of naturalized vegetation on undeveloped parcels or parts of parcels with ruderal species. Dominant species observed in ruderal habitats at the time of the field surveys include non-native annual grasses and forbs, such as ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), shepherd's purse (*Capsella bursa-pastoris*), mouse ear chickweed (*Cerastium fontanum*), fringed willowherb (*Epilobium ciliatum*), white stemmed filaree (*Erodium moschatum*), telegraph weed (*Heterotheca grandiflora*), foxtail barley (*Hordeum murinum* subsp. *leporinum*), and milk thistle (*Silybum marianum*). One blue elderberry shrub (*Sambucus nigra* subsp. *caerulea*), habitat for the federally threatened VELB, was found in ruderal habitat on the Sacramento side of the river near the bike path (Appendix A, Figure 5). Representative photographs of ruderal habitat in the action area are provided as Photos 5–7 in Appendix C.

The ruderal vegetation provides nesting habitat for common birds, including northern mockingbird (*Mimus polyglottos*), western meadowlark (*Sturnella neglecta*), and killdeer (*Charadrius vociferous*) (in more open areas). Mallards (*Anas platyrhynchos*) from the adjacent river could use the denser areas of ruderal grassland for nesting. This ruderal area also provides foraging habitat for bird species.

Perennial Stream (Sacramento River)

The Sacramento River is the only perennial stream in the action area (Appendix A, Figure 5). All perennial stream is unvegetated open water. The river averages 720 feet wide at the OHWM in the action area. The riverbanks are levees that are mostly steeply sloped and support riparian forest vegetation, as described above, with rip-rap near the bottom of the slope. Representative photographs of the Sacramento River in the action area are provided as Photos 1–4 in Appendix C.

The Sacramento River is a traditional navigable water and a water of the United States, subject to regulation under CWA Section 404 and Section 10 of the RHA, and under the jurisdiction of the USACE. The river is considered a sensitive natural community. The RWQCB protects all waters of the State under the Porter-Cologne Act.

Riverine habitats like the Sacramento River provide habitat for amphibians, birds, and mammals. Common wildlife species that could be found in the river and along the shore of the river include American bullfrog (*Lithobates catesbeianus*), mallard, great egret (*Ardea alba*), and river otter (*Lutra canadensis*). Numerous species of fish also are known to occur in the Sacramento River and are described below.

Landscaped

The vegetation in landscaped areas typically comprises ornamental species planted as street trees and landscaping, including deodar cedar (*Cedrus deodara*), camphortree (*Cinnamomum camphora*), Italian cypress (*Cupressus sempervirens*), oleander (*Nerium oleander*), pines (*Pinus* spp.), London plane tree (*Platanus* x *hispanica*), and California fan palm (*Washingtonia filifera*) (Appendix A, Figure 5). Areas shown as landscaped on Figure 5 include some paved areas located within surrounding landscaping. Landscaping is depicted in Photos 8–10 in Appendix C.

Common bird species may forage and nest in some of the landscaped areas, including mourning dove (*Zenaida macroura*), American robin (*Turdus migratorius*), cliff swallow (*Petrochelidon pyrrhonota*) (nests on buildings and bridges), and western scrub jay (*Aphelocoma californica*).

Developed/Graded

Developed portions of the action area consist of commercial/industrial areas, and paved roadways and parking lots. Graded portions in the action area include unpaved areas adjacent to roadways and unpaved parking areas. These areas generally are unvegetated. Disturbed/graded areas are depicted in Photos 8–10 in Appendix C.

Common wildlife species that would occur in developed areas would be the same as those described above for the landscaped areas.

3.2.2.2 Habitat Connectivity

Migratory fish species (e.g., Chinook salmon, CCV steelhead, North American green sturgeon, and delta smelt) use the Sacramento River within the action area as a migration corridor during their upstream migration to spawning habitat (adults) and downstream migration (fry and juveniles) to the Delta or Pacific Ocean. Generally, channel geometry and river flow of the Sacramento River support unimpeded passage for these species and life stages; no other fish passage issues in the Sacramento River within the action area have been identified.

The river and riparian habitat within the action area provide connectivity between habitats for wildlife downstream and upstream. The riparian vegetation, although currently lacking elderberry shrubs, does represent an area where shrubs could establish at a later time and serve to connect VELB populations.

3.2.2.3 Invasive Plant Species

Invasive plant species include species designated as federal noxious weeds by the USDA, species listed by the CDFA, and invasive plants identified by Cal-IPC. Invasive plants displace native species, change ecosystem processes, alter plant community structure, and lower wildlife habitat quality. Road, highway, and related construction projects are potential dispersal pathways for invasive plants and their propagules (California Invasive Plant Council 2012). FHWA requires that state departments of transportation use the state's noxious weed list to identify invasive plant species that could be spread by construction of transportation projects. Table 3-2 lists the invasive plant species identified by the CDFA and Cal-IPC that are known to occur in the action area (Natural Resources Conservation Service 2003; California Invasive Plant Council 2018). No plant species designated as federal noxious weeds have been identified in the action area (Natural Resources Conservation Service 2010). Invasive plant species occur in riparian forest, ruderal, and disturbed/graded areas in the action area. Infestation of the action area by these species generally is limited; they occur primarily as scattered individuals.

Table 3-2. Invasive Plant Species Identified in the Action Area

Species	CDFA	Cal-IPC
Tree of heaven (*Ailanthus altissima*)	–	Moderate
Black mustard (*Brassica nigra*)	–	Moderate
Ripgut brome (*Bromus diandrus*)	–	Moderate
Soft chess (*Bromus hordeaceus*)	–	Limited
Bull thistle (*Cirsium vulgare*)	B	Moderate
Bermuda grass (*Cynodon dactylon*)	C	Moderate
Rattail fescue (*Festuca myuros*)	–	Moderate
English ivy (*Hedera helix*)	–	High
Foxtail barley (*Hordeum murinum* subsp. *leporinum*)	–	Moderate
Wild radish (*Raphanus sativus*)	–	Limited
Black locust (*Robinia pseudoacacia*)	–	Limited
Himalayan blackberry (*Rubus armeniacus*)	–	High
Russian thistle (*Salsola tragus*)	C	Limited
Red sesbania (*Sesbania punicea*)	B	High
Milk thistle (*Silybum marianum*)	–	Limited
Johnson grass (*Sorghum halepense*)	C	–
Smilo grass (*Stipa miliacea*)	–	Limited
Field hedge parsley (*Torilis arvensis*)	–	Moderate

Notes: The California Department of Agriculture (CDFA) and California Invasive Plant Council (Cal-IPC) lists assign ratings that reflect the CDFA and Cal-IPC views of the statewide importance of the pest, likelihood that eradication or control efforts would be successful, and present distribution of the pest in the state. These ratings are guidelines that indicate the most appropriate action to take against a pest under general circumstances. The Cal-IPC species list is more inclusive than the CDFA list.

The CDFA categories indicated in the table are defined as follows:

B: Eradication, containment, control or other holding action at the discretion of the county agricultural commissioner.

C: State-endorsed holding action and eradication only when found in a nursery; action to retard spread outside nurseries at the discretion of the county agricultural commissioner.

The Cal-IPC categories indicated in the table are defined as follows:

High: Species with severe ecological impacts, high rates of dispersal and establishment, and usually widely distributed.

Moderate: Species with substantial and apparent ecological impacts, moderate to high rates of dispersal, establishment dependent on disturbance, and limited to widespread distribution.

Limited: Species with minor ecological impacts, low to moderate rates of invasion, limited distribution, and locally persistent and problematic.

3.3 Habitat Conditions in the Action Area

As described in Section 2.4 of this BA, *Define Action Area*, the aquatic action area includes the Sacramento River from 3,900 feet downstream to 8,000 feet upstream of the proposed bridge crossing (i.e., from approximately RM 57 to approximately RM 59.5); and the terrestrial portion of the action area includes the adjacent lands that are dominated by riparian forest along the Sacramento River, local roads, and commercial development (see Figure 5 in Appendix A). Associated with these areas are land cover types including cottonwood riparian forest, ruderal, landscaped, developed and graded, and perennial stream (Sacramento River). The ruderal habitat supports one blue elderberry shrub which is suitable habitat for VELB; and the Sacramento River provides habitat for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, North American green sturgeon, and delta smelt.

Both the West Sacramento and Sacramento sides of the Sacramento River in the action area include areas of naturalized vegetation on undeveloped parcels or parts of parcels with ruderal species. The terrestrial action area on the east side of the Sacramento River (Sacramento side) with ruderal vegetation near the bike path supports a single blue elderberry shrub, which is suitable habitat for the federally threatened VELB. No other elderberry shrubs are present on either side of the Sacramento River. Non-native annual grasses and forbs dominate the ruderal areas.

The Sacramento River in the action area functions primarily as a migratory corridor for adult and juvenile Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and North American green sturgeon, and as juvenile rearing habitat (seasonal or year-round) for all species. Based on past occurrence of adult delta smelt in the trawl surveys as part of ongoing fish monitoring studies conducted approximately 2 miles downstream of the action area, the action area functions as a migratory corridor for adult delta smelt, and may provide limited spawning habitat for adults and larval transport and rearing habitat for larvae and juveniles, respectively. Habitat conditions in the aquatic action area have been highly altered as a result of past and ongoing levee, bridge, and boat dock construction, flow modification, water quality degradation, water diversion, and species introductions. The creation of levees in the action area has reduced or eliminated floodplain habitat that once provided habitat necessary for rearing and foraging of juvenile native fish species and has led to declines in the natural meandering of the river channel and the subsequent reduction in habitat complexity. Armoring (with rip-rap) of the levee banks and past and ongoing levee maintenance actions have limited the establishment of ecologically important riparian and wetland vegetation and associated cover for fish that is characteristic of undisturbed delta habitat. In addition to the reduction of shade-producing riparian vegetation that acts to moderate water temperatures, pollutants associated with agricultural in the region and local urban runoff have contributed to declining water quality in the action area.

The action area includes designated critical habitat for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, North American green sturgeon, and delta smelt. A description of each is provided below.

- The primary constituent elements of Sacramento River winter-run Chinook salmon critical habitat in the action area include freshwater rearing habitat with water quantity and quality, natural cover, forage, and passage conditions supporting migration and rearing of winter-run Chinook salmon.
- The primary constituent elements of CV spring-run Chinook salmon critical habitat in the action area include freshwater rearing habitat with water quantity and quality, natural cover, forage, and passage conditions supporting migration and rearing of spring-run Chinook salmon.
- The primary constituent elements of CCV steelhead critical habitat in the action area include freshwater rearing habitat; freshwater migration corridors; and estuarine areas with water quantity and quality, natural cover, forage, and passage conditions supporting migration and rearing of steelhead.

- The primary constituent elements of North American green sturgeon critical habitat in the action area include freshwater and estuarine areas with water flow, water quality, depth, forage, sediment quality, and passage conditions supporting migration and rearing of green sturgeon.
- The primary constituent elements of delta smelt critical habitat in the action area 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.

3.4 Status of Federally Listed/Proposed Species

Federally listed wildlife and fish species that could occur or are known to occur in the action area were identified based on a review of existing species information and the USFWS and NMFS species lists for the project vicinity (Appendix A). Two federally listed species under USFWS jurisdiction (VELB and delta smelt) and four federally listed fish species under NMFS jurisdiction (Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and the southern DPS of North American green sturgeon), have the potential to occur in the action area and be affected by the proposed action (Table 1-1). The subsections below include a description of the biology of these species, as well as species-specific survey results.

The proposed action also may affect critical habitat for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, the southern DPS of North American green sturgeon, and delta smelt. A discussion of the critical habitat and associated essential physical or biological features (also known as primary constituent elements) for these species is provided below.

3.4.1 Discussion of Valley Elderberry Longhorn Beetle

VELB is federally listed as threatened. The species range extends approximately from Shasta County south to Fresno County, including the valley floor and associated lower foothills (U.S. Fish and Wildlife Service 2017:4). The majority of VELB have been documented below 500 feet (152 meters) in elevation (U.S. Fish and Wildlife Service 2017:4). VELB is dependent on its host plant, elderberry shrubs, which is a common component of riparian corridors and adjacent upland areas (non-riparian vegetative communities) in the Central Valley (Barr 1991:5). Elderberry shrubs can be found on historical floodplain terraces above the river, on levees, and in areas where subsurface flow provides water to elderberry roots (U.S. Fish Wildlife Service 2017:5). In non-riparian settings, elderberry shrubs can occur singly or in clumps in valley oak and blue oak (*Q. douglassi*) woodlands and annual grasslands (U.S. Fish Wildlife Service 2017:5).

3.4.1.1 Survey Results

The action area was surveyed for elderberry shrubs on October 29, 2019. One elderberry shrub was identified in an area of ruderal vegetation on the Sacramento side of the action area

(Appendix A, Figure 5). The shrub was approximately 7 feet tall, with five stems just over 1 inch in diameter; no exit holes were observed on the shrub (Appendix C, Photo 11). The shrub is located within 160 feet of riparian habitat along the Sacramento River. The shrub occurs within the general location of a 1949 CNDDB record for the species (California Department of Fish and Wildlife 2019). According to the USFWS *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle* (U.S. Fish and Wildlife Service 2017), this shrub represents potential habitat for VELB.

Riparian habitat along both sides of the Sacramento River in the action area also represents linkages between occupied VELB habitat upstream and downstream of the action area.

3.4.1.2 Status of Designated Critical Habitat in the Action Area for VELB

Critical habitat was designated for VELB on August 8, 1980 (45 FR 52083-52807); however, there is no designated critical habitat for VELB in the action area.

3.4.2 Discussion of Chinook Salmon and Steelhead

Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead are discussed below.

3.4.2.1 Sacramento River Winter-Run Chinook Salmon

The Sacramento River winter-run Chinook salmon evolutionarily significant unit (ESU) is listed as endangered under the ESA (59 FR 440; January 4, 1994). The ESU includes all naturally spawned populations of winter-run Chinook salmon in the Sacramento River and its tributaries, as well as artificially-propagated fish from the Livingston Stone National Fish Hatchery (70 FR 37160–37204; June 28, 2005). The Sacramento River winter-run Chinook salmon ESU was listed as endangered under CESA in September 1989.

Winter-run Chinook salmon currently are found in the mainstem Sacramento River downstream of Keswick Dam. Areas where winter-run Chinook salmon historically migrated to and spawned are now inaccessible because of the construction of Keswick and Shasta Dams. The current population in the Sacramento River is maintained through cold water releases from Shasta Reservoir that create spawning and rearing habitat in the reach between Redding and the Red Bluff Diversion Dam. Efforts currently are underway to reestablish a population of Sacramento River winter-run Chinook salmon in North Fork Battle Creek with the purpose of recovering the species.

Winter-run Chinook salmon spend 1 to 3 years in the ocean. Adult winter-run Chinook salmon leave the ocean and migrate up the Sacramento River from December through July, with the majority of the run passing the Red Bluff Diversion Dam from January through May, peaking in mid-March (National Marine Fisheries Service 2009a, 2014). Adults spawn from mid-April through mid-August, with peak activity in May and June (Vogel and Marine 1991). Fry emerge from the gravel beginning in late June, with emergence continuing through October (Fisher 1994). Juvenile winter-run Chinook salmon have been observed emigrating past Sherwood

Harbor (located approximately 3 miles downstream from the action area) from October through April, with most passing through the area in November, December, and February through April (Table 3-3), based on USFWS Sacramento trawl survey data from 2009 to 2019 (U.S. Fish and Wildlife Service 2019).

During juvenile rearing and downstream movement, salmonids prefer stream margin habitats with sufficient depths and velocities to provide suitable cover and foraging opportunities. Ephemeral habitats, such as floodplains and the lower reaches of small streams, also are very important to rearing Chinook salmon as these areas can be much more productive than the main channel and provide refuge from predatory fishes (Maslin et al. 1997; Sommer et al. 2001).

Winter-run Chinook salmon use the Sacramento River within the action area for upstream migration (adults) and downstream migration and rearing (juveniles); spawning and egg incubation do not occur in the action area. Table 3-4 summarizes the life stage timing and distribution of winter-run Chinook salmon in the Sacramento River, including in the action area.

One of the main factors in the decline of winter-run Chinook salmon is habitat loss and degradation. On the Sacramento River, Shasta Dam blocked access to historical spawning and rearing habitat. Other factors affecting abundance include the effects of reservoir operations on water temperature, drought effects, passage impediments, harvesting and fishing pressure, entrainment in diversions, contaminants, predation by non-native species, and interaction with hatchery stock (U.S. Army Corps of Engineers 2000).

In the Sacramento River, operation of the Central Valley Project (CVP) and State Water Project (SWP) influences river flow, which can reduce habitat area and adversely affect water quality. Factors such as levee construction and bank armoring have altered the critical habitat of winter-run Chinook salmon. These factors reduce floodplain habitat, change riverbank substrate size, and decrease the amount of SRA cover and riparian habitat—which in turn, reduce habitat availability and quality (National Marine Fisheries Service 2006).

Table 3-3. Number of Winter-Run Size Juvenile Chinook Salmon Captured by Trawl at Sherwood Harbor (RM 55) by Month (January 2009 through October 2019)

Month/ Year	2009	2010	2011	2012	2013[a]	2014	2015	2016	2017	2018	2019	Monthly Total[b]
Jan	1	1		2				1		4	17	9
Feb	14	7	3	2		45	2			4	19	76
Mar			3	24		23	1	6	61	12	16	127
Apr			5	1		3	2	2	47	0	27	60
May												0
Jun												0
Jul												0
Aug												0
Sep												0
Oct	3	2										5
Nov	2			48		2	1					45
Dec		7		26		13	4			22		72
Annual Total	**20**	**17**	**11**	**93**	**0**	**84**	**10**	**9**	**108**	**42**	**NA**	**394**

NA = not applicable
RM = river mile
[a] No winter-run size juvenile Chinook salmon were detected by trawl surveys.
[b] 2019 data are excluded from the total because data are incomplete.

Table 3-4. Life Stage Timing of Listed and MSA-Managed Fish Species in the Action Area

Species/Life Stage	Distribution	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Winter-Run Chinook Salmon													
Adult migration and holding	San Francisco Bay to upper Sacramento River		P	P	P								
Juvenile movement and rearing	Upper Sacramento River to San Francisco Bay		P	P									P
Spring-Run Chinook Salmon													
Adult migration	San Francisco Bay to upper Sacramento River and tributaries				P	P	P						
Juvenile movement	Upper Sacramento River and tributaries to San Francisco Bay			P	P	P							
Late Fall–Run Chinook Salmon													
Adult migration	San Francisco Bay to upper Sacramento River and tributaries												P
Juvenile movement and rearing	Upper Sacramento River and tributaries											P	P
Fall-Run Chinook Salmon													
Adult migration and holding	San Francisco Bay to upper Sacramento River and tributaries									P	P		
Juvenile movement	Upper Sacramento River and tributaries to San Francisco Bay		P	P	P	P							
Steelhead													
Adult migration	San Francisco Bay to upper Sacramento River and tributaries		K	K	K	K			P	P	P	P	
Juvenile and smolt movement	Upper Sacramento River and tributaries to San Francisco Bay		P	P									
Green Sturgeon													
Adult migration and holding	San Francisco Bay to upper Sacramento River												
Juvenile rearing)	Upper Sacramento River to San Francisco Bay		P	P	P		P	P					
Juvenile movement and rearing	Upper Sacramento River to San Francisco Bay												
Delta Smelt													
Adult migration	South Delta to north Delta and lower Sacramento River												
Spawning	Upper Delta to lower Sacramento River				P	P							
Longfin Smelt													
Adult migration and spawning	San Francisco Bay to upper Delta												

Sources: Moyle 2002; National Marine Fisheries Service 2018; Delta Juvenile Fish Monitoring Program (U.S. Fish and Wildlife Service 2019).
Note: Gray shading indicates primary periods of species and life stage occurrence included in the assessment of project effects.

K = period when kelts (post-spawning adults) may be returning to ocean
MSA = Magnuson-Stevens Fishery Management and Conservation Act
P = peak period of occurrence

3.4.2.2 Central Valley Spring-Run Chinook Salmon

The CV spring-run Chinook salmon ESU is federally listed as threatened (70 FR 37160; June 28, 2005). The ESU includes naturally spawned populations in the Sacramento River and its tributaries, including the Feather and Yuba Rivers, and artificially propagated fish from the Feather River Fish Hatchery. The CV spring-run Chinook salmon ESU was listed as threatened under CESA in February 1999.

Adult spring-run Chinook salmon enter the mainstem Sacramento River from February through September, with the peak upstream migration occurring from May through June (Yoshiyama et al. 1998). Adults generally enter tributaries from the Sacramento River between mid-April and mid-June (National Marine Fisheries Service 2006). Spring-run Chinook salmon are sexually immature during upstream migration; and adults hold in deep, cold pools near spawning habitat until spawning commences in late summer and fall. Spawning habitat occurs in the upper reaches of the Sacramento River and tributaries, including Butte Creek.

Juvenile spring-run Chinook salmon typically spend up to 1 year rearing in fresh water before migrating to sea as yearlings, but some may migrate downstream as young-of-year juveniles. Rearing takes place in their natal streams, the mainstem of the Sacramento River, inundated floodplains (including the Sutter and Yolo Bypasses), and the Delta. Based on observations in Butte Creek and the Sacramento River, young-of-year juveniles typically migrate from November through May. Yearling spring-run Chinook salmon migrate from October to March, with peak migration in November (Cramer and Demko 1997; Hill and Webber 1999). Downstream migration of yearlings typically coincides with the onset of the winter storm season, and migration may continue through March (California Department of Fish and Game 1998). Juvenile spring-run Chinook salmon have been observed emigrating past Sherwood Harbor (located approximately 3 miles downstream from the action area) from November through June, with most passing through the area in March, April, and May (Table 3-5), based on USFWS Sacramento trawl survey data from 2009 to 2019 (U.S. Fish and Wildlife Service 2019).

Spring-run Chinook salmon use the Sacramento River within the action area for upstream migration (adults) and downstream migration and rearing (juveniles); spawning and egg incubation do not occur in the action area (Moyle 2002). Table 3-4 summarizes the life stage timing and distribution of spring-run Chinook salmon in the Sacramento River, including in the action area.

Reasons for the decline and current status of spring-run Chinook salmon fall into three general categories: (1) loss of historical spawning habitat; (2) degradation of remaining habitat; and (3) threats to the genetic integrity of the wild spawning populations. The construction of debris, hydropower, flood control, and water supply dams eliminated virtually all historical spawning habitat of spring-run Chinook salmon. Altered flows and water temperatures from dam operations and water diversions; losses of suitable spawning substrate; channel alterations (e.g., channelization and levees) associated with navigation and flood risk reduction; and associated

losses of riparian, floodplain, and wetland habitat are contributing factors to past declines and the current status of spring-run Chinook salmon populations in the Central Valley.

Table 3-5. Number of Spring-Run Size Juvenile Chinook Salmon Captured by Trawl at Sherwood Harbor (RM 55) by Month (January 2009 through October 2019)

Month/ Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Monthly Total[a]
Jan			10	1	1	0	2	3	5	0	17	22
Feb	2	3	20	1	0	99	9	2	18	4	26	158
Mar	2	13	9	115	1	135	1	30	187	53	95	546
Apr	148	101	169	88	251	316	33	137	1,200	78	320	2,521
May	39	5	4	4	5	6	0	1	508	5	10	577
Jun									1			1
Jul												0
Aug												0
Sep												0
Oct												0
Nov								1				1
Dec		25		10	0	21	0	8		4		68
Annual Total	**191**	**147**	**212**	**219**	**258**	**577**	**45**	**182**	**1,919**	**144**	**NA**	**3,894**

NA = not applicable
RM = river mile
[a] 2019 data are excluded from the total because data are incomplete.

3.4.2.3 California Central Valley Steelhead

The CCV steelhead DPS was federally listed as threatened on March 19, 1998 (National Marine Fisheries Service 1998) (63 FR 13347). The threatened status of CCV steelhead was reaffirmed in NMFS's final listing determination on January 5, 2006 (71 FR 834). At the same time, NMFS adopted the term *DPS*, in place of *ESU*, to describe CCV steelhead and other population segments of this species. The DPS includes all naturally spawned populations of steelhead in the Sacramento and San Joaquin Rivers and their tributaries, excluding steelhead from San Francisco and San Pablo Bays and their tributaries. Artificially propagated fish from Coleman National Fish Hatchery and Feather River Fish Hatchery are included in the DPS (71 FR 834, January 5, 2006). The CCV steelhead DPS is not listed under CESA.

Steelhead exhibit highly variable life history patterns throughout their range but are broadly categorized into winter and summer reproductive ecotypes. Winter steelhead, the most widespread reproductive ecotype, is the only type currently present in Central Valley streams (McEwan and Jackson 1996). Winter steelhead become sexually mature in the ocean; enter spawning streams in summer, fall, or winter; and spawn a few months later in winter or spring (Meehan and Bjornn 1991; Behnke 1992).

Adult steelhead immigration into Central Valley streams typically begins in August, continues into March or April (McEwan 2001; National Marine Fisheries Service 2014), and generally peaks during January and February (Moyle 2002); but adult steelhead immigration potentially can occur during all months of the year (National Marine Fisheries Service 2009a). Steelhead

spawning generally occurs from December through April, with peaks from January through March, in small streams and tributaries (National Marine Fisheries Service 2009a).

After fry emerge, they inhabit shallow areas along the stream margin and prefer riffles; they use a greater variety of habitats as they grow and develop (Barnhart 1986; National Marine Fisheries Service 2014). Habitat use is affected by the presence of predators; and juvenile steelhead survival increases when cover, such as wood debris and large cobble, is available (Mitro and Zale 2002).

Juvenile CCV steelhead typically migrate to the ocean after spending 1 to 3 years in fresh water (McEwan 2001). Steelhead fry and fingerlings rear and migrate downstream in the Sacramento River during most months of the year, but the primary period of emigration is January to June (Hallock et al. 1961; McEwan 2001). Juvenile steelhead have been observed emigrating past Sherwood Harbor (located approximately 3 miles downstream from the action area) from January through June, with peaks during February and March for hatchery fish and February through May for wild fish (Table 3-6), based on USFWS Sacramento trawl survey data from 2009 to 2019 (U.S. Fish and Wildlife Service 2019). Because of their varied freshwater residence times, steelhead fry and juveniles can be rearing and migrating in the Sacramento River year-round (McEwan 2001).

Table 3-6. Number of Hatchery and Wild Juvenile Steelhead Captured by Trawl at Sherwood Harbor (RM 55) by Month (January 2009 through October 2019)

Month/ Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Monthly Total[a]
Jan	11	1	3	32 (1)	3	1	1	6	1	36	24	95 (1)
Feb	45	27 (4)	23	74 (5)	4	248 (6)	13	25	11 (4)	37 (1)	91 (1)	507 (20)
Mar	3	1	11	13	1	10 (3)	0	2	17 (6)	50 (1)	83 (3)	108 (10)
Apr	1	4 (2)	1	3 (1)	1 (2)	3 (1)	1 (1)	1	3	1 (1)	3 (1)	19 (8)
May	0 (2)		0 (1)	1 (1)	0 (1)				0 (1)	0 (1)	1 (1)	1 (7)
Jun		0 (1)	0 (1)						0 (1)			0 (3)
Jul												
Aug												
Sep												
Oct												
Nov												
Dec												
Annual Total	**60 (2)**	**33 (7)**	**38 (2)**	**123 (8)**	**9 (3)**	**262 (10)**	**15 (1)**	**34 (0)**	**32 (12)**	**124 (4)**	**NA**	**730 (49)**

Note: Number of wild steelhead are in parentheses.
NA = not applicable
RM = river mile
[a] 2019 data are excluded from the total because data are incomplete.

CCV steelhead use the Sacramento River in the action area for upstream migration (adults) and downstream migration (post-spawning adults and juveniles) and rearing (juveniles); spawning and egg incubation do not occur in the action area (Moyle 2002). Table 3-4 summarizes the life stage timing and distribution of CCV steelhead in the Sacramento River, including in the action area.

Steelhead once were abundant in Central Valley drainages; however, population numbers have declined significantly in recent decades. Factors that have contributed to their present status include habitat loss as a result of barriers, water development, water conveyance and flood control, hatchery operations and practices, land use activities, water quality, sport harvest, disease and predation, environmental variation (e.g., climatic and ocean conditions), and invasive species (National Marine Fisheries Service 2014).

3.4.2.4 Survey Results

Chinook Salmon and Steelhead

Focused surveys for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CV fall and late fall–run Chinook salmon, and CCV steelhead were not conducted in the action area—in part, because the protected status of these species precluded the use of fish sampling as part of the habitat assessment, and because it is well documented that these species use the action area as a migration corridor during upstream (adult) and downstream (juvenile) migration and for juvenile rearing.

The temporal occurrence and relative abundance of juvenile Chinook salmon and steelhead in the action area can be inferred based on the weekly trawl surveys of the Sacramento River at Sherwood Harbor (RM 55) as part of the Delta Juvenile Fish Monitoring Program (U.S. Fish and Wildlife Service 2019) (Table 3-3, Table 3-5, and Table 3-6). Sherwood Harbor is located approximately 3 miles downstream of the action area, and the trawls conducted by USFWS provide a consistent and reliable method for observing the timing of occurrence and relative abundance of juvenile Chinook salmon and steelhead in the action area. USFWS uses a Kodiak trawl at Sherwood Harbor from December through March and switches to a mid-water trawl beginning in April.

Shaded Riverine Aquatic Cover

As mentioned in Chapter 1, a survey of existing SRA cover was conducted along the river in the action area. Quantification of SRA cover habitat in the action area was based on a combination of field observations (August 24, 2017) and interpretation of recent aerial photographs by ICF biologists. USFWS defines *SRA cover* as “the unique, near-shore aquatic cover that occurs at the interface between a stream or river and adjacent woody riparian habitat,” and it is an essential component of salmonid habitat. Key features of SRA cover include the following.

- An adjacent bank composed of natural, often eroding substrate that supports overhanging riparian vegetation and vegetation that may protrude into the water.
- A stream channel with variable amounts of woody material and detritus, and variable water velocity and depth.

SRA cover is composed of two components: overhead cover and instream cover. Overhead cover consists of overhanging riparian vegetation that provides important stream shading and contributes leaf litter and insects to the stream. Instream cover consists of submerged woody material (exposed roots, branches, and trunks), aquatic plants, substrate (gravel, cobble, and boulders), and undercut banks. These attributes provide high-value feeding areas, burrowing

substrates, escape cover, and reproductive cover for numerous regionally important fish and wildlife species (U.S. Fish and Wildlife Service 1992).

Table 3-7 shows the amount of SRA cover in the form of overhead vegetation present along both banks of the Sacramento River in the action area relative to the total bank length.

Table 3-7. Existing Shaded Riverine Aquatic Cover (Overhead Vegetation and Undercut Banks) in the Action Area

River Bank	Existing Bank Length (linear feet)	Existing Overhead Vegetation	
		Bank Length (linear feet)	Percent Bank Length
City of Sacramento	1,741	1,103	63
City of West Sacramento	1,437	940	65
Total	**3,177**	**2,043**	**64**

3.4.2.5 Status of Designated Critical Habitat in the Action Area for Chinook Salmon and Steelhead

The Sacramento River within the action area is included in the designated critical habitat for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead. Critical habitat for each of these species is discussed below.

NMFS designated critical habitat for Sacramento River winter-run Chinook salmon on June 16, 1993 (58 FR 33212–33219); critical habitat includes the water column, river bottom, and adjacent riparian zones of the Sacramento River up to the OHWM, as defined by the USACE in 33 CFR 329.11. The biological and physical features (also referred to as *primary constituent elements*) of critical habitat in the action area include freshwater rearing habitat with water quantity and quality, natural cover, forage, and passage conditions supporting migration and rearing of winter-run Chinook salmon. Within the action area, the Sacramento River and adjacent riparian zones below the OHWM are considered critical habitat for this species.

NMFS proposed critical habitat for CV spring-run Chinook salmon on December 10, 2004, and published a final rule designating critical habitat for this ESU on September 2, 2005 (70 FR 52488, September 2, 2005). Critical habitat for CV spring-run Chinook salmon includes the water column, river bottom, and adjacent riparian zone of the Sacramento River up to the OHWM, as defined by the USACE in 33 CFR 329.11. The physical and biological features of critical habitat in the Sacramento River within the action area include freshwater rearing habitat with water quantity and quality, natural cover, forage, and passage conditions supporting migration and rearing of spring-run Chinook salmon. Within the action area, the Sacramento River and adjacent riparian zones below the OHWM are considered critical habitat for this species.

Critical habitat for CCV steelhead was designated by NMFS on September 2, 2005 (70 FR 52488) and includes all stream reaches accessible to CCV steelhead in the Sacramento and San Joaquin Rivers and their tributaries. Also included are adjacent riparian zones within the OHWM (70 FR 52537, September 2, 2005). The physical and biological features of critical habitat in the Sacramento River portion of the action area are freshwater rearing habitat with water quantity

and quality, natural cover, forage, and passage conditions supporting migration and rearing of steelhead. Within the action area, the Sacramento River and adjacent riparian zones below the OHWM are considered critical habitat for this species.

3.4.3 Discussion of Southern Distinct Population Segment of North American Green Sturgeon

On January 23, 2003, NMFS determined that green sturgeon is composed of two populations, a northern and a southern DPS (National Marine Fisheries Service 2003). The northern DPS includes populations extending from the Eel River northward, and the southern DPS includes populations south of the Eel River to the Sacramento River. The Sacramento River supports the southernmost spawning population of green sturgeon (Moyle 2002). NMFS listed the southern DPS of North American green sturgeon as threatened under the ESA on April 7, 2006 (71 FR 17757–17766). Green sturgeon is not listed under CESA; however, CDFW considers green sturgeon to be a California species of special concern (Moyle et al. 2015).

The green sturgeon is anadromous, but it is the most marine-oriented species in the sturgeon family and has been found in nearshore marine waters from Mexico to the Bering Sea (Colway and Stevenson 2007; Moyle 2002; 70 FR 17386–17401). They are known to spawn in the Sacramento, Feather, Yuba, and Klamath Rivers in California, and in the Rogue River in Oregon (Moyle et al. 1992; Adams et al. 2002; Poytress et al. 2015; Seesholtz et al. 2015; Beccio pers. comm.). In the Sacramento River, spawning has been confirmed between Hamilton City (RM 199) and Inks Creek (RM 264.5) based on egg mat sampling (Poytress et al. 2015) and may occur as far upstream as Cow Creek (RM 280) based on adult distribution (Heublein et al. 2009; Klimley et al. 2015; Mora et al. 2018).

Adults typically migrate upstream into rivers between late February and late July. Spawning occurs from March to July, with peak spawning from mid-April to mid-June. It is believed that green sturgeon spawn every 2 to 6 years, although every 3 to 4 years may be more typical (National Marine Fisheries Service 2018). Young green sturgeon appear to rear for the first 1 to 2 months in the upper Sacramento River between Keswick Dam and Hamilton City (California Department of Fish and Game 2002). Juveniles spend 1 to 4 years in fresh and estuarine waters before migrating to salt water (Nakamoto et al. 1995) at lengths of 300 to 750 millimeters (70 FR 17386–17401).

Green sturgeon use the Sacramento River, including in the action area, as a migration corridor during upstream (adult) and downstream (adult, juvenile) migration, and for holding and rearing (juveniles). Table 3-4 summarizes the life stage timing and distribution of green sturgeon in the Sacramento River, including the action area.

Musick et al. (2000) noted that the abundance of North American green sturgeon populations has declined by 88 percent throughout much of its range. A number of threats and stressors exist for green sturgeon, specifically reduced spawning habitat from migration barriers, exposure to toxins, harvest, reduced rearing habitat, increased water temperatures, dredging, non-native aquatic species, and entrainment in unscreened diversions.

3.4.3.1 Survey Results

Focused surveys for North American green sturgeon were not conducted. However, it is well documented that green sturgeon use the action area as a migration corridor during upstream (adult) and downstream (juvenile) migration (Moyle 2002). In addition, juvenile green sturgeon use the lower reaches of the Sacramento River for seasonal rearing. Spawning and egg incubation do not occur in the action area (Moyle 2002).

Green sturgeon, which are benthic-oriented, generally are not susceptible to the USFWS trawls that sample the water column; therefore, little is known about their seasonal use of habitats and relative abundance in the action area. However, general information on their distribution and habitat use indicates that green sturgeon have the potential to occur in the action area year-round.

3.4.3.2 Status of Designated Critical Habitat in the Action Area for North American Green Sturgeon

NMFS designated critical habitat for green sturgeon on October 9, 2009 (74 FR 52300), including the water column, river bottom, and adjacent riparian zone of the Sacramento River up to the OHWM. The physical and biological features of critical habitat in the action area include freshwater areas with water flow, water quality, depth, forage, sediment quality, and passage conditions supporting migration and rearing of green sturgeon.

3.4.4 Discussion of Delta Smelt

Delta smelt was federally listed as threatened on March 5, 1993 (58 FR 12854–12863). On April 7, 2010, USFWS ruled that a change in the status of delta smelt from threatened to endangered was warranted but was precluded by other higher priority listing actions (75 FR 17667). Delta smelt was listed as a threatened species under CESA on December 9, 1993. On March 4, 2009, the California Fish and Game Commission elevated the status of delta smelt to endangered under CESA.

Delta smelt occur primarily downstream of Isleton on the Sacramento River, in the Cache Slough subregion (Cache Slough–Liberty Island and the Deep Water Ship Channel), downstream of Mossdale on the San Joaquin River, and in Suisun Bay and Suisun Marsh (Moyle 2002). Delta smelt also have been collected in the Petaluma and Napa Rivers (Bennett 2005); the Sacramento River above Rio Vista; and Cache, Lindsey, Georgiana, Prospect, Beaver, Hog, Sycamore, and Barker Sloughs (U.S. Fish and Wildlife Service 1996). In the Sacramento River, delta smelt have been observed as far upstream as Knights Landing (Vincik and Julienne 2012) and in the Deep Water Ship Channel as far upstream as West Sacramento (Merz et al. 2011). Over the last 2 decades, the center of adult delta smelt abundance in fall (September through December) has been the West Delta and Suisun Bay subregions (Sommer et al. 2011). There is evidence that a life-history contingent of delta smelt may remain in the Cache Slough subregion throughout their lives (Nobriga et al. 2008; Sommer et al. 2011).

Delta smelt are endemic to the Sacramento–San Joaquin estuary and are found seasonally in Suisun Bay and Suisun Marsh (Moyle 2002). They typically are found in shallow water

(<10 feet) where salinity ranges from 2 to 7 parts per thousand (ppt), although they have been observed at salinities between 0 and 18.4 ppt (Moyle 2002). Delta smelt have relatively low fecundity, and most live for 1 year (Moyle 2002). They feed on planktonic copepods, cladocerans, amphipods, and insect larva (Moyle 2002).

Delta smelt are semi-anadromous. During their spawning migration, adults move into the freshwater channels and sloughs of the Delta between December and January (Moyle 2002). Spawning occurs between January and July, with peak spawning from April through mid-May (Moyle 2002). Spawning locations in the Delta have not been identified and are inferred from larval catches (Bennett 2005). Larval fish have been observed in Montezuma Slough (Wang 1986); Suisun Slough in Suisun Marsh (Moyle 2002); the Napa River estuary (Stillwater Sciences 2006); the Sacramento River above Rio Vista; and Cache, Lindsey, Georgiana, Prospect, Beaver, Hog, Sycamore, and Barker Sloughs (U.S. Fish and Wildlife Service 1996). Spawning also was detected in the Sacramento River up to Garcia Bend (RM 51) during drought conditions as a result of increased saltwater intrusion that moved delta smelt spawning and rearing farther inland (Wang and Brown 1993). Laboratory experiments have found eggs to be adhesive and demersal; they usually are attached to substrate composed of gravel, sand, or other submerged material (Moyle 2002; Wang 1991). Hatching takes approximately 9 to 13 days, and larvae begin feeding 4 to 5 days later (Moyle 2002). Newly hatched larvae contain a large oil globule that makes them semi-buoyant and allows them to stay near the bottom (Moyle 2002). As their fins and swim bladder develop, they move higher into the water column and are transported downstream to the open waters of the estuary (Moyle 2002). Adult delta smelt have been observed in the vicinity of Sherwood Harbor (located approximately 3 miles downstream from the action area) in March and April (Table 3-8), based on USFWS Sacramento trawl survey data from 2009 to 2019 (U.S. Fish and Wildlife Service 2019). However, delta smelt have not been observed in the trawls since 2014.

Delta smelt use the Sacramento River, including in the action area, as a migration corridor during upstream migration (adult), downstream transport (larvae), and rearing (juveniles). Table 3-4 summarizes the life stage timing and distribution of delta smelt in the Sacramento River, including the action area.

Diversions and Delta inflow and outflow may affect survival of delta smelt. Estimates of delta smelt entrainment at the CVP and SWP South Delta export facilities suggest a population decline in the early 1980s, mirroring the decline indicated by mid-water trawl, summer tow-net, Kodiak trawl, and beach seine data (Bennett 2005). Diversions and upstream storage, including operation of the CVP and SWP, control Delta inflow and outflow during most months. Reduced Delta flow may inhibit or slow movement of larvae and juveniles to estuarine rearing habitat, increasing their residence in the deeper and narrower channels of the Delta and exposure to lower prey availability and increased predation (Moyle 2002). Reduced Delta flow also may increase entrainment in diversions, including entrainment at the CVP and SWP export pumps (Moyle 2002). Additional factors affecting delta smelt abundance include extremely high river outflow that increases entrainment at export facilities, changes in prey abundance and composition, predation by non-native species, toxic substances, disease, and loss of genetic integrity through interbreeding with the introduced wakasagi smelt (*Hypomesus nipponensis*) (Moyle 2002; Bennett 2005).

3.4.4.1 Survey Results

Focused surveys for delta smelt were not conducted. However, it is well documented that delta smelt occur in the Sacramento River in the vicinity of the action area. Spawning locations in the Delta have not been identified and are inferred from the location of gravid females and larval catches (Bennett 2005).

The temporal occurrence and relative abundance of adult delta smelt in the vicinity of the action area can be inferred based on the weekly trawl surveys of the Sacramento River at Sherwood Harbor (RM 55) as part of the Delta Juvenile Fish Monitoring Program (U.S. Fish and Wildlife Service 2019) (Table 3-8). In addition to collecting data on the relative number and timing of occurrence of delta smelt, USFWS collects information on the maturation status of adult smelt (i.e., individuals are physically examined at the time of capture to determine their readiness to spawn based on whether eggs or milt can be manually expressed from the individual). Maturation status provides information on the potential timing of spawning and, therefore, the potential occurrence of the species' eggs and larvae in the river. The occurrence of mature adults in the trawl samples suggests that delta smelt may spawn in this part of the Sacramento River, including the action area.

Table 3-8. Number of Delta Smelt Captured by Trawl at Sherwood Harbor (RM 55) by Month (January 2009 through October 2019)

Month/ Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Monthly Total[a]
Jan												
Feb												
Mar		1		28		18						47
Apr				1	1	3						5
May												
Jun												
Jul												
Aug												
Sep												
Oct												
Nov												
Dec												
Annual Total		**1**		**29**	**1**	**21**						**52**

RM = river mile

[a] 2019 data are excluded from the total because data are incomplete.

3.4.4.2 Status of Designated Critical Habitat in the Action Area for Delta Smelt

USFWS designated critical habitat for delta smelt on December 19, 1994 (59 FR 65256–65278). The primary constituent elements of critical habitat determined to be essential to the conservation of the species 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 (U.S. Fish and Wildlife Service 2006). Shallow water habitat is an element of of particular importance to the species because it includes the highly productive photic zone.

Shallow water habitat is defined as all waters between mean high water and 3 meters (9.8 feet) below mean lower low-water mark (U.S. Fish and Wildlife Service 2004).

Chapter 4 Effects of the Project on the Action Area

Effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including consequences of other activities that are caused by the proposed action. The analysis of effects of the action first identifies stressors from project actions, then exposure to stressors, and finally the response to exposure to stressors to determine consequences. The effects of the action are used to make determinations for each listed species and critical habitat.

4.1 Stressors from the Action

Stressors induce an adverse response in an organism by any physical, chemical, or biological alteration of the environment that can lead to a response from the individual.

4.1.1 Valley Elderberry Longhorn Beetle

Stressors that could induce an adverse response from VELB include the following.

- Increase in noise and vibrations during construction.
- Visual/physical disruption during construction, which includes the presence and movement of large equipment, stockpiling of construction materials, and presence of construction personnel.
- Removal of riparian vegetation.

4.1.2 Sacramento River Winter-Run Chinook Salmon, Central Valley Spring-Run Chinook Salmon, California Central Valley Steelhead, North American Green Sturgeon, and Delta Smelt

Stressors that could induce an adverse response from Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, North American green sturgeon, and delta smelt include the following.

- Underwater noise from pile driving, increased exposure to contaminants (including sediment), contaminant spills, and entrapment of fish in cofferdams
- Loss of aquatic habitat and vegetative cover, including SRA cover.
- Introduction of AIS, increase in temporary and permanent direct lighting on the Sacramento River, and temporary and permanent shading of aquatic habitat from trestles, barges, and the new bridge.

4.2 Exposure to Stressors from the Action

Exposures are defined as the interaction of the species, their resources, and the stressors that result from the proposed action.

4.2.1 Valley Elderberry Longhorn Beetle

The proposed action would expose VELB, if present, to an increase in noise, vibrations, and visual disturbance from construction equipment and personnel relative to existing conditions. The movement of construction vehicles and equipment also could result in collisions with VELB during the flight season (March–July), if they are dispersing through or are present in the action area. The loss of riparian vegetation (1.27 acres permanent and 0.63 acres temporary) would remove areas for future establishment of elderberry shrubs and fragment riparian along the Sacramento River corridor.

4.2.2 Sacramento River Winter-Run Chinook Salmon, Central Valley Spring-Run Chinook Salmon, and California Central Valley Steelhead

The action area is used as a movement corridor by adults that migrate between the ocean and upstream spawning areas, and by juveniles emigrating to the lower river and Delta (juveniles) and the ocean (smolts) from upstream spawning and rearing areas. In addition, it is used by juveniles that use the lower river for seasonal (Chinook salmon, steelhead) and potentially year-round (steelhead) rearing. Restricting in-water activities to May 1 to November 30 avoids the peak adult and juvenile migration periods for winter-run Chinook salmon and the smolt migration period for steelhead. However, in-water activities during this period would overlap the peak migration period for adult steelhead, a portion of the peak adult and juvenile migration periods for spring-run Chinook salmon, and the entire summer and early fall rearing period for juvenile steelhead (Table 3-4). No overlap with adult spawning would occur because Chinook salmon and steelhead do not use the action area for spawning. Vegetation clearing; ground-disturbing activities; installation and removal of temporary piles, cofferdams, and barges; installation of permanent piles; temporary and permanent nighttime lighting; water quality impacts; and noise and disturbance from construction activities, including underwater noise from pile driving, could degrade habitat and water quality in the Sacramento River. The entire action area overlaps designated critical habitat for all three species.

The sequential construction activities for the proposed project would generate stressors that could induce an adverse response from listed salmonids. Underwater noise generated by impact pile driving represents the stressor with the greatest potential to result in adverse effects on fish. Table 4-1 summarizes the pile-driving activities (location, timing, and duration) associated with constructing the new bridge. Other construction activities generating stressors that also could induce an adverse response from listed salmonids would occur in association with, or in temporal proximity to, pile-driving activities. Therefore, Table 4-1 provides a reasonable approximation of the timing of these other stressors that could induce an adverse response from listed salmonids associated with in-water construction activities.

4.2.3 North American Green Sturgeon

The action area is used as a movement corridor by adult green sturgeon that migrate between the ocean and upstream spawning areas, and by juveniles emigrating to the lower river and Delta from upstream spawning and rearing areas. In addition, it is used by juveniles that use the lower river for year-round rearing. Restricting in-water activities to May 1 to November 30 avoids most of the peak juvenile migration period and overlaps the end of the adult migration period (Table 3-4). Project activities would overlap the period that juvenile green sturgeon may use the action area for summer and early fall rearing. No overlap with adult spawning would occur because green sturgeon do not use the action area for spawning. Vegetation clearing; ground-disturbing activities; installation and removal of temporary piles, cofferdams, and barges; installation of permanent piles; temporary and permanent nighttime lighting; water quality impacts; and noise and disturbance from construction activities, including underwater noise from pile driving, could degrade habitat and water quality in the Sacramento River. The entire action area overlaps habitat designated as critical habitat for the species.

Table 4-1 summarizes the pile-driving activities (location, timing, and duration) and timing of stressors that could induce an adverse response from green sturgeon associated with in-water construction activities.

Table 4-1. Summary of Pile-Driving Activities with Potential to Affect Fish

Activity	Location	Approximate Timing	Approximate Duration (days)
Vibratory and impact driving of 16-inch steel pipe or H piles for construction trestle	On land and in water	Season 1, May 3–May 21	20
Vibratory and impact driving of 16-inch steel pipe piles for temporary barges	In water	Seasons 1 and 2, May 1–October 27	10
Vibratory driving of sheet piles for cofferdams	In water	Season 1, May 24–June 4	12
Vibratory and impact driving of 16-inch steel pipe piles for fixed span (piers 4 and 5)	In water	Season 1, June 7–June 11	5
Vibratory and impact driving of 16-inch steel pipe piles for abutments 1 and 6	On land	Season 1, June 8–June 14	5
Removal of sheet piles with vibratory driver	In water	Season 1, July 12–July 23	12
Vibratory and impact driving of 60-inch cast in steel shell piles for movable span (piers 2 and 3)	In water	Season 1, May 24–August 13	10
Vibratory and impact driving of 14-inch concrete or 16-inch steel pipe piles for bridge fender system	In water	Season 2, September 25–October 6	6
Removal of 16-inch steel pipe or H piles for construction trestle with vibratory driver	In water	Season 2, September 25–October 17	20

4.2.4 Delta Smelt

The action area is used as a movement corridor by adult delta smelt that migrate between the estuary and upstream spawning areas and by larvae that are transported to the Delta from upstream spawning areas. Restricting in-water activities to May 1 to November 30 avoids the peak adult spawning period but overlaps the end of the adult spawning period (Table 3-4). Adult

delta smelt may use the action area for spawning. Vegetation clearing; ground-disturbing activities; installation and removal of temporary piles, cofferdams, and barges; installation of permanent piles; temporary and permanent nighttime lighting; water quality impacts; and noise and disturbance from construction activities, including underwater noise from pile driving, could degrade habitat and water quality in the Sacramento River. The entire action area upstream to the I Street Bridge overlaps designated critical habitat for the species.

Table 4-1 summarizes the pile driving activities (location, timing, and duration) and timing of stressors that could induce an adverse response from delta smelt associated with in-water construction activities.

4.3 Response to the Exposure

4.3.1 Valley Elderberry Longhorn Beetle

The increase in noise, vibrations, and visual disturbance from construction equipment and personnel would result in the disruption of adult VELB dispersal, foraging, and breeding if they are present in the action areas during construction taking place during the flight season (March–July). Collisions with construction vehicles and equipment would result in injury or mortality of VELB if present in the action area during the flight season. The removal of riparian vegetation would contribute to the already fragmented habitat on this portion of the Sacramento River and could result in isolation of VELB populations north and south of the action area. Fragmentation of habitat can result in decreased genetic diversity in populations and create limitations on the ability to colonize new habitats (elderberry shrubs) as they become established.

4.3.2 Sacramento River Winter-Run Chinook Salmon, Central Valley Spring-Run Chinook Salmon, California Central Valley Steelhead, North American Green Sturgeon, and Delta Smelt

4.3.2.1 Pile-Driving Noise

Pile driving and other sources of anthropogenic noise have the potential to adversely affect fish through a broad range of behavioral, physiological, and physical effects (McCauley et al. 2003; Popper and Hastings 2009). These effects may include behavioral responses, physiological stress, temporary and permanent hearing loss, tissue damage (auditory and non-auditory), and direct mortality depending on the intensity and duration of exposure. In salmonids, the presence of a swim bladder to maintain buoyancy increases their vulnerability to direct physical injury (i.e., tissue and organ damage) from underwater noise (Hastings and Popper 2005). Underwater noise may damage hearing organs and temporarily affect hearing sensitivity, communication, and the ability to detect predators or prey (Popper and Hastings 2009). In addition, underwater noise may cause behavioral effects (e.g., startle or avoidance responses) that can disrupt or alter normal activities (e.g., migration, holding, or feeding) or expose individuals to increased predation (Voellmy et al. 2014; Simpson et al. 2016).

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 4-2). 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 of fish from pile-driving noise.

Table 4-2. 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 1µPa^2-sec—for fish size ≥ 2 grams 183 dB re 1µPa^2-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.

4.3.2.2 Fish Entrapment in Cofferdams

Cofferdams would be required in order to construct piers 4 and 5 for the new bridge. Cofferdams would be constructed of sheet piles; when installed, each cofferdam would be approximately 35 feet wide and 95 feet long. The potential exists for entrapment and mortality of listed fish following cofferdam closure and dewatering.

4.3.2.3 Direct Physical Injury

During construction of the new bridge, fish could be injured or killed by direct contact with equipment or materials that enter or operate within the open waters of the Sacramento River. Potential mechanisms include fish being crushed by falling rock (riprap), impinged by piles, or struck by propellers related to barge operations.

Transporting of the four barges also would increase the frequency of wave-induced shoreline disturbances, which could adversely affect rearing juveniles that depend on shallow nearshore areas for resting, feeding, and protection from predators.

4.3.2.4 Water Quality Impacts

Erosion and Mobilization of Sediment

Site clearing, earthwork, driving of permanent piles, driving and removal of piles for the temporary trestles and barges, vibrating and removal of sheet piles for cofferdams, and installation of RSP would result in disturbance of soil and riverbed sediments—potentially resulting in temporary increases in turbidity and suspended sediments in the Sacramento River. In addition, dewatering and soil removal from the inside of the cofferdams could result in temporary increases in turbidity and suspended sediments in the river, if water (and associated spoils) from within the cofferdams is not properly disposed of or contained and treated before being discharged back to the river.

The potential for disturbance of riverbed sediments and associated increases in sedimentation and turbidity in the Sacramento River are anticipated to be greatest during activities to extract the piles used for the temporary trestles and cofferdams. These activities would result in greater disturbance to riverbed sediments than during pile driving for piers and the bridge fender system; these piles would be driven only and not extracted.

In addition to increasing exposure to contaminants (described below), elevated levels of suspended sediments have the potential to result in physiological, behavioral, and habitat effects related to increased sediment concentrations in the water column. The severity of these effects depends on the sediment concentration, duration of exposure, and sensitivity of the affected life stage. Short-term increases in turbidity and suspended sediment may disrupt normal behavior patterns of fish, potentially affecting foraging, rearing, and migration. The level of disturbance also may cause juveniles to abandon protective habitat or reduce their ability to detect predators, potentially increasing their vulnerability to predators (e.g., striped bass and largemouth bass). Previous studies have documented these effects.

For example, juvenile salmonids have been observed to avoid streams that are chronically turbid (Lloyd et al. 1987) or move laterally or downstream to avoid turbidity plumes (Sigler et al. 1984). Bisson and Bilby (1982) reported that juvenile coho salmon avoid turbidities exceeding 70 nephelometric turbidity units (NTUs). Chronic exposure to high turbidity and suspended sediment may affect growth and survival by impairing respiratory function, reducing tolerance to disease and contaminants, and causing physiological stress (Waters 1995). Sigler et al. (1984) found that prolonged exposure to turbidities between 25 and 50 NTUs resulted in reduced growth and increased emigration rates of juvenile coho salmon and steelhead compared to controls. Increased sediment delivery also can smother aquatic invertebrates (a fish food item), degrade forage habitat, and reduce cover for juvenile fish.

Increased Exposure to Contaminants in Resuspended Sediments

Disturbance and resuspension of river bottom sediments during in-water construction pose a risk to listed fish because of potential increases in the exposure to contaminated sediments.

Sand, silt, and gravel characterize bottom substrate in the action area. Non-soluble contaminants with a tendency to adsorb to sediments (as opposed to soluble contaminants, which have a tendency to be readily diluted in water) can accumulate in the substrate over time. Non-soluble contaminants that are known to be present in the Sacramento River include polychlorinated biphenyls (PCBs), mercury, pesticides and insecticides (i.e., dieldrin, chlorodane, and DDT), and other unknown toxicities (State Water Resources Control Board 2011). Resuspension of sediments with adsorbed metals during in-water construction potentially could lead to degradation of water quality and food resources in the action area. In addition, resuspended particulate material could be transported to other locations in the Sacramento River as a result of transport by river currents, thus leading to potential degradation of water quality and food resources beyond the immediate in-water work area.

Contaminant Spills

Construction activities that occur in or near the Sacramento River channel can result in the discharge of contaminants that are potentially lethal to fish. The operation of heavy equipment, cranes, pile drivers, drilling rigs, barges, and other construction equipment during vegetation removal, excavation, and bridge construction could result in spills and leakage of fuel, lubricants, hydraulic fluids, and coolants. Other sources of potential contamination include asphalt, wet concrete, and other materials that may come into direct contact with surface water during construction activities. For example, concrete that is being poured for the bridge decking could be discharged accidentally to the river, thereby contaminating the river with uncured concrete (which can raise pH) and related compounds.

The potential magnitude of biological effects resulting from contaminants depends on a number of factors, including the proximity of spills to the river; the type, volume, concentration, and solubility of the contaminant; and the timing and duration of the spill or release of the contaminant into the water column. Contaminants can affect the survival, growth, and reproductive success of fish and other aquatic organisms. The level of effect depends on the species, life stage sensitivity, duration of exposure, condition or health of exposed individuals, and the physical and chemical properties of the water (e.g., temperature, pH, dissolved oxygen, and other factors).

4.3.2.5 Habitat Impacts

The proposed project would result in temporary and permanent impacts on several natural community and sensitive habitat types, including riparian and aquatic habitat supporting listed fish. For Chinook salmon, steelhead, green sturgeon, and delta smelt, these habitats include the essential physical and biological features of critical habitat supporting adult migration and juvenile rearing and migration, and spawning (delta smelt).

Temporary Disturbance to and Permanent Loss of Aquatic Habitat

Installation of the temporary cofferdams and temporary and permanent piles would result in seasonal disturbance to, and temporary and permanent loss of, open water and benthic habitat equal to the cumulative river bottom area affected by the cofferdams and piles. This would result in the temporary and permanent loss of food-producing areas; living space for fish; and shallow, low-velocity river margins preferred by juvenile fish. In addition, shade produced by overwater structures can alter rearing and holding behavior of salmonids and other fishes (including predatory fish), potentially resulting in adverse effects on juvenile fish. Shading from bridges and other overwater structures also can have beneficial incremental effects on localized water temperatures and negative effects on primary production and feeding efficiency of listed fish from reduced prey production.

Temporary and Permanent Loss of Riparian Vegetation (Including SRA Cover)

Riparian vegetation is important in controlling stream bank erosion, contributing to instream structural diversity, and maintaining undercut banks in the absence of RSP. In addition, canopy cover (overhanging vegetation [a form of SRA cover]) maintains shade that is necessary to reduce thermal input and provides an energy input to the aquatic habitats in the form of fallen leaves and insects (a food source for fish). SRA cover also provides fish with protection from predators in the form of undercut banks and instream woody material in the form of submerged branches, roots, and logs.

Without appropriate mitigation, removal of streamside vegetation is likely to adversely affect anadromous salmonids and other fish species because riparian and SRA cover habitats are essential components of salmonid rearing habitat that may limit the production and abundance of salmonids in the Sacramento River. Salmonid populations in particular are highly influenced by the amount of available cover (Raleigh et al. 1984). The amount of existing riparian and SRA cover habitat in the action area and in the region is of variable quality because of past and ongoing impacts, including levee construction and bank protection activities (i.e., placement of rock revetment).

USFWS mitigation policy identifies California's riparian habitats, including SRA cover habitat, as a Resource Category 2 habitat. The designation criteria for habitat in Resource Category 2 is "habitat to be impacted is of high quality for evaluation species and is relatively scarce or becoming scarce on a national basis or in the ecoregion section" (U.S. Fish and Wildlife Service 2015) for which "no net loss of in-kind habitat value" is recommended (46 FR 7644, January 23, 1981). In addition, NMFS typically recommends revegetating onsite at a 3:1 ratio (three units replaced for every one unit of affected habitat) with native riparian species to facilitate the development of SRA cover habitat.

Increase in Overwater Structure (Artificial Shade)

The increased shading created by the new bridge could affect the migration of adult and juvenile Chinook salmon and steelhead, and other species. In the Sammamish River in Washington State, migrating adult salmon hold in shaded areas beneath bridges (Carrasquero 2001). Juvenile salmonids also prefer shaded areas created by bridges, which may make them more vulnerable to

predatory fish (e.g., striped bass, Sacramento pikeminnow, and largemouth bass) that also prefer structural and overhead cover (e.g., artificial shade) for ambushing prey. Temporary shading attributable to the presence of the temporary trestles, work platforms, and barges during bridge construction and permanent shading from the new bridge potentially could reduce the primary productivity of affected habitats, leading to reduced prey availability for listed fish.

4.3.2.6 Increases in Impervious Surface Area and Storm Water Runoff

The proposed project would result in 2 acres of added impervious surface area, which could increase runoff volume to the Sacramento River. Increased traffic loads on the new bridge resulting from improved access could result in increased deposition of particulates onto the bridge deck that then could be transported to the Sacramento River with road runoff.

Heavy metals, oil, grease, and polycyclic aromatic hydrocarbons (PAHs) are common pollutants in road runoff. Some of these pollutants can accumulate in stream sediments, with lethal and sublethal consequences for fish and other aquatic species—particularly during "first flush" rain events. PAHs are organic compounds—containing only carbon and hydrogen—that occur in motor vehicle exhaust, petroleum products, materials associated with asphalt, and various other municipal and industrial sources. PAHs are widely distributed in the environment and are important environmental pollutants because of their carcinogenicity and tendency to bioaccumulate. PAHs are readily absorbed by fish and other aquatic organisms and, depending on concentration, can lead to lethal and deleterious sublethal effects in these organisms (Tuvikene 1995). PAHs tend to adsorb to any particulate matter, including fine sediment; therefore, relative concentrations of PAHs in aquatic ecosystems generally are highest in sediments, followed by aquatic biota and the water column (Tuvikene 1995). There is evidence that urban runoff containing roadway sediment may be an important PAH input to aquatic habitats and that a significant contribution to the PAH content of roadway sediment comes from materials associated with asphalt (Wakeham et al. 1980).

4.3.2.7 Introduction of Aquatic Invasive Species

During construction, operation of barges and other in-water equipment originating from regions or areas outside the project region could result in the introduction and spread of AIS, including the Asian overbite clam (*Corbula amurensis*), quagga mussel, zebra mussel, hydrilla, and Brazilian elodea (California Department of Fish and Game 2008). These species can adversely affect native fishes and other ecologically and economically important species through a number of mechanisms, including competition for resources, predation, parasitism, interbreeding, disease transmission, and changes in the physical or chemical attributes of aquatic habitat.

4.3.2.8 Increase in Direct Lighting on Sacramento River

Temporary lighting of work areas to facilitate nighttime construction, especially at construction sites adjacent to or over the Sacramento River, and permanent lighting associated with the new bridge may result in increased nighttime light intensity on the water surface of the Sacramento River. Increases in direct lighting of the Sacramento River at night may affect the migratory behavior of juvenile fish; alter the behavior of animals that prey on fish (e.g., piscivorous birds, mammals, and fish) in adjacent and affected habitats; or make juvenile fish more visible to

predators, thereby leading to increased mortality of fish through increased predation (Tabor et al. 2001).

4.4 Effects of the Action

Effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur (50 CFR 402.17). Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR 402.02). The effect of the action is the consequence (behavioral, physical, or physiological) of a response to a stressor.

A conclusion that activities are reasonably certain to occur must be based on clear and substantial information, using the best scientific and commercial data available. Factors to consider whether an activity caused by the proposed action is reasonably certain to occur include, but are not limited to, past experiences with similar activities that have resulted from actions that are similar in scope, nature and magnitude to the proposed action; existing plans for the activities; and any remaining economic, administrative and legal requirements necessary for the activity to go forward.

Considerations for determining a consequence to the species or critical habitat is not caused by the proposed action include, but are not limited to, the consequence is so remote in time from the proposed action that it is not reasonably certain to occur, or the consequence is so geographically remote from the immediate area involved in the proposed action that it is not reasonably certain to occur, or the consequence is only reached through a lengthy causal chain that involves so many steps as to make the consequence not reasonably certain to occur (50 CFR 402.17).

4.4.1 Valley Elderberry Longhorn Beetle

The proposed action would not directly affect the elderberry shrub in the action area but would result in the permanent loss and temporary loss of cottonwood riparian along the Sacramento River (1.27 acres permanent and 0.63 acres temporary). This loss of riparian habitat could create permanent and temporary barriers to the dispersal of VELB along this riparian corridor and contribute to the already fragmented habitat and the isolation of existing populations.

If construction takes place during the flight season (March–July), it could disrupt VELB foraging and breeding, and their ability to disperse between the elderberry shrub in the action area and the nearby riparian habitat—as well as within the riparian habitat itself, and could result in the potential for injury and mortality from construction equipment.

4.4.2 Sacramento River Winter-Run Chinook Salmon, Central Valley Spring-Run Chinook Salmon, California Central Valley Steelhead, North American Green Sturgeon, and Delta Smelt

4.4.2.1 Pile-Driving Noise

In the following analysis, the potential for injury to fish from exposure to pile-driving sounds was evaluated using a spreadsheet model developed by NMFS to calculate the distances from the pile that sound attenuates to the peak or cumulative criterion. These distances define the area in which the criteria are expected to be exceeded and potentially result in the injury of fish that may be present. The NMFS spreadsheet calculates these distances based on estimates of the single-strike sound levels for each pile type (measured at 10 meters [33 feet] from the pile) and the rate at which sound attenuates with distance. In the following analysis, the standard sound attenuation rate of 4.5 dB per doubling of distance was used in the absence of other data. To account for the exposure of fish to multiple pile-driving strikes, the model computes a cumulative SEL for multiple strikes based on the single-strike SEL and the number of strikes per day or pile-driving event. The NMFS spreadsheet also uses the concept of *effective quiet*, which assumes that cumulative exposure of fish to pile driving sounds of less than 150 dB SEL does not cause injury. Because insufficient data currently are available to support the establishment of a noise threshold for behavioral effects (Popper et al. 2006), NMFS generally assumes that a noise level of 150 dB RMS is an appropriate threshold for behavioral effects.

The reference levels used to estimate the noise levels for pile-driving activities were selected from data reported for projects with similar types of pile driving and demolition operations and site characteristics (California Department of Transportation 2015). The peak level represents the maximum reported noise level. The single-strike SELs and RMS levels represent noise levels from a typical pile strike; typical pile strike levels were developed by averaging a range of data collected from past projects. The computation of cumulative SELs is based on the maximum number of piles that can reasonably be installed in 1 day and the estimated number of strikes required to drive each pile. Because of uncertainties in site conditions potentially encountered during pile-driving operations (e.g., bed resistance), it was assumed that approximately half the length of each pile can be installed using vibratory pile driving, with impact driving used to drive the remaining half. The computed distances over which pile-driving sounds are expected to exceed the injury and behavioral thresholds assume an unimpeded sound propagation path. However, site conditions such as shallow water, major channel bends, and other in-water structures can reduce these distances by impeding the propagation of underwater sound waves.

Where impact driving is proposed in open water, computations also were performed to evaluate the potential effect of an attenuation device (e.g., bubble curtain, dewatered cofferdam) on the distances to the injury thresholds. The amount of noise reduction from attenuation devices depends on numerous factors, including water depth and flow and attenuation type, design, and deployment. For assessment purposes, the standard practice is to assume between a 5- and 10-dB reduction from attenuation. Because precise site conditions where the piles would be installed are unknown, it is difficult to predict the effectiveness of an attenuation device. For this reason, it was assumed that a maximum of 5-dB reduction could be achieved with implementation of an attenuation system for the piles that would be impact driven in open water. If a pile is driven in

flowing water, it was assumed that a bubble curtain would be deployed inside an isolation casing to prevent the bubbles from dispersing away from the pile.

The estimated number of pile strikes per day was provided by the project engineers. Because juveniles of some species in the project area could be smaller than 2 grams, the cumulative SEL threshold of 183 dB (i.e., the more protective threshold) was used in this analysis. It should be noted, however, that in cases where the estimated daily number of strikes per day exceeds 5,000, the distance to the onset of physical injury does not increase because pile-driving energy does not accumulate once the single strike SEL drops to 150 dB (i.e., effective quiet); therefore, the distance to the 183-dB and 187-dB thresholds are the same.

Pile-Driving Noise Results

The primary source of underwater noise associated with constructing either one of three alternative bridge types (i.e., bascule, vertical lift, or swing) would be driving the 238 16-inch steel pile or 16-inch steel H-piles with an impact hammer for the temporary trestles and work platforms, the 16 16-inch spud piles for the barges, the 20 to 40 (depending on bridge type) 16-inch steel pipe piles in water for the two in-water piers (i.e., piers 4 and 5), the 40 16-inch steel pipe piles on land for the two in-levee abutments (i.e., abutments 1 and 6), the 6 to 18 (depending on bridge type) 60-inch cast-in-steel shell (CISS) piles for the two in-water piers (i.e., piers 2 and 3) for the movable span, and the 60 14-inch square concrete or 16-inch steel pipe piles for the bridge fender system (Appendix A, Figure 6). Additional sources of underwater noise associated with the project would occur during installation and removal of temporary sheet piles with a vibratory hammer for the temporary cofferdams used to isolate the in-water construction areas for bridge piers 4 and 5. Only driving of piles with an impact hammer is expected to produce sound levels that could result in injury to fish.

Table 4-1 summarizes the pile-driving activities (location, timing, and duration) associated with constructing the new bridge.

Temporary Trestle Piles

Two temporary construction trestles would be installed to support work platforms during construction, one extending from the Sacramento bank and the other extending from the West Sacramento bank of the river (Appendix A, Figure 6). Each trestle would require piles to be driven on land and in the water. Two pile types are being considered: 16-inch diameter steel pipe piles and 16-inch steel H-piles. This assessment assumes that 10 to 20 piles would be installed per day and that each pile would require approximately 800 blows to install. Installation of the trestle piles would occur during the first in-water construction season (May 1 to November 30) and would require an estimated 3 weeks to complete (Appendix A, Figure 4). Table 4-11 shows the assumed installation rate and computed distances to the injury and behavioral thresholds for each trestle pile type and location. The computed distances for the in-water piles are shown for both unattenuated and attenuated impact driving.

For the piles driven on land, peak SPLs exceeding the injury threshold are predicted to occur within less than 33 feet for the 16-inch-diameter steel pipe piles and the 16-inch-diameter steel H-piles (Table 4-11). Cumulative SELs exceeding the 183-dB and 187-dB injury thresholds are

predicted to occur within a radius of 824 feet from the 16-inch steel pipe piles and 328 feet from the 16-inch steel H-piles, assuming an unimpeded propagation path. These potential impacts would occur over a period of approximately 2 days.

For the piles in water, peak SPLs exceeding the injury threshold are predicted to occur within 46 feet for the 16-inch-diameter steel pipe piles and within less than 33 feet for the 16-inch-diameter steel H-piles (Table 4-3). The use of an attenuation device is expected to reduce these distances to 33 feet or less. Cumulative SELs exceeding the 183-dB and 187-dB injury thresholds are predicted to occur within a radius of 1,775 feet from the 16-inch steel pipe piles and 705 feet from the 16-inch steel H-piles, assuming an unimpeded propagation path. The use of an attenuation device is expected to reduce these distances for the respective piles by slightly more than 50 percent. These potential impacts could occur over a period of approximately 24 days.

Table 4-3. Distances to Injury and Behavioral Thresholds for Impact Driving of 16-Inch Steel Pipe or 16-Inch Steel H-Piles for the Temporary Construction Trestles

Pile Size/Type	Location	Number of Piles	Number of Piles per Day	Number of Strikes per Day	Distance to 206-dB Peak Criterion (feet)[a]	Distance to 187-dB Cumulative SEL Criterion (feet)[a]	Distance to 183-dB Cumulative SEL Criterion (feet)[a]	Distance to 150 dB RMS Criterion (feet)[a]
16-inch steel pipe	In water	234	10–20	16,000–32,000[b]	46 (<33)	1,775 (824)[c]	1,775 (824)[c]	9,610 (4,459)[d]
	On land	4	2–4	3,200–6,400[b]	<33	824[c]	824[c]	5,200[d]
16-inch steel H-pile	In water	234	10–20	16,000–32,000[b]	<33	705 (328)[c]	705 (328)[c]	3,281 (1,522)[d]
	On land	4	2–4	3,200–6,400[b]	<33	328[c]	328[c]	1,522

dB = decibels.
RMS = root mean square.
SEL = sound exposure level.

[a] Distances in parentheses are based on a 5-dB level of attenuation.

[b] Based on an estimate of 1,600 strikes per pile.

[c] Pile-driving energy does not accumulate once the single strike SEL drops to 150 dB (i.e., "effective quiet"). The distance to the onset of physical injury therefore cannot extend beyond the distance to effective quiet. Once the daily number of strikes exceeds 5,000 strikes per day, the distance to the onset of injury does not increase. For this reason, the distances to the 183-dB and 187-dB thresholds are the same.

[d] Maximum distance limited to 6,000 feet upstream and 1,900 feet downstream of proposed bridge location due to the presence of river bends.

Noise levels exceeding the behavioral threshold of 150 dB RMS would theoretically extend thousands of feet from pile-driving activities, assuming an unimpeded propagation path (Table 4-3). However, river bends located approximately 1,900 feet downstream and approximately 6,000 feet upstream of the pile driving activity likely would limit the extent of these noise levels. These potential impacts could occur over a period of 4 days.

Temporary Barge Piles

Four temporary construction barges would be used to facilitate bridge construction. Each barge would require four spud piles to be driven in the water to anchor the barge. One pile type is being considered: 16-inch diameter steel pipe piles. This assessment assumes that 4 to 16 piles would be installed on a single day and that each pile would require approximately 800 blows to install. Installation of the spud piles would occur during the first and second in-water construction seasons (May 1 to November 30) and would require approximately 1 week to complete (Appendix A, Figure 4). Table 4-4 shows the assumed installation rate and computed distances to the injury and behavioral thresholds for spud piles. The computed distances for the in-water piles are shown for both unattenuated and attenuated impact driving.

For spud piles in water, peak SPLs exceeding the injury threshold are predicted to occur within 46 feet (Table 4-4). The use of an attenuation device is expected to reduce this distance to 33 feet or less. Cumulative SELs exceeding the 183-dB and 187-dB injury thresholds are predicted to occur within a radius of 1,316 and 1,775 feet, respectively, from the pile, on the days one barge (four piles) is anchored, assuming an unimpeded propagation path. The use of an attenuation device is expected to reduce these distances by slightly more than 50 percent. If two or more barges (8 to 16 piles) are anchored in a single day, then cumulative SELs exceeding the 183-dB and 187-dB injury thresholds are predicted to occur within a radius of 1,775 feet from the pile, assuming an unimpeded propagation path. The use of an attenuation device is expected to reduce these distances by slightly more than 50 percent. These potential impacts could occur on 1 or more days throughout each construction season as the barges are periodically repositioned to support construction activities.

Noise levels exceeding the behavioral threshold of 150 dB RMS theoretically would extend thousands of feet from pile-driving activities, assuming an unimpeded propagation path, regardless of whether one or more barges are anchored on the same day (Table 4-4). However, river bends located approximately 1,900 feet downstream and approximately 6,000 feet upstream of the pile-driving activity likely would limit the extent of these noise levels. These potential impacts could occur on 1 or more days throughout each construction season as the barges are periodically repositioned to support construction activities.

Table 4-4. Distances to Injury and Behavioral Thresholds for Impact Driving of 16-Inch Steel Pipe Piles for the Temporary Construction Barges

Pile Size/Type	Location	Number of Piles	Number of Piles Per Day	Number of Strikes Per Day	Distance to 206-dB Peak Criterion (feet)[a]	Distance to 187-dB Cumulative SEL Criterion (feet)[a]	Distance to 183-dB Cumulative SEL Criterion (feet)[a]	Distance to 150-dB RMS Criterion (feet)[a]
16-inch steel pipe	In water	4	4	3,200[b]	46 (<33)	1,316 (610)	1,775 (824)	9,610 (4,459)[d]
16-inch steel pipe	In water	8	8	6,400[b]	46 (<33)	1,775 (824)[c]	1,775 (824)[c]	9,610 (4,459)[d]
16-inch steel pipe	In water	12	12	9,600[b]	46 (<33)	1,775 (824)[c]	1,775 (824)[c]	9,610 (4,459)[d]
16-inch steel pipe	In water	16	16	12,800[b]	46 (<33)	1,775 (824)[c]	1,775 (824)[c]	9,610 (4,459)[d]

[a] Distances in parentheses are based on a 5-dB level of attenuation.

[b] Based on an estimate of 800 strikes per pile.

[c] Pile-driving energy does not accumulate once the single strike SEL drops to 150 dB (i.e., effective quiet). The distance to the onset of physical injury therefore cannot extend beyond the distance to effective quiet. Once the daily number of strikes exceeds 5,000 strikes per day, the distance to the onset of injury does not increase. For this reason, the distances to the 183-dB and 187-dB thresholds are the same.

[d] Maximum distance limited to 6,000 feet upstream and 1,900 feet downstream of proposed bridge location due to the presence of river bends.

Permanent Bridge Piles

Two pile types are being considered for each of the three bridge types (i.e., bascule, vertical lift, and swing): 60-inch-diameter CISS piles for the movable span (i.e., piers 2 and 3) and 16-inch-diameter steel pipe piles for the in-water piers (i.e., piers 4 and 5) and the two in-levee abutments (abutments 1 and 6). The only difference would be the number of piles that would be installed for each of the three bridge types. This assessment assumes that the bascule bridge would require 12 60-inch CISS piles, the vertical lift bridge would require 6 to 8 60-inch CISS piles, and the swing bridge would require 18 60-inch CISS piles. It also was assumed that from two to four piles would be driven per day and that each pile would require approximately 1,500 blows to install. For the 16-inch steel pipe piles, 20 piles would be required for the in-water piers for the swing bridge, and 40 piles would be required for the in-water piers for both the bascule and vertical lift bridges. All three bridge types would require 40 16-inch steel pipe piles for the in-levee abutments. Table 4-5 shows the assumed installation rate and computed distances to the injury and behavioral thresholds for each pile type and location for the three bridge types. The computed distances for the in-water piles are shown for both unattenuated and attenuated impact driving.

60-Inch CISS Piles for Piers 2 and 3. For the 60-inch CISS piles, peak SPLs exceeding the injury threshold are predicted to occur within 59 feet (Table 4-5). The use of an attenuation device is expected to reduce this distance to 33 feet or less. Cumulative SELs exceeding the 183-dB and 187-dB injury thresholds are predicted to occur within a radius of 7,067 feet, assuming an unimpeded propagation path. The use of an attenuation device is expected to reduce this distance by more than 50 percent.

Noise levels exceeding the behavioral threshold of 150 dB RMS would theoretically extend 33,000 feet from pile driving activities, assuming an unimpeded propagation path (Table 4-5). The use of an attenuation device is expected to reduce this distance by approximately 50 percent. River bends located approximately 1,900 feet downstream and approximately 6,000 feet upstream of the proposed location of pile driving activity would likely limit the extent of these noise levels.

Although the distances to injury and behavioral thresholds would be the same for the movable span for all three bridge types, potential impacts on fish associated with piers 2 and 3 would vary by bridge type because of the different number of piles required to construct the fixed spans of each of these three bridge types. For example, potential impacts on fish during construction of the fixed spans would occur over a period of approximately 6 days for the bascule bridge, approximately 4 days for the vertical lift bridge, and approximately 9 days for the swing bridge.

Table 4-5. Distances to Injury and Behavioral Thresholds for Impact Driving of 60-Inch CISS and 16-Inch Steel Pipe Piles for a Bascule, Vertical Lift, and Swing Bridge

Pile Size/Type	Location	Number of Piles (Bridge Type)	Number of Piles Per Day	Number of Strikes Per Day	Distance to 206-dB Peak Criterion (feet)[a]	Distance to 187-dB Cumulative SEL Criterion (feet)[a]	Distance to 183-dB Cumulative SEL Criteria (feet)[a]	Distance to 150-dB RMS Criteria (feet)[a]
60-inch cast-in-steel shell	In water (piers 2 and 3)	12 (Bascule)	2–4	3,000–6,000[b]	59 (<33)	7,067 (3,000)[c]	7,067 (3,000)[c]	33,000 (15,230)[d]
		6–8 (Vertical Lift)						
		18 (Swing)						
16-inch steel pipe	In water (piers 4 and 5)	40 (Bascule)	4–8	6,400–12,800[e]	46 (<33)	1,775 (824)[c]	1,775 (824)[c]	9,610 (4,459)[d]
		40 (Vertical Lift)						
		20 (Swing)						
16-inch steel pipe	On land (abutments 1 and 6)	40 (All)	4–8	6,400–12,800[e]	<33	824[c]	824[c]	5,200[d]

[a] Distances in parentheses are based on a 5-dB level of attenuation.

[b] Based on an estimate of 1,500 strikes per pile.

[c] Pile-driving energy does not accumulate once the single strike SEL drops to 150 dB (i.e., effective quiet). The distance to the onset of physical injury therefore cannot extend beyond the distance to effective quiet. Once the daily number of strikes exceeds 5,000 strikes per day, the distance to the onset of injury does not increase. For this reason, the distances to the 183-dB and 187-dB thresholds are the same.

[d] Maximum distance limited to 6,000 feet upstream and 1,900 feet downstream of proposed bridge location due to the presence of river bends.

[e] Based on an estimate of 1,600 strikes per pile.

16-Inch Steel Pipe Piles for Piers 4 and 5. For the 16-inch steel pipe piles in water, peak SPLs exceeding the injury threshold are predicted to occur within 46 feet from pile-driving activities (Table 4-5). The use of an attenuation device is expected to reduce this distance to 20 feet or less. Cumulative SELs exceeding the 183-dB and 187-dB injury thresholds are predicted to occur within a radius of 1,775 feet, assuming an unimpeded propagation path. The use of an attenuation device is expected to reduce this distance by more than 50 percent.

Noise levels exceeding the behavioral threshold of 150 dB RMS would extend 446 feet from pile-driving activities (Table 4-5). The use of an attenuation device is expected to reduce this distance by slightly more than 50 percent.

Although the distances to injury and behavioral thresholds would be the same for all three bridge types, potential impacts on fish associated with piers 4 and 5 would vary by bridge type because of the different number of piles required to construct each bridge type. Potential impacts could occur over a period of 10 days for the bascule and vertical lift bridge types, and 5 days for the swing bridge type.

16-Inch Steel Pipe Piles for Abutments 1 and 6. For the 16-inch steel pipe piles on land, peak SPLs exceeding the injury threshold are predicted to occur within a radius of 10 feet from pile-driving activities (Table 4-5). Cumulative SELs exceeding the 183-dB and 187-dB injury thresholds are predicted to occur within a radius of 824 feet, assuming an unimpeded propagation path.

Noise levels exceeding the behavioral threshold of 150 dB RMS would extend 5,200 feet from pile-driving activities, assuming an unimpeded propagation path (Table 4-5). River bends located approximately 1,900 feet downstream and approximately 6,000 feet upstream of the proposed location of pile-driving activity likely would limit the extent of these noise levels.

The distances to injury and behavioral thresholds associated with abutments 1 and 6 would be the same for all three bridge types because the same number of piles would be required to construct all of the three bridge types. Potential impacts could occur over a period of 10 days for all three bridge types.

Bridge Fender Piles

Two pile types are being considered for the bridge fender system: 14-inch-square concrete piles and 16-inch-diameter steel pipe piles. The only difference between the two approaches is the size and type of pile material; the same number of piles would be installed regardless of the type of pile used.

For the 14-inch-square concrete piles in water, peak SPLs exceeding the injury threshold are predicted to occur within a radius of 46 feet from pile-driving activities (Table 4-6). The use of an attenuation device is expected to reduce this distance to 33 feet or less. Cumulative SELs exceeding the 183-dB and 187-dB injury thresholds are predicted to occur within a radius of 384 feet, assuming an unimpeded propagation path. The use of an attenuation device is expected to reduce this distance by approximately 50 percent. These potential impacts could occur over a period of 6 days.

Table 4-6. Distances to Injury and Behavioral Thresholds for Impact Driving of 14-Inch-Square Concrete or 16-Inch-Diameter Steel Pipe Piles for the Bridge Fender System

Pile Size/Type	Location	Number of Piles	Number of Piles Per Day	Number of Strikes Per Day	Distance to 206-dB Peak Criterion (feet)[a]	Distance to 187-dB Cumulative SEL Criterion (feet)[a]	Distance to 183-dB Cumulative SEL Criterion (feet)[a]	Distance to 150-dB RMS Criterion (feet)[a]
14-inch-square concrete	In water	60	10–20	10,000–20,000[b]	46 (<33)	384 (177)[c]	384 (177)[c]	1,775 (824)[d]
16-inch-diameter steel pipe	In water	60	10–20	10,000–20,000[b]	46 (<33)	1,775 (824)[c]	1,775 (824)[c]	9,610 (4,459)[d]

[a] Distances in parentheses are based on a 5-dB level of attenuation.

[b] Based on an estimate of 1,000 strikes per pile.

[c] Pile-driving energy does not accumulate once the single strike SEL drops to 150 dB (i.e., effective quiet). The distance to the onset of physical injury therefore cannot extend beyond the distance to effective quiet. Once the daily number of strikes exceeds 5,000 strikes per day, the distance to the onset of injury does not increase. For this reason, the distances to the 183-dB and 187-dB thresholds are the same.

[d] Maximum distance limited to 6,000 feet upstream and 1,900 feet downstream of proposed bridge location due to the presence of river bends.

Noise levels exceeding the behavioral threshold of 150 dB RMS would extend 1,775 feet from pile-driving activities, assuming an unimpeded propagation path (Table 4-6). The use of an attenuation device is expected to reduce this distance by slightly more than 50 percent.

For the 16-inch steel pipe piles in water, peak SPLs exceeding the injury threshold are predicted to occur within a radius of 46 feet from pile-driving activities (Table 4-6). The use of an attenuation device is expected to reduce this distance to 33 feet or less. Cumulative SELs exceeding the 183-dB and 187-dB injury thresholds are predicted to occur within a radius of 1,775 feet, assuming an unimpeded propagation path. The use of an attenuation device is expected to reduce this distance by slightly more than 50 percent. These potential impacts could occur over a period of 6 days.

Noise levels exceeding the behavioral threshold of 150 dB RMS would extend 9,610 feet from pile-driving activities (Table 4-6). The use of an attenuation device is expected to reduce this distance by slightly more than 50 percent. River bends located approximately 1,900 feet downstream and approximately 6,000 feet upstream of the proposed location of pile-driving activity likely would limit the extent of these noise levels.

Sheet Piles for Temporary Cofferdams

Two cofferdams would be installed to construct piers 4 and 5 (Appendix A, Figure 6). The sheet piles for the cofferdams would be installed and removed with a vibratory pile driver; this method of installation and removal would not generate high underwater noise levels that result in injury to fish. Vibratory pile driving is a preferred method for minimizing the exposure of fish to potentially harmful pile-driving sounds (National Marine Fisheries Service 2009b). The sheet piles for the two cofferdams would be installed over a 2-week period in late May and early June of the first construction season (Appendix A, Figure 4).

Summary of Effects and Proposed Minimization Measures

Based on hydroacoustic measurements from similar types of pile-driving operations, underwater noise produced by impact pile driving is expected periodically to reach levels in the Sacramento River that exceed the injury and behavioral thresholds for fish. Although underwater noise levels exceeding the injury thresholds would be limited to the proposed in-water construction season (May 1 to November 30), small proportions of adult and juvenile salmonids that may be migrating or rearing in the action area after May 1 may be adversely affected (impacts on specific species/races are described below). The potential for injury would occur over an estimated 50-day period during installation of the temporary trestle piles and permanent bridge piles (from approximately May 1 to August 15 in the first year of construction) and during an estimated 6-day period during installation of the bridge fender piles (from late September to early October in the second year of construction). In addition, the potential for injury would occur periodically during installation of the temporary barge spud piles (from May 1 to November 30 in the first and second in-water construction seasons).

The potential for behavioral effects would occur during the same periods described above for noise levels exceeding the injury thresholds in the first and second in-water construction seasons. Noise levels exceeding the behavioral threshold of 150 dB RMS potentially would extend much

farther from the source than would noise levels exceeding the injury thresholds, although river bends located approximately 1,900 feet downstream and approximately 6,000 feet upstream of the proposed location of pile driving activity likely would limit the extent of these noise levels and associated behavioral effects. Species-specific effects related to pile-driving noise are described below.

Winter-Run Chinook Salmon. Impact pile driving for the temporary trestles and the permanent bridge piles in the first in-water construction season is not expected to expose juvenile or adult winter-run Chinook salmon to underwater sound levels that exceed the injury and behavioral thresholds for fish (Table 4-2) because pile driving would occur when juvenile winter-run Chinook salmon are not expected to be present in the action area (Tables 3-3 and 3-4). However, impact driving of any spud piles for the temporary barges in October or November in either in-water construction season and impact driving of the bridge fender piles in early October in the second in-water construction season would overlap the beginning of the juvenile and adult winter-run Chinook salmon migration season, thereby exposing a portion of the juvenile winter-run Chinook salmon migrating in the Sacramento River during these months to underwater sound levels that exceed the injury and behavioral thresholds for fish. Adults would be expected to tolerate higher sound pressures than the levels associated with the onset of injury in smaller fish, such as juveniles. At a minimum, any adults or juveniles encountering pile-driving noise may exhibit some form of behavioral response, including an avoidance response that could disrupt or delay their movement or feeding. Evidence suggests that some fish species avoid or disperse from areas subject to pile-driving and other human-generated noises (Popper and Hastings 2009).

Spring-Run Chinook Salmon. Impact pile driving for the temporary trestles and the permanent bridge piles in the first in-water construction season would overlap the end of the juvenile migration season (Tables 3-4 and 3-5), thereby exposing a portion of the juvenile spring-run Chinook salmon migrating in the Sacramento River in May to underwater sound levels that exceed the injury and behavioral thresholds for fish (Table 4-2). Similarly, impact pile driving for the temporary trestles and the permanent bridge piles in the first in-water construction season would overlap the latter half of the adult migration season. Any impact driving of spud piles for the temporary barges in October or November in either construction season and impact driving of the bridge fender piles in late September and early October in the second in-water construction season would not be expected to expose juvenile or adult spring-run Chinook salmon to underwater sound levels that exceed the injury and behavioral thresholds for fish because pile driving would occur when juvenile and adult spring-run Chinook salmon are not expected to be present in the action area (Tables 3-4 and 3-5). Adults would be expected to tolerate higher sound pressures than the levels associated with the onset of injury in smaller fish, such as juveniles. At a minimum, any adults or juveniles encountering pile-driving noise may exhibit some form of behavioral response, including an avoidance response that could disrupt or delay their movement or feeding. Evidence suggests that some fish species avoid or disperse from areas subject to pile-driving and other human-generated noises (Popper and Hastings 2009).

Steelhead. Impact pile driving for the temporary trestles and the permanent bridge piles in the first in-water construction season would overlap the end of the juvenile and kelt (post-spawning adult) migration season, thereby exposing a portion of the juvenile steelhead migrating in the Sacramento River in May and June, and adult kelts migrating in the Sacramento River in May

(Tables 3-4 and 3-6) to underwater sound levels that exceed the injury and behavioral thresholds for fish (Tables 4-2). Any impact driving of spud piles for the temporary barges in October or November in either construction season and impact driving of the bridge fender piles in late September and early October in the second in-water construction season would be unlikely to expose a significant number of juvenile steelhead to underwater sound levels that exceed the injury and behavioral thresholds for fish because pile driving would occur when juvenile steelhead are expected to be least abundant in the action area (Table 3-6). However, these activities would occur during the peak upstream migration season for adults (Table 3-4). Adults would be expected to tolerate higher sound pressures than the levels associated with the onset of injury in smaller fish, such as juveniles. At a minimum, any adults or juveniles encountering pile-driving noise may exhibit some form of behavioral response, including an avoidance response that could disrupt or delay their movement or feeding. Evidence suggests that some fish species avoid or disperse from areas subject to pile-driving and other human-generated noises (Popper and Hastings 2009).

North American Green Surgeon. Impact pile driving for the temporary trestles and the permanent bridge piles in the first in-water construction season would overlap the end of the adult migration season and the peak juvenile migration season, thereby exposing a portion of the adult and juvenile green sturgeon population migrating in the Sacramento River in May, June, and July (Tables 3-4) to underwater sound levels that exceed the injury and behavioral thresholds for fish (Table 4-2). Any impact driving of spud piles for the temporary barges in August, September, October, or November in either construction season, and impact driving of the bridge fender piles in late September and early October in the second in-water construction season is not expected to expose adults to underwater sound levels that exceed the injury and behavioral thresholds for fish because pile driving would occur when adults are not likely to be present in the action area (Table 3-4). However, all impact pile driving would expose juvenile green sturgeon in the action area to underwater sound levels that exceed the injury and behavioral thresholds for fish (Table 4-2). Adults would be expected to tolerate higher sound pressures than the levels associated with the onset of injury in smaller fish, such as juveniles. At a minimum, any adults or juveniles encountering pile-driving noise may exhibit some form of behavioral response, including an avoidance response that could disrupt or delay their movement or feeding. Evidence suggests that some fish species avoid or disperse from areas subject to pile-driving and other human-generated noises (Popper and Hastings 2009).

Delta Smelt. Impact pile driving for the temporary trestles and the permanent bridge piles in the first in-water construction season would overlap the end of the adult spawning season, thereby exposing spawning adults, eggs, and larvae in May, June, and July (Table 3-4 and 3-8) to underwater sound levels that exceed the injury and behavioral thresholds for fish (Table 4-2). Any impact driving of spud piles for the temporary barges in August, September, October, or November in either construction season, and impact driving of the bridge fender piles in late September and early October in the second in-water construction season is not expected to expose adults to underwater sound levels that exceed the injury and behavioral thresholds for fish because pile driving would occur when adults are not present in the action area (Table 3-4). Fish monitoring suggests, however, that the number of delta smelt that potentially would be exposed to underwater sound levels that exceed the injury and behavioral thresholds for fish would be extremely low (Table 3-8).

4.4.2.2 Fish Entrapment in Cofferdams

The proposed timing of cofferdam installation (late May to early June) would overlap the end of the adult and juvenile peak migration season for spring-run Chinook salmon, the end of the adult (kelt) migration season for steelhead, the end of the peak rearing season for green sturgeon, and the end of the peak spawning season for delta smelt in the Sacramento River. Consequently, the potential would exist for listed fish to become entrapped in the cofferdams, although juveniles would be expected to be at a greater risk because they are likely to be more abundant in the action area than adults at this time of year.

4.4.2.3 Direct Physical Injury

Restriction of in-water activities to May 1 to November 30 would avoid the primary migration and rearing periods of endangered species (winter-run Chinook salmon, delta smelt) in the Sacramento River and would minimize the overlap of in-water activities with the adult and juvenile migration seasons for threatened species, with the exception of adult steelhead (Table 3-4). Based on the general timing of occurrence of listed fish in the action area, the potential for exposure for most life stages would occur in May to mid-August, October, and November when in-water activities with the greatest potential to cause direct physical injury would occur. However, most listed fish that are likely to be present in the action area during in-water construction activities are likely to be large, migrating adults and juveniles that would be expected to avoid or move away from active construction areas.

The estimated total of eight barge-trips per season (four in May as the barges are brought to the work site and four in November as the barges are removed from the work site at the end of the construction season) and periodic repositioning of the barges during the in-water construction season suggest that any increases in injury, harassment, or mortality of listed fish would be expected to be small.

4.4.2.4 Water Quality Impacts

Erosion and Mobilization of Sediment

Although listed fish may be present in the action area during any month, restricting in-water construction to the May 1 to November 30 window would minimize or avoid exposure of most listed fish to contaminants because these species, with the exception of adult steelhead, occur less frequently in the action area during this time of year (Table 3-4).

In-water construction would be limited to pile driving (trestle, bridge, and barge), installation and removal of sheet piles for cofferdams, and placement of RSP. These activities would be limited to daylight hours each day. Thus, disturbance of channel substrate and the potential for increased contaminants would be temporary (up to 12 hours each day) and localized. Assuming that mobilization of sediment is also an indication of contaminant mobilization, the proposed in-water construction methods should minimize the increase in contaminants.

Given the relatively short exposure time and the restricted area of in-water construction relative to the distribution and temporal occurrence of listed species between May 1 and November 30,

the effect of contaminants mobilized by in-water construction is not expected to significantly affect the survival or growth of adult or juvenile fish.

Contaminants

The potential exposure of listed fish to contaminants and other harmful substances would be avoided or minimized through implementation of measures and BMPs required by Sections 401 and 402 of the federal CWA. The City would require the contractor to prepare and implement a SWPPP and other construction site BMPs to control storm water discharges and potential discharges of pollutants to the Sacramento River. These BMPs are designed to avoid and minimize the potential for accidental spills, minimize the extent and potential effects of accidental spills, and avoid and minimize the potential for contaminated runoff from waste materials. Implementation of the BMPs in accordance with an approved SWPPP and other requirements of local agency or Caltrans Statewide NPDES permits would substantially reduce or eliminate the potential for accidental spills or unintentional discharges of potentially hazardous materials to the Sacramento River, wetlands, and drainage channels.

4.4.2.5 Habitat Impacts

Temporary Disturbance to and Permanent Loss of Aquatic Habitat

The proposed project would result in the temporary disturbance to and permanent loss of aquatic habitat area and volume, including foraging and rearing habitat for listed fish. Table 4-7 shows the temporary and permanent loss of aquatic habitat that would result from constructing the proposed project.

Installation of sheet pile cofferdams to isolate the in-water construction areas for piers 4 and 5 from the water column during pier construction would result in temporary disturbance of aquatic habitat (substrate and water column) equal to the enclosed area and volume of the in-water cofferdams. The proposed dimensions of each cofferdam are 35 feet by 95 feet, or 3,325 square feet. Together, the two cofferdams would result in temporary disturbance of 6,650 square feet (0.15 acre) of substrate habitat and up to 325,850 cubic feet of water column habitat below the OHWM (based on a water surface elevation of +19 feet). The temporary cofferdams would remain in place for 2 months in the first in-water construction season. Similarly, installation of piles for the temporary trestles would result in temporary disturbance to substrate and water column habitat equal to the total area and volume of the in-water piles used to support the temporary trestles. The temporary trestle piles would remain in place throughout the duration of construction, although the work platforms would be removed at the end of the first in-water construction season before the onset of winter. The 234 16-inch-diameter pipe or H piles that would be installed below the OHWM to support the temporary trestles would result in temporary disturbance to 327 square feet (0.007 acre) of substrate habitat and up to 16,023 cubic feet of water column habitat below the OHWM. (Four of the 238 piles for the temporary trestles would be installed above the OHWM.) Similarly, the 16 16-inch-diameter pipe or H piles that would be installed in the wetted channel to anchor the temporary barges would result in temporary disturbance to 22 square feet (0.0005 acre) of substrate habitat and up to 1,078 cubic feet of water column habitat below the OHWM. Together, this would result in total temporary

disturbance to 6,999 square feet (0.16 acre) of substrate habitat and 342,951 cubic feet of water column habitat below the OHWM.

Installation of the new bridge piers (piers 2 through 5) and piles for the new bridge fender system would result in permanent loss of aquatic habitat (substrate and water column) equal to the cumulative area (substrate) and volume (water column) of the in-water piers and bridge fender piles. Two 75-foot-wide by 95-foot-long piers (piers 2 and 3) that would be installed in the river to support the movable span of the new bridge (bascule bridge) would result in a permanent loss of up to 13,500 square feet (0.31 acre) of substrate habitat and up to 661,500 cubic feet of water column habitat below the OHWM. The footprint of piers 2 and 3 for the vertical lift and swing bridge types would be less. Similarly, two piers (piers 4 and 5) that would be installed in the river to support the fixed spans of the new bridge would result in a permanent loss of 360 square feet (0.01 acre) of substrate habitat and up to 17,640 cubic feet of water column habitat below the OHWM.

Placement of rock revetment (riprap) on the waterside slope of the new bridge abutments below the OHWM also would result in permanent loss of natural substrate habitat equal to the net increase in area of rock revetment. Up to 824 linear feet of shoreline (398 linear feet on the City of Sacramento shoreline and 426 linear feet on the City of West Sacramento shoreline), covering up to 24,126 square feet (0.55 acre) of the bank below the OHWM, would be lined with RSP (assumed 1/4-ton stone weight, machine positioned [Method B]). A total of 2,949 cubic yards of RSP would be placed below the OHWM, and a total of 4,216 cubic yards would be placed above the OHWM. The RSP above and below the OHWM would cover a total of 58,622 square feet (1.35 acre).

Installation of these features may result in direct and indirect effects by inhibiting establishment of riparian vegetation; inhibiting recruitment and retention of sediment and woody debris; and eliminating shallow, low-velocity river margins preferred by juvenile fish.

Compensation for impacts on critical habitat, as described in Section 2.6, would offset the effects of permanent impacts on the substrate and water column resulting from construction of the new bridge piers and installation of RSP.

Table 4-7. Amount of Temporarily and Permanently Affected Aquatic Habitat in the Sacramento River

Feature/Habitat	Temporary Impact (square feet [acre])	Permanent Impact (square feet [acre])
Temporary Cofferdams		
Substrate area (square feet [acre])	6,650 (0.15)	NA
Water column volume (cubic feet)	325,850	NA
Temporary Trestle Piles		
Substrate area (square feet [acre])	327 (0.007)	NA
Water column volume (cubic feet)	16,023	NA
Temporary Barge Spud Piles		
Substrate area (square feet [acre])	22 (0.0005)	NA
Water column volume (cubic feet)	1,078	NA

Feature/Habitat	Temporary Impact (square feet [acre])	Permanent Impact (square feet [acre])
Piers 2 and 3		
Substrate area (square feet [acre])	NA	13,500 (0.31)[a]
Water column volume (cubic feet)	NA	661,500[a]
Piers 4 and 5		
Substrate area (square feet [acre])	NA	360 (0.01)
Water column volume (cubic feet)	NA	17,640
Piles for Bridge Fender System		
Substrate area (square feet [acre])	NA	84 (0.002)
Water column volume (cubic feet)	NA	4,106
Shoreline Rock Revetment (RSP)		
Substrate area (square feet [acre])	NA	24,126 (0.55)
Total		
Substrate area (square feet [acre])	6,999 (0.16)	38,070 (0.87)
Water column volume (cubic feet)	342,951	683,246

NA = not applicable
RSP = rock slope protection
[a] Assumes bascule bridge type (worst-case scenario).

Temporary and Permanent Loss of Riparian Vegetation (Including SRA Cover)

Clearing of the existing cottonwood riparian forest vegetation within the proposed project footprint would result in permanent loss of up to 1.273 acres and temporary disturbance to up to 0.625 acre of cottonwood riparian forest within the action area, of which approximately 0.368 acre is below the OHWM and contributes to overhead (shade) and instream SRA cover (see additional discussion below regarding SRA cover). The permanent loss of existing cottonwood forest would result from activities related to construction of the two fixed-span bridge approach structures and the bikeways that would pass under the east end of the bridge structure in the City of Sacramento and the west end of the bridge structure in the City of West Sacramento (Appendix A, Figure 6). The temporary disturbance to cottonwood riparian forest would occur from trimming riparian vegetation and removing additional trees and understory vegetation to provide equipment access. Portions of this affected riparian forest also provide SRA cover habitat that is an important component of anadromous fish habitat (see additional discussion below). Clearing of the existing cottonwood riparian forest that contributes to SRA cover would result in temporary disturbance to up to 330 linear feet and permanent loss of up to 302 linear feet of overhead SRA cover (shade) along the summer (low-flow) shoreline of the Sacramento River (Table 4-8).

Table 4-8. Temporary and Permanent Impacts on Overhead SRA Cover Vegetation in the Action Area

Location	Shaded River Aquatic Cover	
	Temporary Disturbance (feet)	Permanent Loss (feet)
West riverbank	90	125
East riverbank	240	177
Total	**330**	**302**

SRA = shaded riverine aquatic

Increase in Overwater Structure (Artificial Shade)

Barge shading would occur only during the in-water construction season (May 1 to November 30) as the temporary barges would be removed at the end of the first construction season before the onset of winter. Four barges, each approximately 60 feet wide and 150 feet long (9,000 square feet [0.21 acre]), would be present during construction and would provide a total of 36,000 square feet (0.83 acre) of temporary over-water structure (Table 4-9). Because the barges would be present only during construction and moved periodically as construction of the bridge progresses, effects of barge shading would be temporary and localized.

Shading by the temporary work platforms would occur only during the in-water construction season (May 1 to November 30) as the temporary work platforms would be removed at the end of the first construction season before the onset of winter (the temporary trestle piles could remain in place). Two trestles, approximately 22 feet wide and varying in length and configuration (Appendix A, Figure 6), would be present during construction and would provide a total of approximately 33,500 square feet (0.77 acre) of temporary over-water structure (Table 4-9). Because the trestles and work platforms would be present only during construction, effects of temporary work platform shading would be temporary and localized. Together, the barges and temporary work platforms would create up to 69,500 square feet (1.60 acres) of temporary overwater structure (i.e., artificial shade) (Table 4-9).

The new bridge would create approximately 56,000 square feet (1.29 acres) of permanent over-water structure where no over-water structure currently exists. The increased shading created by the new bridge could affect the migration of adult and juvenile Chinook salmon and steelhead, and other species. In the Sammamish River in Washington State, migrating adult salmon hold in shaded areas beneath bridges (Carrasquero 2001). Juvenile salmonids also prefer shaded areas created by bridges, which may make them more vulnerable to predatory fish (e.g., striped bass, Sacramento pikeminnow, and largemouth bass) that also prefer structural and overhead cover (e.g., artificial shade) for ambushing prey. Because of the height of the new bridge over the water, ambient light levels generally would be expected to penetrate into the water, thereby minimizing the effect of bridge shading on aquatic habitats in the Sacramento River.

Table 4-9. Amount of Artificial Overwater Structure (Shade) Created on the Sacramento River in the Action Area

Overwater Structure	Square Feet (acre) of Shaded Area
Barges (temporary)	36,000 (0.83)
Trestle (temporary)	33,500 (0.77)
Bridge (permanent)	56,000 (1.29)
Total	
Net change (temporary)	69,500 (1.60)
Net change (permanent)	56,000 (1.29)

4.4.2.6 Increases in Impervious Surface Area and Storm Water Runoff

Although the new bridge and roadway modifications would add impervious surface area, the proposed project would not substantially increase impervious surface area in the watershed, relative to existing conditions. Furthermore, the purpose of the new bridge is to improve the

connectivity across the river, thereby reducing the trip lengths currently required to cross the river via one of the other three bridges in the project vicinity (i.e., Pioneer, Tower, and I Street). Nevertheless, it is anticipated that the new bridge would result in some added vehicle trips across the river because of the increased convenience the new bridge would offer, thereby potentially increasing the pollutant load that currently is delivered to the river. Because the added vehicle trips are not anticipated to substantially increase the amount of pollutants, the proposed project is not anticipated to contribute to a cumulative water quality impact during operations.

4.4.2.7 Introduction of Aquatic Invasive Species

The potential to spread or introduce AIS associated with operation of the barges and other in-water construction equipment would be avoided or minimized through implementation of the standard construction measures and BMPs described in Section 2.5.1.

4.4.2.8 Increased in Direct Lighting on Sacramento River

The project proponent or their contractor will minimize or avoid the effects of permanent bridge lighting on special-status fish species by implementing standard construction measures and BMPs described in Section 2.5.1.

4.5 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 described in this BA. Future federal actions that are unrelated to the proposed action are not considered in this cumulative effects analysis because those actions would require separate consultation pursuant to Section 7 of the ESA.

Current, future, and reasonably foreseeable actions in the project region that also could affect VELB, special-status fish species, SRA cover habitat, and critical habitat potentially affected by the proposed project include the following.

- Flood management projects affecting the Sacramento River.
- Levee improvement projects on the Sacramento River.
- Restoration and other water-related projects in and near the Sacramento River that could affect fish or vegetation on the waterside of levees.
- Development in the West Sacramento and Sacramento area that could result in effects similar to those of the proposed project.

Without compensation, construction of the proposed project would contribute a small amount to the cumulative loss of riparian habitat for VELB and suitable aquatic habitat (substrate, water column) for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, North American green sturgeon, and delta smelt in the project region. However, with implementation of Measures 1–13 and compensatory Measures 14–16, the project's contribution to effects on VELB and listed fish would be reduced to a less than cumulatively considerable level.

Caltrans is not aware of any future state or private activities that are reasonably certain to affect VELB, Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, North American green sturgeon, delta smelt, or designated critical habitat within the area potentially affected by the proposed project.

4.6 Determination

4.6.1 Species and Critical Habitat Determination

4.6.1.1 No Effect

A *No Effect* determination was made for the following species and designated critical habitat. No consultation is required.

- Vernal pool fairy shrimp
- Vernal pool tadpole shrimp
- California red-legged frog
- California tiger salamander
- Giant garter snake
- Least Bell's vireo

4.6.1.2 May Affect, Not Likely to Adversely Affect

A *May Affect, Not Likely to Adversely Affect* determination was made for the following species and designated critical habitat. Informal consultation is required.

- VELB

4.6.1.3 May Affect, Likely to Adversely Affect

A *May Affect, Likely to Adversely Affect* determination was made for the following species and designated critical habitat. Formal consultation is required.

- Sacramento River winter-run Chinook salmon, including designated critical habitat
- CV spring-run Chinook salmon, including designated critical habitat
- CCV steelhead, including designated critical habitat
- Southern DPS of North American green sturgeon, including designated critical habitat
- Delta smelt, including designated critical habitat

Chapter 5 Essential Fish Habitat Assessment

The MSA takes immediate action to conserve and manage fishery resources found off the coasts of the United States, and the anadromous species and Continental Shelf fishery resources of the United States, by exercising sovereign rights for the purposes of exploring, exploiting, conserving, and managing all fish within the exclusive economic zone of the United States, and exclusive fishery management authority beyond the Exclusive Economic Zone over such anadromous species, Continental Shelf fishery resources, and fishery resources in the special areas.

5.1 Essential Fish Habitat

5.1.1 Essential Fish Habitat Background

Public Law 104-297, the Sustainable Fisheries Act of 1996, amended the MSA to establish new requirements for EFH descriptions in federal fishery management plans (FMPs). In addition the MSA established procedures designed to identify, conserve, and enhance EFH for those species regulated under a federal FMP. Pursuant to the MSA:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH.
- NOAA Fisheries must provide conservation recommendations for any federal or state action that would adversely affect EFH.
- Federal agencies must provide a detailed response in writing to NOAA Fisheries within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the effect of the activity on EFH. In the case of a response that is inconsistent with the NOAA Fisheries' EFH conservation recommendations, the federal agency must explain its reasons for not following the recommendations.

EFH has been defined for the purposes of the MSA as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." NOAA Fisheries has further added the following interpretations to clarify this definition.

- *Waters* include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate.
- *Substrate* includes sediment, hard bottom, structures underlying the waters, and associated biological communities.
- *Necessary* means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and
- *Spawning, breeding, feeding, or growth to maturity* covers the full life cycle of a species.

Adverse effect means any effect that reduces quality or quantity of EFH and may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey or reduction in species fecundity), or site-specific or habitat-wide effects, including individual, cumulative, or synergistic consequences of actions.

EFH consultation with NOAA Fisheries is required regarding any federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as certain upstream and upslope activities.

The objectives of this EFH consultation are to determine whether the proposed action may adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects on EFH. Under Section 305(b)(4) of the MSA, NOAA Fisheries is required to provide EFH conservation and enhancement recommendations to federal and state agencies for actions that may adversely affect EFH. Wherever possible, NOAA Fisheries uses existing interagency coordination processes to fulfill EFH consultations with federal agencies. For the proposed action, this goal is being met by incorporating EFH consultation into the ESA Section 7 consultation, as represented by this EFH assessment.

5.2 Managed Fisheries with Potential to Occur in the Action Area

The MSA requires that EFH be identified for all federally managed species, including all species managed by the Pacific Fisheries Management Council (PFMC). The PFMC is responsible for managing commercial fisheries resources along the coast of Washington, Oregon, and California. Managed species that have a potential to occur in the action area are covered under the Pacific Salmon FMP (Pacific Fishery Management Council 2016).

The MSA-managed species occurring in the Sacramento River in the action area and potentially affected by the project is Chinook salmon. The species accounts for Sacramento River winter-run Chinook salmon ESU and CV spring-run Chinook salmon ESU are provided in Sections 3.4.2.1 and 3.4.2.2, respectively, of the BA. The Central Valley fall- and late-fall-run Chinook salmon ESU also is a managed species under the Pacific Salmon FMP. The species account for the CV fall- and late-fall-run Chinook salmon ESU is provided below.

5.2.1 Central Valley Fall- and Late Fall-Run Chinook Salmon ESU

The CV fall-run and late fall-run Chinook salmon ESU includes all naturally spawned populations of fall-run and late fall-run Chinook salmon in the Sacramento and San Joaquin River basins and their tributaries east of the Carquinez Strait in California (64 FR 50394). On September 16, 1999, after reviewing the best available scientific and commercial information, NMFS determined that listing CV fall- and late fall-run Chinook salmon was not warranted. On April 15, 2004, the CV fall- and late fall-run Chinook salmon ESU was identified by NMFS as a species of concern (69 FR 19975). Critical habitat is not designated for fall- and late fall-run Chinook salmon because the species is not listed under the ESA.

The CV fall- and late fall-run Chinook salmon ESU is not listed under CESA but is considered a California species of special concern. CDFW classifies the current status of CV fall-run Chinook salmon as Moderate Concern (i.e., the species is under no immediate threat of extinction; but populations are in long-term decline or are naturally small and isolated, and warrant frequent status re-assessment) and CV late fall-run Chinook salmon as High Concern (considered to be under severe threat of extinction, but extinction is less imminent than for other more imperiled species) (Moyle et al. 2015).

Currently, fall-run Chinook salmon spawn below rim dams and barriers to migrate in the Sacramento and San Joaquin Rivers and their tributaries. Some smaller streams that lack unpassable barriers have runs that extend into historical fall-run habitat. Late fall-run Chinook salmon currently spawn almost exclusively in the upper Sacramento River from Keswick Dam to the Anderson-Cottonwood Irrigation District Dam. Adult fall-run Chinook salmon migrate through the Delta and into Central Valley rivers from June through December; they spawn from September through December. Peak spawning activity usually occurs in October and November. The life history characteristics of late fall-run Chinook salmon are not well understood. Adult late fall-run Chinook salmon migrate through the Delta and into the Sacramento River from October through April and may wait for 1 to 3 months before spawning from December through April. Peak spawning activity occurs in February and March.

Upon emergence from the gravel, fry swim or are displaced downstream (Healey 1991); most movement occurs during twilight (National Marine Fisheries Service 2014). Fry seek nearshore habitats providing shallow water; vegetation; and substrates that provide aquatic and terrestrial invertebrates, cover and shelter from predators, and slower water velocities for resting (National Marine Fisheries Service 2014).

CV fall-run Chinook salmon fry (i.e., juveniles shorter than 2 inches long) generally emerge from December through March, with peak emergence occurring by the end of January. In general, fall-run Chinook salmon fry abundance in the Delta increases following high winter flows. Most fall-run Chinook salmon fry rear in fresh water from December through June, with smolt emigration occurring primarily from April through June. Smolts that arrive in the estuary after rearing upstream migrate quickly through the Delta and Suisun and San Pablo Bays. A very small number (generally less than 5 percent) of fall-run juveniles spend over a year in fresh water and emigrate as yearling smolts the following November through April. Juvenile fall-run Chinook salmon have been observed emigrating past Sherwood Harbor (located approximately 3 miles downstream from the action area) from December through August, with most passing through the area from January through June (Table 5-1), based on USFWS Sacramento trawl survey data from 2009 to 2019 (U.S. Fish and Wildlife Service 2019).

Table 5-1. Number of Fall-Run Size Juvenile Chinook Salmon Captured by Trawl at Sherwood Harbor (RM 55) by Month (January 2009 through October 2019)

Month/ Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Monthly Total[a]
Jan	1	62	59	242	162	0	1	198	183	141	459	1,049
Feb	247	119	80	123	70	2,213	197	73	753	45	770	3,920
Mar	73	38	83	339	5	1,459	1	221	333	246	597	2,798
Apr	215	238	358	315	493	692	27	220	781	119	283	3,458
May	497	44	316	263	341	74	10	27	2,271	177	327	4,020
Jun	24	6	96	13	16	1			697	4	10	857
Jul	6	4	3	2	1				6	1	2	23
Aug	1			3	1				1		1	6
Sep												
Oct												
Nov												
Dec		112		58		103	1	14	1	16		305
Annual Total	**1,064**	**623**	**995**	**1,358**	**1,089**	**4,542**	**237**	**753**	**5,026**	**749**	**NA**	**16,436**

NA = not applicable
RM = river mile
[a] 2019 data are excluded from the total because data are incomplete.

CV late fall-run Chinook salmon fry generally emerge from April through June. Late fall-run fry rear in fresh water from April through the following April and emigrate as smolts from October through February (Snider and Titus 2000). Juvenile late fall-run Chinook salmon have been observed emigrating past Sherwood Harbor (located approximately 3 miles downstream from the action area) from August through April, with most passing through the area in November and December (Table 5-2), based on USFWS Sacramento trawl survey data from 2009 to 2019 (U.S. Fish and Wildlife Service 2019).

CV fall- and late fall-run Chinook salmon use the Sacramento River within the action area for upstream migration (adults) and downstream migration and rearing (juveniles); spawning and egg incubation do not occur in the action area (Moyle 2002). Table 3-5 summarizes the life stage timing and distribution of fall- and late fall-run Chinook salmon in the Sacramento River, including in the action area.

Factors that contributed to the decline of CV fall- and late fall-run Chinook salmon are similar to those described earlier for Sacramento River winter-run Chinook salmon and CV spring-run Chinook salmon. Access to much or all of their historical spawning habitat was eliminated by dams, although fall-run Chinook salmon were less affected by these barriers because much of their historical spawning habitat included the lower-gradient reaches downstream of these dams (Reynolds et al. 1993; McEwan 2001). Levee construction, channelization, and bank armoring have reduced and degraded the value and availability of natural habitat features for rearing and emigrating juvenile Chinook salmon (Brandes and McLain 2001). Other factors that have contributed to the current status of CV fall-run and late fall-run Chinook salmon—and currently affect their abundance include harvest, artificial propagation programs (ecological and genetic effects), entrainment, and contaminants (Moyle 2002).

Table 5-2. Number of Late Fall–Run Size Juvenile Chinook Salmon Captured by Trawl at Sherwood Harbor (RM 55) by Month (January 2009 through October 2019)

Month/ Year	2009	2010	2011[a]	2012	2013[a]	2014	2015	2016	2017	2018	2019	Monthly Total[b]
Jan										1	1	1
Feb									1			1
Mar								1				1
Apr				1							1	1
May												0
Jun												0
Jul												0
Aug	1			1								2
Sep		1										1
Oct		1										1
Nov	1			5								6
Dec	1			4		5	1	4		7		22
Annual Total	**3**	**2**	**0**	**11**	**0**	**5**	**1**	**5**	**1**	**8**	**NA**	**36**

NA = not applicable
RM = river mile
[a] No late fall–run size juvenile Chinook salmon were detected by trawl surveys.
[b] 2019 data are excluded from the total because data are incomplete.

5.2.2 Chinook Salmon Essential Fish Habitat

Only freshwater EFH is designated in the action area. Freshwater EFH for Chinook salmon consists of four major components: (1) spawning and incubation; (2) juvenile rearing; (3) juvenile migration corridors; and (4) adult migration corridors and holding habitat. Freshwater EFH depends on lateral (floodplain and riparian), vertical (hyporheic), and longitudinal connectivity to create habitat conditions for spawning, rearing, and migration, including (1) water quality (dissolved oxygen, nutrients, and temperature); (2) water quantity, depth, and velocity; (3) riparian-stream-marine energy exchanges; (4) channel gradient and stability; (5) prey availability; (6) cover and habitat complexity (large woody material, pools, and aquatic and terrestrial vegetation); (7) space; (8) habitat connectivity (dispersal corridors) from headwaters to the ocean; (9) groundwater-stream interactions; and (10) substrate composition. (Pacific Fishery Management Council 2014.)

5.3 Potential Adverse Effects of Proposed Project on EFH

EFH designated under the FMP may be adversely affected by the proposed project. Habitat areas of particular concern (HAPCs) that may be directly or indirectly adversely affected include complex channels and floodplain habitat, and thermal refugia.

Effects on EFH and HAPCs for Chinook salmon would be similar to the impacts on species and critical habitat described in Section 4.4, *Effects of the Action* for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, North American green sturgeon, and delta smelt.

The following environmental conditions potentially affect Chinook salmon EFH and HAPCs.

- Sedimentation and turbidity
- Hazardous materials and contaminant-related effects
- Disturbance and direct injury
- Temporary and permanent loss of aquatic habitat
- Temporary and permanent loss of SRA cover habitat

Effects on Pacific salmon EFH and HAPCs associated with sedimentation and turbidity, hazardous materials and contaminants, disturbance and direct injury, and habitat loss would be temporary. Potential adverse effects on EFH of increased fine sediment and turbidity would be avoided or minimized through implementation of all applicable BMPs. The potential environmental effects of the project would be limited to short-term, localized, and minor increases in turbidity and suspended sediment. Implementation of the SWPPP along with applicable BMPs would substantially reduce or eliminate the potential for an accidental spill and unintentional discharge of contaminants, with potential associated effects on EFH. Potential injury to and mortality of fish associated with pile driving would be avoided or minimized by the following.

- During impact driving, limiting the number of strikes per day to the minimum necessary to complete the work, with the total maximum number of hammer strikes limited to 32,000 strikes per day (i.e., 1,600 hammer strikes per pile, per day) for piles for the temporary trestles, 20,000 strikes per day (i.e., 1,000 hammer strikes per pile, per day) for the piles for the bridge fender system, 12,800 strikes per day (i.e., 1,600 hammer strikes per pile, per day) for piles for the fixed span piers, 6,000 strikes per day (i.e., 1.500 strikes per pile, per day) for the CISS piles for the movable span piers.
- Using vibratory hammers whenever feasible.
- Using a bubble ring or similar device to minimize the magnitude and extent of potentially harmful underwater noise levels.
- Conducting pile driving during daylight hours only.
- Limiting in-water construction, including pile driving, to the proposed in-water construction window (May 1–November 30).

Long-term and permanent effects on EFH and HAPCs would be limited to the net loss of aquatic habitat (substrate and water column) associated with the new bridge piers and net loss of SRA cover habitat associated with the footprints for the bridge and bike trails. The displacement of EFH and HAPCs would be insignificant compared to the total extent of EFH available to these species in the Sacramento River.

The proposed project would adversely affect EFH; however, the temporary and permanent effects would be small relative to the total EFH available in the Sacramento River. Compensation for the permanent loss of critical habitat for listed fish species, as described in Section 2.6, *Compensation*, also would benefit EFH for Chinook salmon.

5.4 Essential Fish Habitat Conservation Measures

Measures 1–4 and 6–13 described in Section 2.5 of this BA, *Conservation Measures*, would avoid and minimize potential impacts on EFH. In addition, implementation of Measure 14, *Compensate for Temporary Effects on and Permanent Loss of Cottonwood Riparian Forest (Including SRA Cover)*; Measure 15, *Compensate for Loss of Perennial Stream*; and Measure 16, *Purchase Channel Enhancement Credits for Impacts on Critical Habitat* also would compensate for permanent impacts on EFH.

5.5 Conclusions

Caltrans has determined that the proposed action *will adversely affect* EFH for Chinook salmon; however, most of the effects would be temporary and small relative to the total EFH available to Chinook salmon in the region. Compensation for the permanent loss of critical habitat for anadromous fish (see Measure 16 described in Section 2.6 of this BA, *Compensation*) also would compensate for the permanent loss of EFH for Chinook salmon.

Chapter 6 Literature Cited

6.1 Printed References

Adams, P. B., C. B. Grimes, J. E. Hightower, S. T. Lindley, and M. L. Moser. 2002. Status Review for North American Green Sturgeon, *Acipenser medirostris*. National Marine Fisheries Service, Santa Cruz, California.

Baldwin, B. G., D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken (eds.). 2012. The Jepson Manual: Vascular Plants of California. Second edition, revised. Berkeley: University of California Press.

Barnhart, R. A. 1986. Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Pacific Southwest)–Steelhead. June. U.S. Fish and Wildlife Service Biological Report 82 (11.60). U.S. Army Corps of Engineers. (TR EL-82-4.) 21 pp.

Barr, C. B. 1991. The Distribution, Habitat, and Status of the Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus*. U.S. Fish and Wildlife Service. Sacramento, California.

Behnke, R. J. 1992. Native Trout of Western North America. American Fisheries Society, Bethesda, Maryland.

Bennett, W. A. 2005. Critical Assessment of the Delta Smelt Population in the San Francisco Estuary, California. San Francisco Estuary and Watershed Science [online serial] 3(2), Article 1.

Bisson, P. B. and R. E. Bilby. 1982. Avoidance of Suspended Sediment by Juvenile Coho Salmon. *North American Journal of Fisheries Management* 2: 371-374.

Brandes and McLain. 2001. Juvenile Chinook Salmon Abundance, Distribution, and Survival in the Sacramento–San Joaquin Estuary. Contributions to the Biology of Central Valley Salmonids. R. L. Brown (ed.) California Department of Fish and Game. (Fish Bulletin 179.) Vol. 2:39–138.

California Department of Fish and Game. 1965. California Fish and Wildlife Plan. Volumes 1–3. Inland Fisheries Division, Sacramento, California.

———. 1998. Report to the Fish and Game Commission. A Status Review of the Spring-Run Chinook Salmon (*Oncorhynchus tshawytscha*) in the Sacramento River Drainage. (Candidate Species Status Report 98-01.)

———. 2002. California Department of Fish and Game comments to the National Marine Fisheries Service regarding green sturgeon listing. Sacramento, California.

———. 2008. California Aquatic Invasive Species Management Plan. January. Available: https://www.wildlife.ca.gov/Conservation/Invasives/Plan. Accessed: December 2, 2019.

California Department of Fish and Wildlife. 2019. California Natural Diversity Database, RareFind 5. Version 5.2.14. Search of the Sacramento West, Clarksburg, Saxon, Rio Linda, Sacramento East, Florin, Taylor Monument, Grays Bend, and Davis USGS 7.5-minute quadrangles. Accessed: September 23, 2019.

California Department of Transportation. 2015. Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish. November. Sacramento, California. Available: http://www.dot.ca.gov/hq/env/bio/files/bio_tech_guidance_hydroacoustic_effects_110215.pdf.

California Department of Water Resources. 1995. Sacramento-San Joaquin Delta Atlas.

———. 2012a. Central Valley Flood Protection Plan: Levee Vegetation Management Strategy. DWR Division of Flood Management. March 9. Available: http://www.water.ca.gov/cvfmp/docs/CVFPP_LeveeVegMgmt_20120309.pdf. Accessed: February 16, 2015.

———. 2012b. Urban Levee Design Criteria. May. Available: https://water.ca.gov/LegacyFiles/floodsafe/leveedesign/ULDC_May2012.pdf. Accessed: December 2, 2019.

California Invasive Plant Council. 2012. Preventing the Spread of Invasive Plants: Best Management Practices for Transportation and Utility Corridors. Berkeley, California. Available: http://www.cal-ipc.org/resources/library/publications/tuc/. Accessed: January 17, 2018.

———. 2018. The Cal-IPC Inventory. Berkeley, California. Available: http://www.cal-ipc.org/plants/inventory/. Accessed: January 17, 2018.

California Native Plant Society. 2019. Inventory of Rare and Endangered Plants (Online edition, Version v8-03 0.39). Search of the Sacramento West, Clarksburg, Saxon, Rio Linda, Sacramento East, Florin, Taylor Monument, Grays Bend, and Davis USGS 7.5-minute quadrangles. Available: http://www.rareplants.cnps.org. Accessed: September 23, 2019.

Carrasquero, J. 2001. Overwater Structures: Freshwater Issues. Seattle, Washington: Herrera Environmental Consultants, for Washington Department of Fish and Wildlife, Washington Department of Ecology, Washington Department of Transportation.

Central Valley Regional Water Quality Control Board. 2018. The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region. Fifth edition, revised May 2018 (with approved amendments). Available: https://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/sacsjr_201805.pdf. Accessed: October 2020.

City of Sacramento. 2015. City of Sacramento 2030 General Plan. Adopted March 3, 2009. Available: http://www.cityofsacramento.org/-/media/Corporate/Files/CDD/Planning/General-Plan/2035-GP/Environmental-Resources.pdf?la=en. Accessed: June 17, 2015.

City of West Sacramento. 2016. City of West Sacramento General Plan Policy Document. Approved: November 2016. Available: http://www.cityofwestsacramento.org/civica/filebank/blobdload.asp?BlobID=14460. West Sacramento, California.

Colway, C. and D. E. Stevenson. 2007. Confirmed Records of Two Green Sturgeon from the Bering Sea and Gulf of Alaska. *Northwestern Naturalist* 88: 188–192.

Cramer, S. P. and D. B. Demko. 1997. The Status of Late-Fall and Spring Chinook Salmon in the Sacramento River Basin regarding the Endangered Species Act. Special Report. Submitted to National Marine Fisheries Service on behalf of Association of California Water Agencies and California Urban Water Agencies. Prepared by S. P. Cramer and Associates, Inc., Gresham, Oregon.

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. (Wetlands Research Program Technical Report Y-87-1 [on-line edition]). January. Available at: https://usace.contentdm.oclc.org/digital/collection/p266001coll1/id/4532/. Accessed: October 21, 2020.

Fisher, F. 1994. Past and Present Status of Central Valley Chinook Salmon. *Conservation Biology* 8(3): 870–873.

Fisheries Hydroacoustic Working Group. 2008. Agreement in Principal for Interim Criteria for Injury to Fish from Pile Driving Activities. Memorandum to NOAA Fisheries, U.S. Fish and Wildlife Service, California/Washington/Oregon Departments of Transportation, California Department of Fish and Game, and U.S. Federal Highways Administration. Dated June 12, 2008.

Hastings, M. C. and A. N. Popper. 2005. Effects of Sound on Fish. Prepared for Jones & Stokes and the California Department of Transportation. Sacramento, California.

Hallock, R. J., W. F. Van Woert, and L. Shapovalov. 1961. An Evaluation of Stocking Hatchery-Reared Steelhead Rainbow Trout (*Salmo gairdnerii gairdnerii*) in the Sacramento River System. (California Department of Fish and Game Fish Bulletin 114.) 74 pp.

Healey, M. C. 1991. Life History of Chinook Salmon (*Oncorhynchus tshawytscha*). pp. 311–393. In: C. Groot and L. Margolis (eds.), Pacific Salmon Life Histories. Vancouver, British Columbia: UBC Press. 564 pp.

Heublein, J. C., J. T. Kelly, C. E. Crocker, A. P. Klimley, and S. T. Lindley. 2009. Migration of Green Sturgeon *Acipenser medirostris* in the Sacramento River. *Environmental Biology of Fishes* Vol. 84. pp. 245–258.

Hill, K. A. and J. D. Webber. 1999. Butte Creek Spring-Run Chinook Salmon, *Oncorhynchus tshawytscha*, Juvenile Outmigration and Life History 1995–1998. (Inland Fisheries Administrative Report No. 99-5.) California Department of Fish and Game, Sacramento Valley and Central Sierra Region, Rancho Cordova, California.

Klimley, A. P., E. D. Chapman, J. J. Cech, D. E. Cocherell, N. A. Fangue, M. Gingras, Z. Jackson, E. A. Miller, E. A. Mora, J. B. Poletto, A. M. Schreier, A. Seesholtz, K. J. Sulak, M. J. Thomas, D. Woodbury, and M. T. Wyman. 2015. Sturgeon in the Sacramento-San Joaquin Watershed: New Insights to Support Conservation and Management. *San Francisco Estuary and Watershed Science* 13: 1–19.

Lichvar, Robert W. and Shawn M. McColley. 2008. A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States. A Delineation Manual. August. U.S. Army Corps of Engineers, Engineer Research and Development Center. Available: https://www.spk.usace.army.mil/Portals/12/documents/regulatory/pdf/Ordinary_High_Watermark_Manual_Aug_2008.pdf. Accessed: October 21, 2020.

Lloyd, D. S., J. P. Koenings, and J. D. La Perriere. 1987. Effects of Turbidity in Fresh Waters of Alaska. *North American Journal of Fisheries Management*.

McCauley, R. D., J. Fewtrell, and A. N. Popper. 2003. High Intensity Anthropogenic Sound Damages Fish Ears. *Journal of the Acoustical Society of America* 113: 638–642.

Maslin, P., J. Kindopp, and W. McKenney. 1997. Intermittent Streams as Rearing Habitat for Sacramento River Chinook Salmon (*Oncorhynchus tshawytscha*). Report to U.S. Fish and Wildlife Service. (Grant # 1448-0001-96729.) 95 pp.

McEwan, D. R. 2001. Central Valley Steelhead. In: R. Brown (ed.). Contributions to the Biology of Central Valley Salmonids. (California Department of Fish and Game Fish Bulletin No. 179.)

McEwan, D. and T. A. Jackson. 1996. Steelhead Restoration and Management Plan for California. Management Report. California Department of Fish and Game, Inland Fisheries Division, Sacramento, California.

Meehan, W. R. and T. C. Bjornn. 1991. Salmonid Distributions and Life Histories. Pages 47–82 in W. R. Meehan (ed.). Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. (American Fisheries Society Special Publication No. 19.) Bethesda, Maryland.

Merz, J. E., S. Hamilton, P. S. Bergman, and B. Cavallo. 2011. Spatial Perspective for Delta Smelt: a Summary of Contemporary Survey Data. *California Fish and Game* 97(4): 164–189.

Mitro, M. G. and A. V. Zale. 2002. Estimating Abundances of Age-0 Rainbow Trout by Mark-Recapture in a Medium-Sized River. *North American Journal of Fisheries Management* 22: 188–203.

Mora, E. A., R. D. Battleson, S. T. Lindley, M. J. Thomas, R. Bellmer, L. J. Zarri, and A. P. Klimley. 2018. Estimating the Annual Spawning Run Size and Population Size of the Southern Distinct Population Segment of Green Sturgeon. *Transactions of the American Fisheries Society* 147: 195–203.

Moyle, P. 2002. Inland Fishes of California. Berkeley: University of California Press.

Moyle, P. B., P. J. Foley, and R. M. Yoshiyama. 1992. Status of Green Sturgeon, *Acipenser medirostris*, in California. Final report sent to NMFS, Terminal Island, California by UC Davis Department of Wildlife and Fisheries Biology.

Moyle, P. B., R. M. Quiñones, J. V. Katz and J. Weaver. 2015. Fish Species of Special Concern in California. Sacramento: California Department of Fish and Wildlife. Available: https://www.wildlife.ca.gov.

Musick, J. A., M. M. Harbin, S. A. Berkeley, G. H. Burgess, A. M. Eklund, L. Findley, R. G. Gilmore, J. T. Golden, D. S. Ha, G. R. Huntsman, J. C. McGovern, S. J. Parker, S. G. Poss, E. Sala, T. W. Schmidt, G. R. Sedberry, H. Weeks, and S. G. Wright. 2000. Marine, Estuarine, and Diadromous Fish Stocks at Risk of Extinction in North America (exclusive of Pacific Salmonids). *Fisheries* 25: 6–30.

Nakamoto, R. J., T. T. Kisanuki, and G. H. Goldsmith. 1995. Age and Growth of Klamath River Green Sturgeon (*Acipenser medistrostris*). Funded by U.S. Fish and Wildlife Service, Klamath River Fishery Resource Office. Yreka, California. (Project 93-FP-13.)

National Invasive Species Council. 2008. *National Invasive Species Management Plan*. Available: http://www.invasivespecies.gov/home_documents/2008-2012%20National%20Invasive%20Species%20Management%20Plan.pdf.

National Marine Fisheries Service. 1998. Endangered and Threatened Species: Threatened Status for Two ESUs of Steelhead in Washington, Oregon, and California. Federal Register 63: 13347.

———. 2003. Endangered and Threatened Wildlife and Plants: 12-Month Finding on a Petition to List North American Green Sturgeon as a Threatened or Endangered Species. Federal Register 68: 4433–4441.

———. 2006. Biological Opinion for the Sacramento River Bank Protection Project, 14 Critical Levee Erosion Repairs. Prepared for the U.S. Army Corps of Engineers, Sacramento District, California.

———. 2009a. Public Draft Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-Run Chinook Salmon and Central Valley Spring-Run Chinook

Salmon and the Distinct Population Segment of Central Valley Steelhead. Sacramento Protected Resources Division. October.

_____. 2009b. Biological Opinion for the Dumbarton Bridge Seismic Retrofit Project. Southwest Region, Long Beach, CA. (2009/02486.)

———. 2014. Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-Run Chinook Salmon and Central Valley Spring-Run Chinook Salmon and the Distinct Population Segment of California Central Valley Steelhead. California Central Valley Office, Sacramento, California. July.

———. 2018. Recovery Plan for the Southern Distinct Population Segment of North American Green Sturgeon (*Acipenser medirostris*). California Central Valley Office. Sacramento, California.

———. 2020. NMFS Species List for the Broadway Bridge Project for the Sacramento West, California, USGS 7.5 minute topographic quadrangle map (Quadrangle Number: 38121-E5). October 21, 2020.

Natural Resources Conservation Service. 2003. California State-Listed Noxious Weeds. Available: http://plants.usda.gov/java/noxious?rptType=State&sort=sciname&statefips=06. Accessed: January 17, 2018.

———. 2010. United States Department of Agriculture. Federal Noxious Weed List. Available: http://www.aphis.usda.gov/plant_health/plant_pest_info/weeds/downloads/weedlist.pdf. Accessed: January 17, 2018. Last Updated: March 21, 2017.

———. 2019. United States Department of Agriculture, Soil Survey Staff. Web Soil Survey. Available: http://websoilsurvey.nrcs.usda.gov/. Accessed: October 8, 2019. Last updated: September 16, 2019 (Sacramento County and Yolo County).

Nobriga, M. L., T. R. Sommer, F. Feyrer, and D. Fleming. 2008. Long-Term Trends in Summertime Habitat Suitability for Delta Smelt (*Hypomesus transpacificus*). *San Francisco Estuary and Watershed Science* 6(1): 1–13.

Pacific Fishery Management Council. 2014. Identification and Description of Essential Fish Habitat, Adverse Impacts, and Recommended Conservation Measures for Salmon. Appendix A to the Pacific Coast Salmon Fishery Management Plan as Modified by Amendment 18 to the Pacific Coast Salmon Plan. September. Portland, Oregon. Available: http://www.pcouncil.org/wp-content/uploads/Salmon_EFH_ Appendix_A_FINAL_September-25.pdf.

———. 2016. Pacific Coast Salmon Fishery Management Plan, for Commercial and Recreational Salmon Fisheries off the Coasts of Washington, Oregon, and California as Revised through Amendment 19 (effective March 2016). Portland, Oregon. March.

Available: http://www.pcouncil.org/wp-content/uploads/2016/03/FMP-through-A-19_Final.pdf.

Popper, A. N., T. J. Carlson, A. D. Hawkins, B. L. Southall, and R. L. Gentry. 2006. Interim Criteria for Injury of Fish Exposed to Pile Driving Operations: A White Paper.

Popper, A. N. and M. C. Hastings. 2009. The Effects of Human-Generated Sound on Fish. *Integrative Zoology* 4: 43–52.

Poytress, W. R., J. J. Gruber, J. P. Van Eenennaam, and M. Gard. 2015. Spatial and Temporal Distribution of Spawning Events and Habitat Characteristics of Sacramento River Green Sturgeon. *Transactions of the American Fisheries Society* 144: 6, 1129–1142.

Raleigh, R. F., T. Hickman, R. C. Soloman, and P. C. Nelson. 1984. Habitat Suitability Information: Rainbow Trout. (Biological Report 82[10.60].) U.S. Fish and Wildlife Service. Washington, D. C.

Reynolds, F. L., T. Mills, R. Benthin, and A. Low. 1993. Central Valley Anadromous Fisheries and Associated Riparian and Wetlands Areas Protection and Restoration Action Plan. Draft. California Department of Fish and Game, Inland Fisheries Division. Sacramento, California.

Seesholtz, A. M., M. J. Manuel, and J. P. Van Eenennaam. 2015. First Documented Spawning and Associated Habitat Conditions for Green Sturgeon in the Feather River, California. *Environmental Biology of Fishes* 98: 905–912.

Sigler, J. W., T. C. Bjornn, and F. H. Everest. 1984. Effects of Chronic Turbidity on Densities and Growth of Steelheads and Coho Salmon. *Transactions of the American Fisheries Society* 113: 142–150.

Simpson, S. D., A. N. Radford, S. L. Nedelec, M. C. Ferrari, D. P. Chivers, M. I. McCormick, and M. G. Meekan. 2016. Anthropogenic Noise Increases Fish Mortality by Predation. *Nature Communications* 7: 10544.

Snider, B. and R. G. Titus. 2000. Timing, Composition, and Abundance of Juvenile Anadromous Salmonid Emigration in the Sacramento River near Knights Landing, October 1996–September 1997. California Department of Fish and Game, Habitat Conservation Division. (Stream Evaluation Program Technical Report No. 00-04.) Sacramento, California

Sommer, T. R., M. L. Nobriga, W. C. Harrell, W. Batham, and W. J. Kimmerer. 2001. Floodplain Rearing of Juvenile Chinook Salmon: Evidence of Enhanced Growth and Survival. *Canadian Journal of Fisheries and Aquatic Sciences* 58: 325–333.

Sommer, T., F. Mejia, M. Nobriga, F. Feyrer, and L. Grimaldo. 2011. The Spawning Migration of Delta Smelt in the Upper San Francisco Estuary. *San Francisco Estuary and Watershed Science* 9(2): 1–16.

State Water Resources Control Board. 2011. 2010 Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report) — Statewide. Available: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml. Accessed: April 10, 2015.

Stillwater Sciences. 2006. Napa River Fisheries Monitoring Program. (Contract # DACW05-01-C-0015.) Final report. Prepared by Stillwater Sciences, Davis, California for U.S. Army Corps of Engineers, Sacramento California.

Tabor, R. A., G. S. Brown, and V. T. Luiting. 2001. The Effect of Light Intensity on Sockeye Salmon Fry Migratory Behavior and Predation by Cottids in the Cedar River, Washington. *North American Journal of Fisheries Management* 24: 128–145.

Tuvikene, A. 1995. Responses of Fish to Polycyclic Aromatic Hydrocarbons (PAHs). *Annales Zoologici Fennici* 32: 295–309.

U.S. Army Corps of Engineers. 2000. Biological Assessment for the Sacramento River Bank Protection Project; 42E, Proposed Levee Reconstruction at River Mile 149.0, Colusa County, California and at Five Other Sites along the Mainstem Sacramento River. U.S. Army Corps of Engineers, Sacramento, California.

———. 2005. Ordinary High Water Mark Identification. (Regulatory Guidance Letter No. 05-05.) December. Available: http://www.usace.army.mil/Portals/2/docs/civilworks/RGLS/rgl05-05.pdf.

———. 2008. Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Arid West Region (Version 2.0). J. S. Wakeley, R. W. Lichvar, and C.V. Noble (eds.). (ERDC/EL TR-08-28.) Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center.

———. 2014. Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures. (Technical Letter No. ETL 1110-2-583.) April. Washington, D. C.

U.S. Environmental Protection Agency. 2018. Surf Your Watershed, Lower Sacramento Watershed—18020109. Available: http://cfpub.epa.gov/surf/huc.cfm?huc_code=18020109. Last updated: 3-1-18. Accessed: March 1, 2018.

U.S. Fish and Wildlife Service. 1992. Shaded Riverine Aquatic Cover of the Sacramento River System: Classification as a Resource Category 1 under the FWS Mitigation Policy. October. Fish and Wildlife Enhancement, Sacramento Field Office. Sacramento, California.

———.1996. Recovery Plan for the Sacramento-San Joaquin Delta Native Fishes. Prepared by Delta Native Fishes Recovery Team, U.S. Fish and Wildlife Service, Region 1. Portland, Oregon. November 26.

———. 2004. Formal Programmatic Consultation on the Issuance of Section 10 and 404 Permits for Projects with Relatively Small Effects on the Delta Smelt (*Hypomesus transpacificus*) and Its Critical Habitat within the Jurisdiction of the Sacramento Fish and Wildlife Office of the U.S. Fish and Wildlife Service, California. (1-1-04-F-0345.) Sacramento, California.

———. 2006. Endangered Species Section 7 Consultation for the U.S. Army Corps of Engineers' Proposed Sacramento River Bank Protection Project, 14 Critical Erosion Sites along the Sacramento River and Steamboat Slough, California. (1-1-07-F-0060.) December.

———. 2015. Guidance to Ensure Consistent and Effective Application of the U.S. Fish and Wildlife Service Mitigation Policy. Available: http://www.fws.gov/policy/501fw2.html. Accessed: June 26, 2015.

———. 2017. Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*). U.S. Fish and Wildlife Service; Sacramento, California. 28 pp.

———. 2019. Sacramento trawls CHN-POD species 2012-Present (File Share). Available: https://www.fws.gov/lodi/juvenile_fish_monitoring_program/jfmp_index.htm. Accessed: November 7, 2019.

———. 2020. Information for Planning and Consultation (IPaC). List of threatened and endangered species that may occur in the proposed project, and/or may be affected by the proposed project. (Consultation Code OSESMF00-2017-SLI-1773.) Available: https://ecos.fws.gov/ipac/. Accessed: September 30, 2020.

Vincik, R. F. and J. M. Julienne. 2012. Occurrence of Delta Smelt (*Hypomesus transpacificus*) in the Lower Sacramento River near Knights Landing, California. California Fish and Game 98 (3): 171–174.

Voellmy, I. K., J. Purser, D. Flynn, P. Kennedy, S. D. Simpson, and A. N. Radford. 2014. Acoustic Noise Reduces Foraging Success in Two Sympatric Fish Species via Different Mechanisms. *Animal Behaviour* 89: 191–198.

Vogel, D. A. and K. R. Marine. 1991. Guide to Upper Sacramento River Chinook Salmon Life History. Prepared by CH2M Hill, Redding, California, for U.S. Bureau of Reclamation, Central Valley Project.

Wakeham, S. G., C. Schaffner, and W. Giger. 1980. Polycylic Aromatic Hydrocarbons in Recent Lake Sediments—I. Compounds Having Anthropogenic Origins. *Geochimica et Cosmochimica Acta* 44 (3): 403–413.

Wang, J. C. S. 1986. Fishes of the Sacramento-San Joaquin Estuary and Adjacent Waters, California: a Guide to the Early Life Histories. (Technical Report 9.) Prepared for the Interagency Ecological Study Program for the Sacramento-San Joaquin Estuary by

California Department of Water Resources, California Department of Fish and Game, U.S. Bureau of Reclamation, and U.S. Fish and Wildlife Service.

———. 1991. Early Life Stages and Early Life History of the Delta Smelt, *Hypomesus transpacificus,* in the Sacramento-San Joaquin Estuary, with Comparison of Early Life Stages of the Longfin Smelt, Spirinchus thaleichthys. (Technical Report 28.) Interagency Ecological Studies Program for the Sacramento-San Joaquin Estuary.

Wang, J. C. S. and R. L. Brown. 1993. Observations of Early Life Stages of Delta Smelt, *Hypomesus transpacificus,* in the Sacramento–San Joaquin Estuary in 1991, with a Review of Its Ecological Status in 1988 to 1990. (Technical Report 35.) November.

Waters, T. F. 1995. Sediment in Streams—Sources, Biological Effects and Control. *American Fisheries Society Monograph 7*. Bethesda, Maryland. 251 pp.

Western Regional Climate Center. 2012. Sacramento Executive Airport: Normals, Means, and Extremes Temperatures. Available: http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca7633. Accessed: December 10, 2019.

———. 2016. Sacramento Executive Airport: Monthly Total Precipitation (inches). Available: http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca7633. Accessed: December 10, 2019.

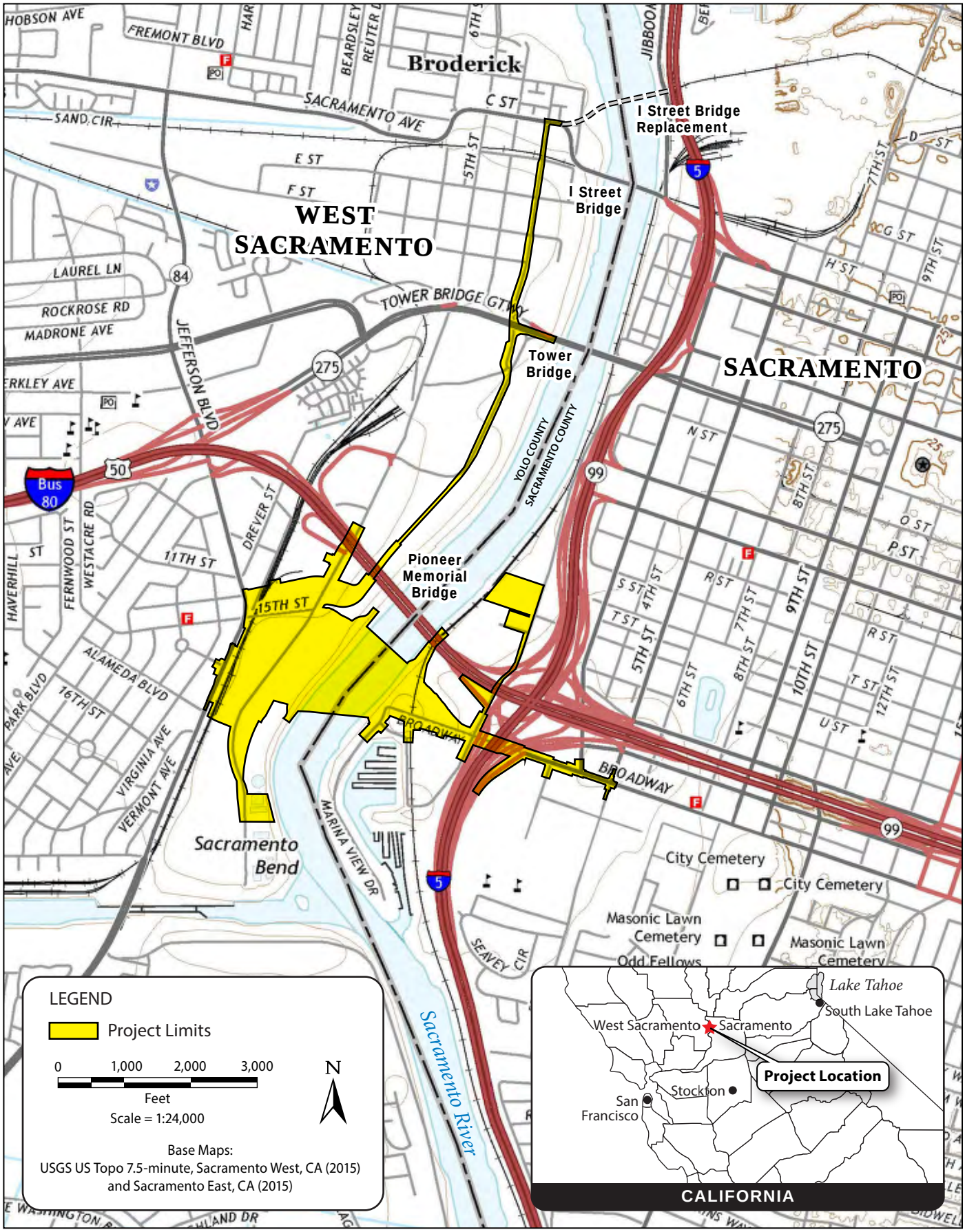
Yoshiyama, R. M., F. W. Fisher, and P. B. Moyle. 1998. Historical Abundance and Decline of Chinook Salmon in the Central Valley Region of California. *North American Journal of Fisheries Management* 18: 487–521.

6.2 Personal Communications

Beccio, M. 2018. Biologist. California Department of Fish and Wildlife. Report to Joel Heublein, National Marine Fisheries Service, regarding Yuba River Green Sturgeon.

Seesholtz, Alicia. Environmental Scientist, California Department of Water Resources. September 20, 2007—Phone conversation with Rick Wilder about fish use of the Feather River.

Appendix A
Figures



ICF Graphics ... 00205.17 NES (12-13-2019) tm

Figure 1
Site Location

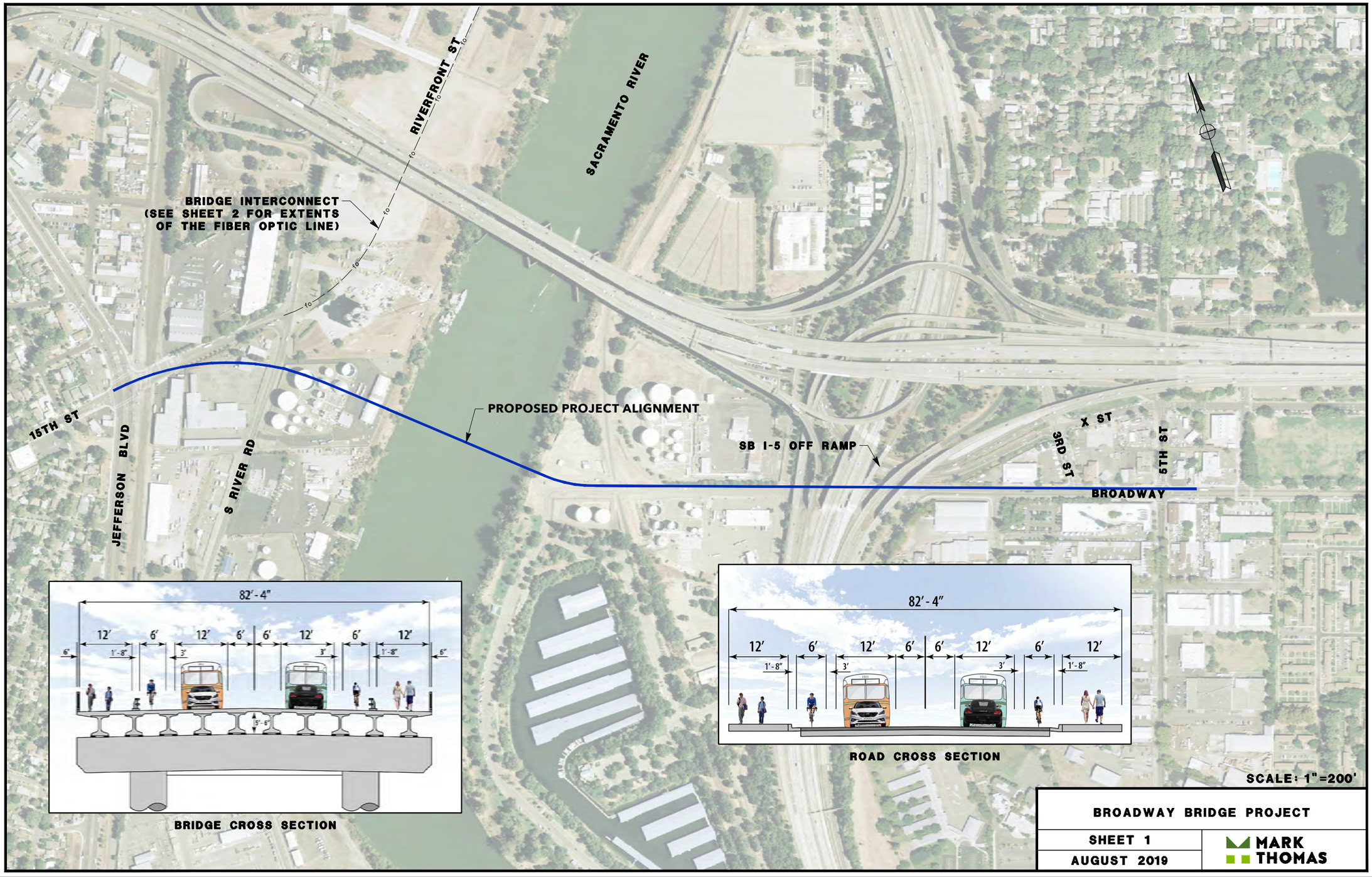


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Figure 2
Location of Proposed Project Alignment

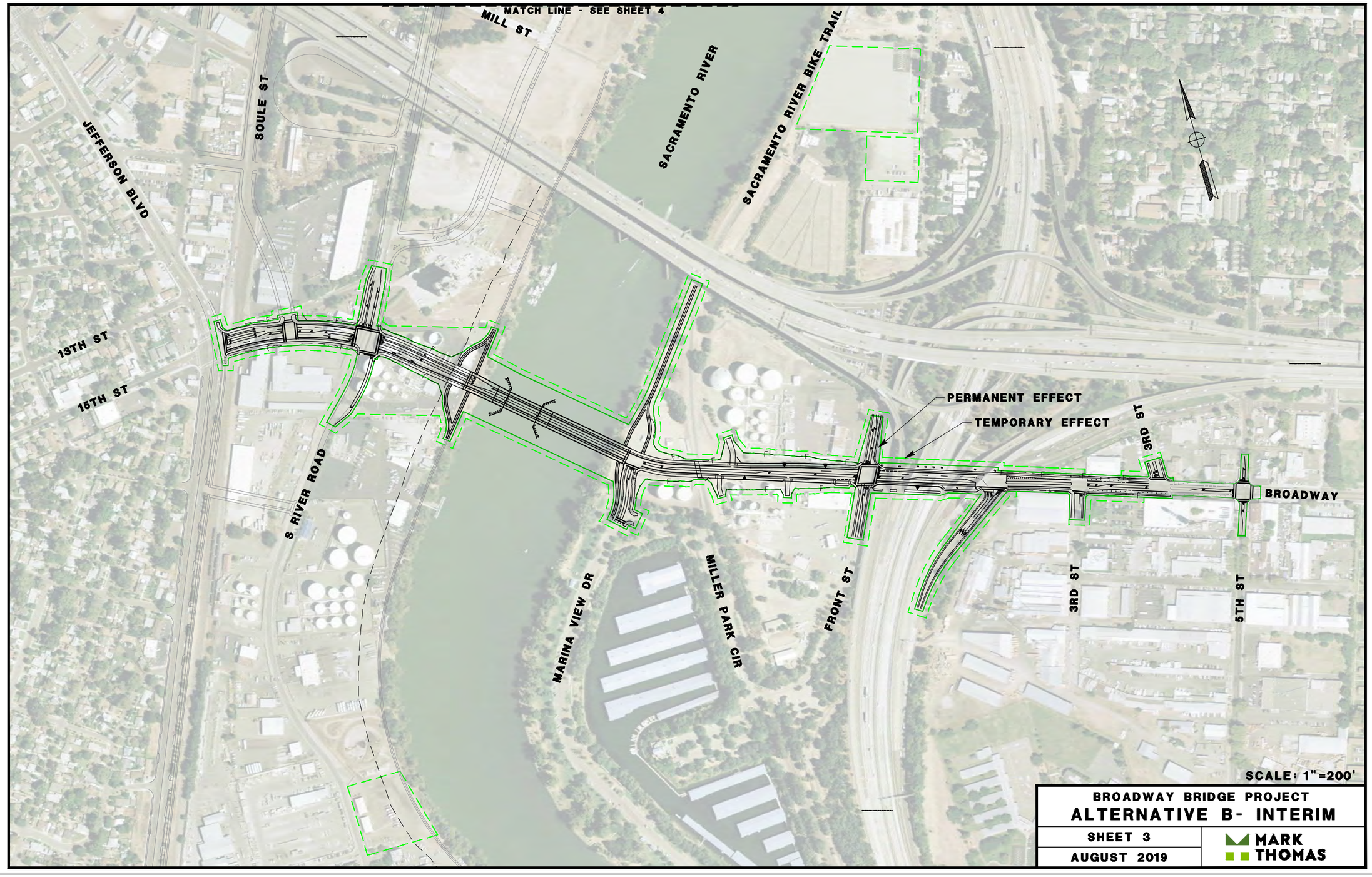

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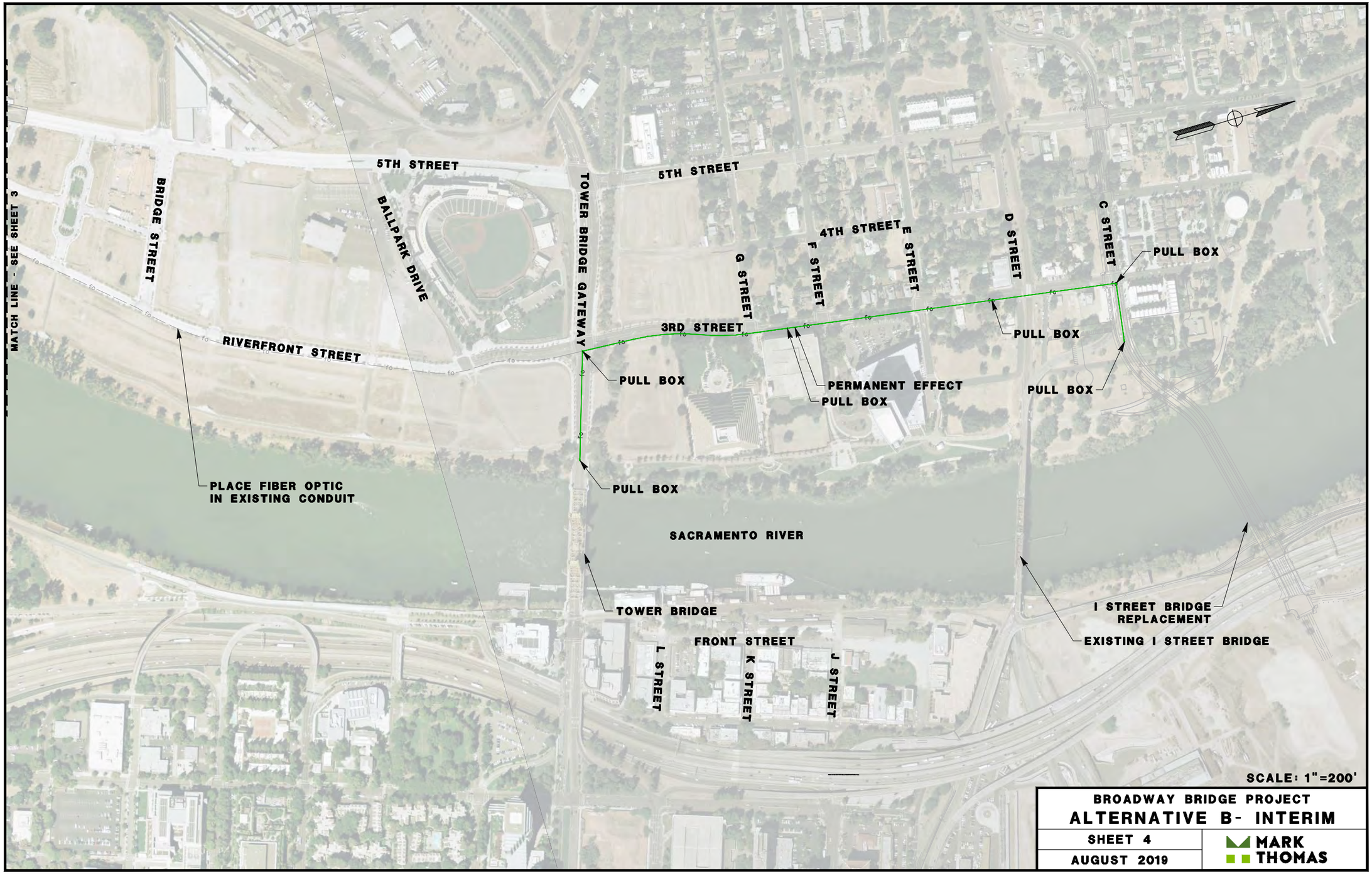
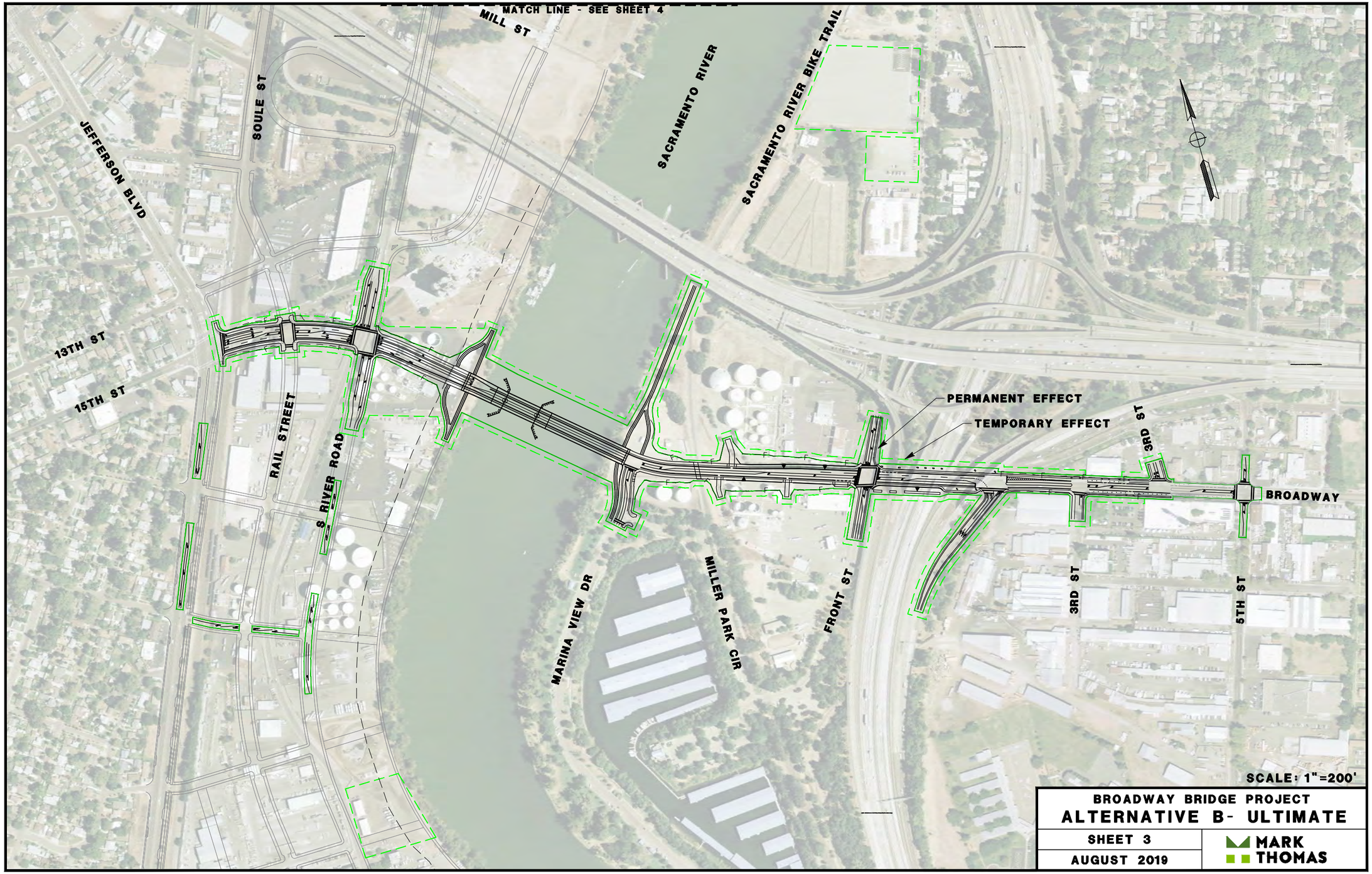
Figure 3a
Permanent and Temporary Project Footprint



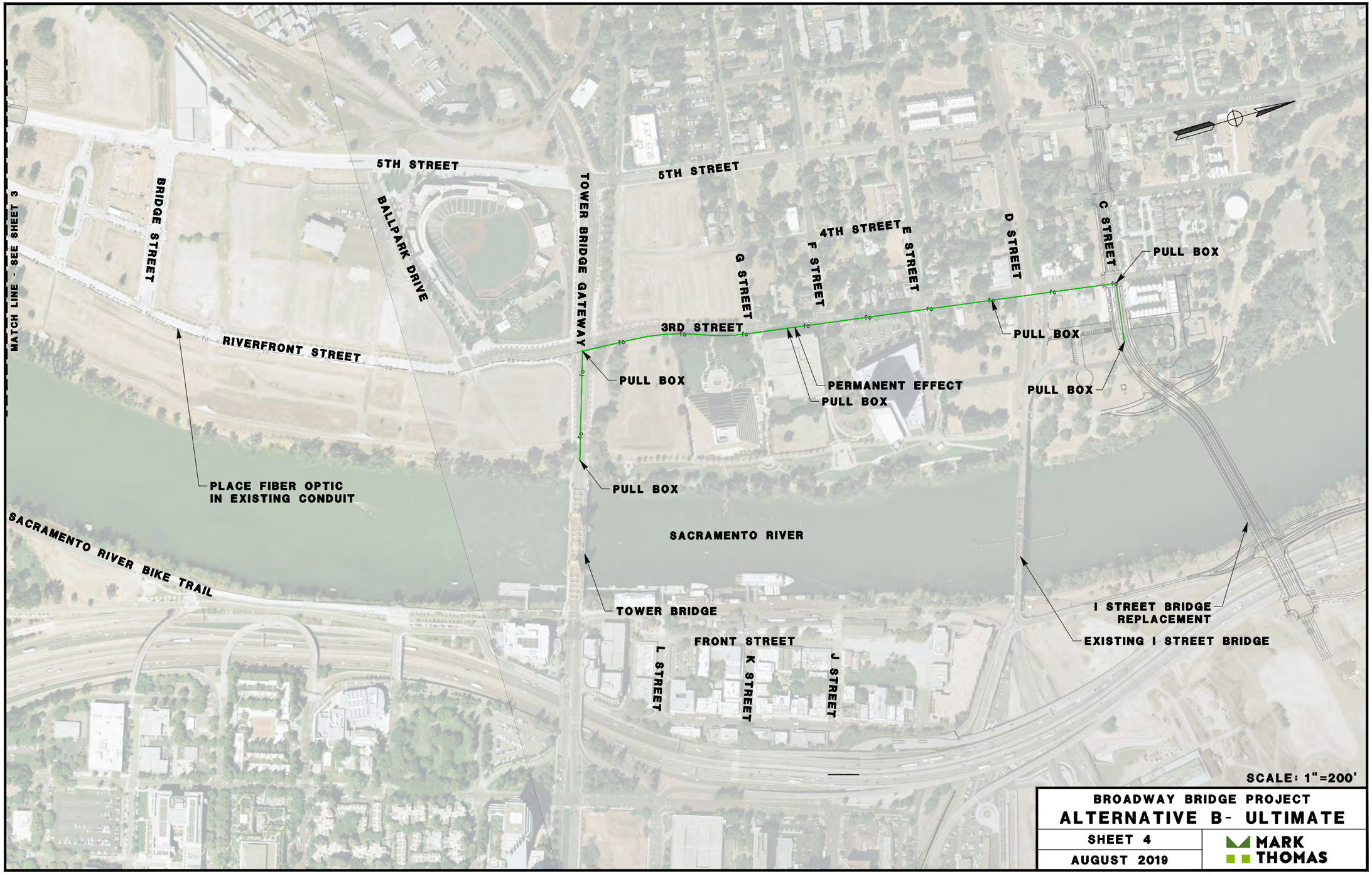
Graphics ... 60205.17 NES (10-26-20).IC

Figure 3b
Permanent and Temporary Project Footprint



Graphics: ...00205.17 NES\10-26-20 JC

Figure 3c
Permanent and Temporary Project Footprint



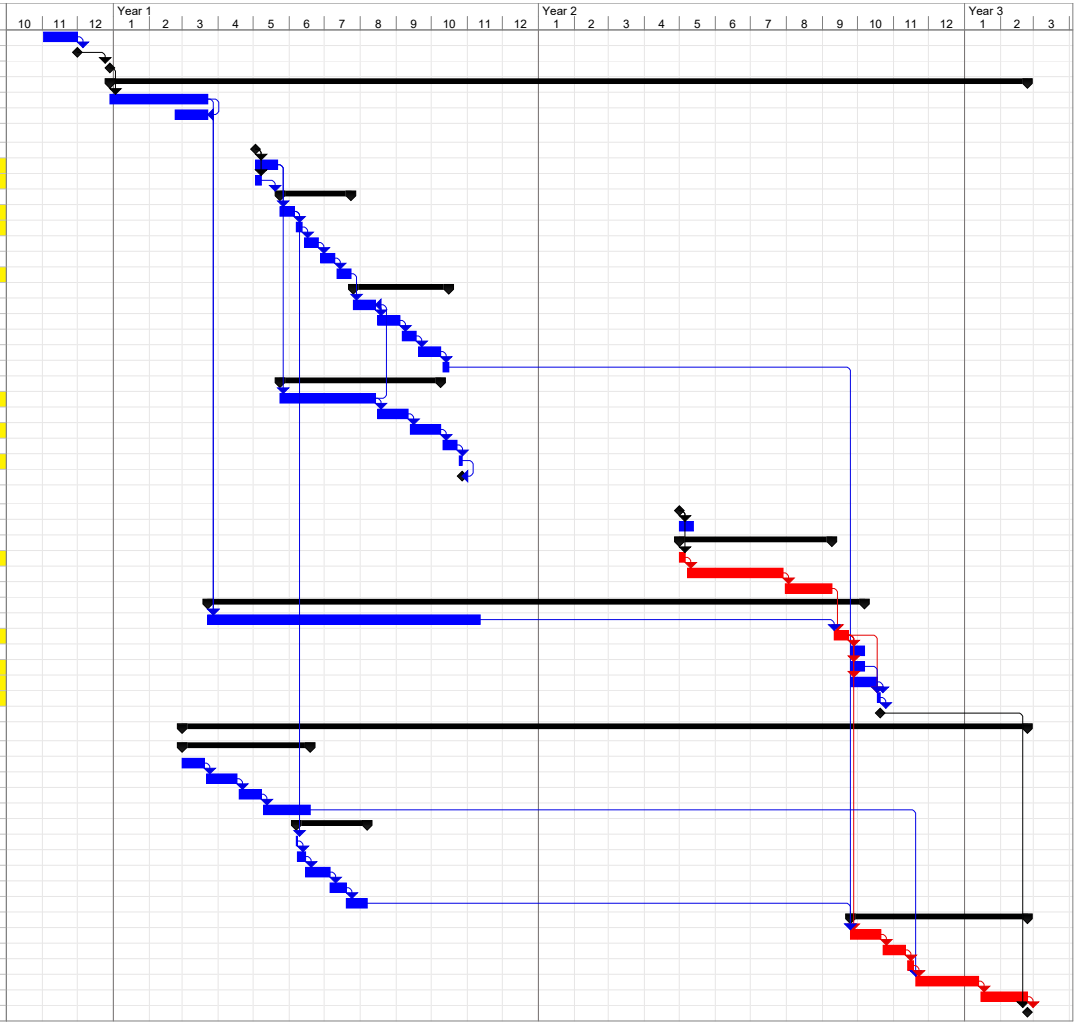
Graphics ... 60205.17 NES (10-26-20).IC

Figure 3d
Permanent and Temporary Project Footprint

Preliminary Bridge Construction Schedule

7-Day Work Week

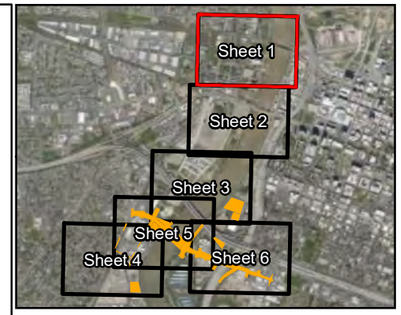
ID	Task Name	Duration	Start	Finish
1	Advertise	21 days	11/2	11/30
2	Bid Opening	0 days	11/30	11/30
3	Award	0 days	12/28	12/28
4	Working Days	564 days	12/29	2/23
5	Submittals/Shop Drawings	12 wks	12/29	3/22
6	Mobilize	4 wks	2/23	3/22
7	**In Water Work Season 1**	**127.5 days**	**5/3**	**10/27**
8	In Water Work Begins	0 days	5/3	5/3
9	Install Temp Constr Trestle From Bank to Piers	3 wks	5/3	5/21
10	Setup Barge	1 wk	5/3	5/7
11	Pier 4&5 Work (Fixed Span)	45 days	5/24	7/23
12	Cofferdam and Dewatering	2 wks	5/24	6/4
13	Pile Installation	1 wk	6/7	6/11
14	Form/Pour Pile Cap	2 wks	6/14	6/25
15	Column Construction	2 wks	6/28	7/9
16	Remove Cofferdam & Place Rock Slope Protection	2 wks	7/12	7/23
17	Approach Superstructure	60 days	7/26	10/15
18	Erect Precast Girders	3 wks	7/26	8/13
19	Form Overhangs & Diaphragms	3 wks	8/16	9/3
20	Deck Rebar & Pour	2 wks	9/6	9/17
21	Deck Cure	3 wks	9/20	10/8
22	Remove Overhang & Diaphragm formwork	1 wk	10/11	10/15
23	Pier 2&3 Work (Movable Span)	100 days	5/24	10/8
24	Vibrate/Drive Piles	12 wks	5/24	8/13
25	Set Cage & Cast Pile Shafts	4 wks	8/16	9/10
26	Form/Pour Cap for Shafts & Place Rock Slope Protection	4 wks	9/13	10/8
27	Remove Portion of Trestle (Leave Piles in Place)	2 wks	10/11	10/22
28	Remove Barges	0.5 wks	10/25	10/27
29	In Water Work Ends Season 1	0 days	10/27	10/27
30	**In Water Work Season 2**	**413.5 days**	**3/23**	**10/20**
31	In Water Work Begins	0 days	5/1	5/1
32	Install Temp Constr Trestle (except piling)	2 wks	5/1	5/12
33	Pier 3&4 Work	95 days	5/1	9/8
34	Setup Barges	1 wk	5/1	5/5
35	Erect Vertical Lift Towers	12 wks	5/8	7/28
36	Install and Test Bridge Operating Equipment	6 wks	7/31	9/8
37	Moveable Span	404 days	3/23	10/6
38	Construct Moveable Span (Offsite)	6 mons	3/23	11/11
39	Float in Moveable Span & Erect	2 wks	9/11	9/22
40	Make Moveable Span Operational	2 wks	9/25	10/6
41	Install Fender System & Piles	2 wks	9/25	10/6
42	Remove Trestle & Piles	17 days	9/25	10/17
43	Remove Barges	0.5 wks	10/18	10/20
44	In Water Work Ends Season 2	0 days	10/20	10/20
45	**Out of Water Work**	**520 days**	**3/1**	**2/23**
46	Approach Roadwork	80 days	3/1	6/18
47	Clearing and Grubbing	3 wks	3/1	3/19
48	Grading/Excavation	4 wks	3/22	4/16
49	Drainage, Utilities, Subgrade	3 wks	4/19	5/7
50	Paving	6 wks	5/10	6/18
51	Construct Abut 1/6	45 days	6/7	8/6
52	Excavate Abutment	0.2 wks	6/7	6/7
53	Drive Abut Piles	1 wk	6/8	6/14
54	Pour Abut	3 wks	6/15	7/5
55	Backfill Abutment	10 days	7/6	7/19
56	Approach Slabs	14 days	7/20	8/6
57	Approach Superstructure	110 days	9/25	2/23
58	Barriers, Median	4 wks	9/25	10/20
59	Lighting	3 wks	10/23	11/10
60	Joint Seals	1 wk	11/13	11/17
61	Finalize Roadway Conforms	8 wks	11/20	1/12
62	Punch List	6 wks	1/15	2/23
63	Bridge Construction Complete	0 days	2/23	2/23



Construction Activities with In-water Effects
Task
Critical Task
Milestone
Summary

ICF Graphics ... 00205.17 (10-26-20) JC

Figure 4
Preliminary Bridge Construction Schedule



Action Area

Fiber Optic Line

Land Cover

- Developed
- Landscaped
- Perennial Stream
- Riparian
- Riparian (Below OHWM)
- Ruderal
- Elderberry Shrub Location

Tree Locations*

- Black Locust
- Black Walnut
- Box Elder
- Fremont's Cottonwood
- Goodding's Black Willow
- Oregon Ash
- Sycamore
- Valley Oak
- White Alder
- Other

N

0 125 250 Feet

1:3,000

*Tree locations are approximate

Source: ICF (2019)

Figure 5
Land Cover and Project Impacts in the Action Area

Action Area

Fiber Optic Line

Land Cover

- Developed
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1:3,000

*Tree locations are approximate

Source: ICF (2019)

Figure 5
Land Cover and Project Impacts in the Action Area

Action Area

Project Footprint

- Permanent Impacts
- Temporary Impacts

Land Cover

- Developed
- Landscaped
- Perennial Stream
- Riparian
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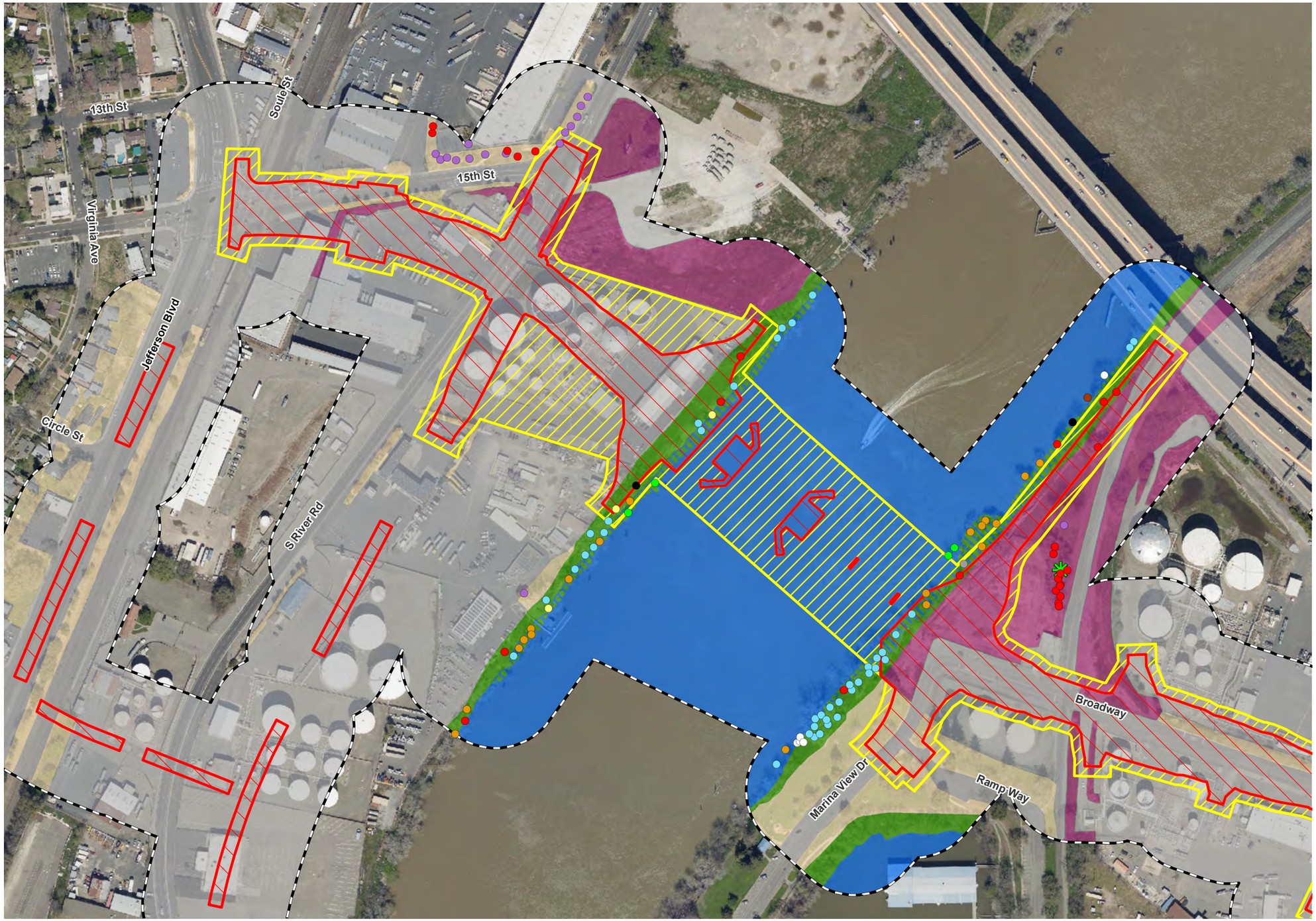

Action Area

Project Footprint

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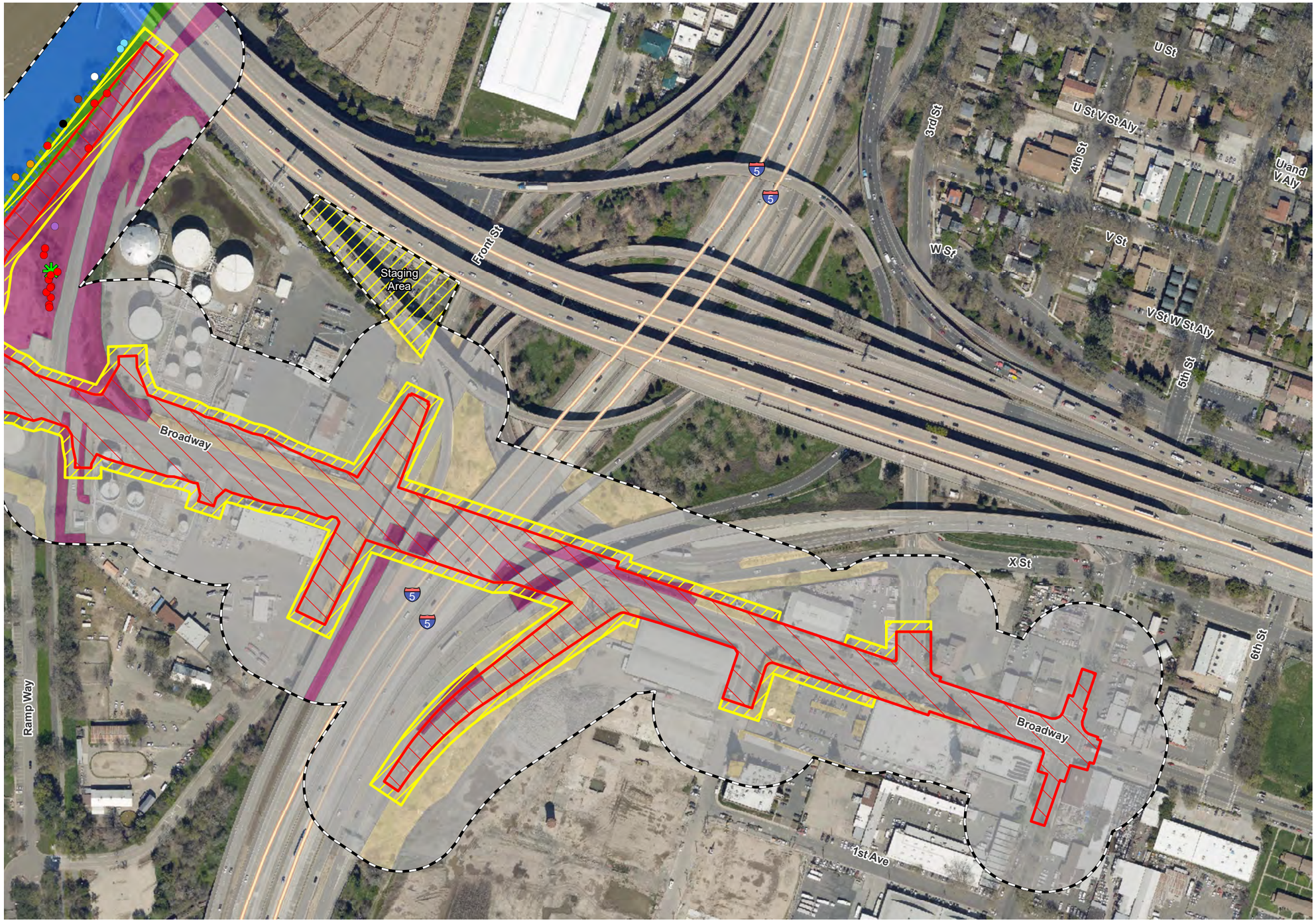

Action Area

Project Footprint

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N

0 125 250 Feet

1:3,000

*Tree locations are approximate

Source: ICF (2019)

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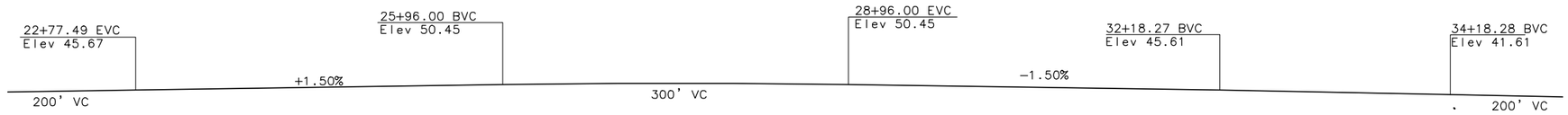
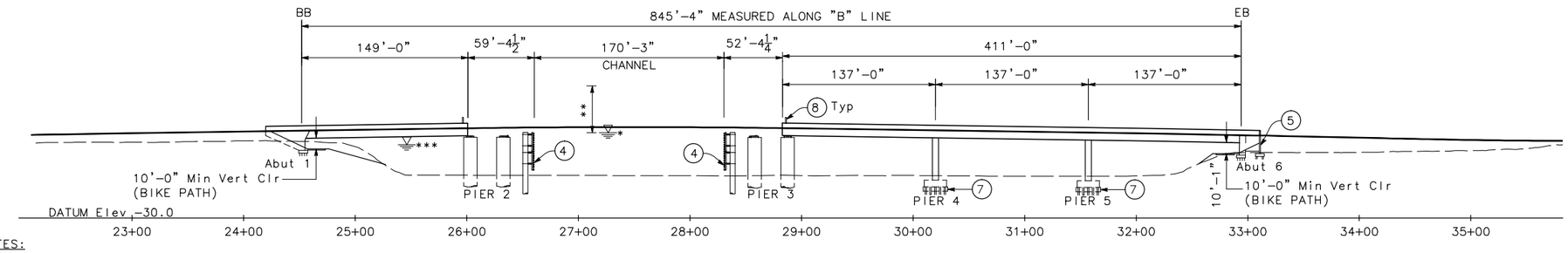
Figure 5
Land Cover and Project Impacts in the Action Area



PROFILE GRADE
NO SCALE



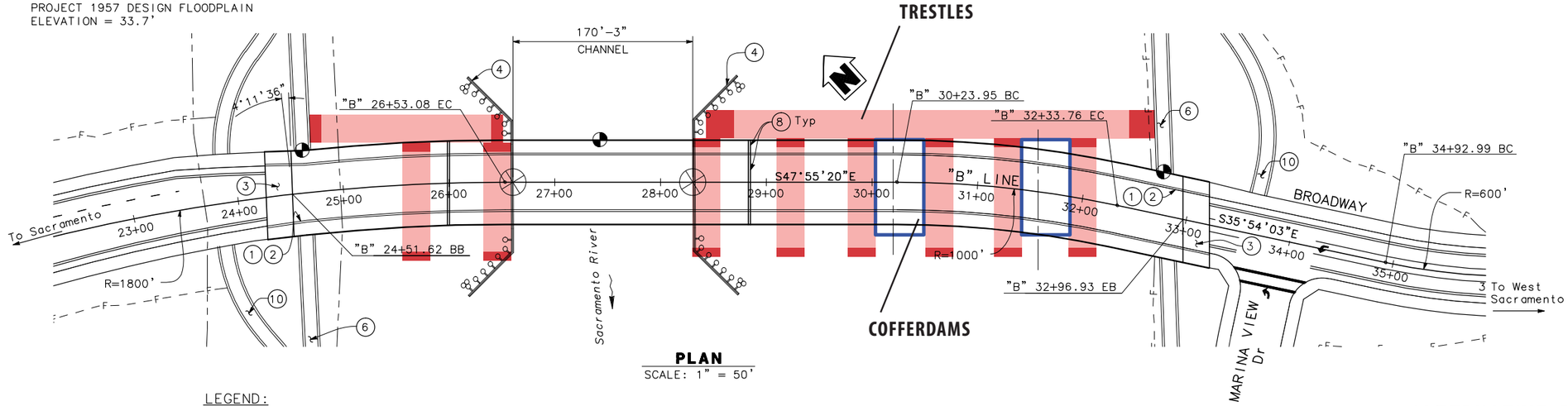
ELEVATION
SCALE: 1" = 50'

NOTES:

* − 200 YEAR WATER SURFACE ELEVATION = 36.4'

** − 3' Min Vert Clr LOWERED POSITION
55' Min Vert Clr RAISED POSITION

*** − SACRAMENTO RIVER FLOOD CONTROL PROJECT 1957 DESIGN FLOODPLAIN ELEVATION = 33.7'



PLAN
SCALE: 1" = 50'

LEGEND:

- ◓ POINT OF MINIMUM VERTICAL CLEARANCE
- (1) PAINT BRIDGE NAME
- (2) PAINT BRIDGE NUMBER
- (3) APPROACH SLAB
- (4) FENDER SYSTEM
- (5) RETAINING WALL
- (6) BIKE PATH
- (7) SEAL COURSE
- (8) TRAFFIC/PEDESTRIAN GATE & WARNING SIGNAL
- (9) LEVEE CUTOFF WALL
- (10) ACCESS ROAD
- (11) RSP

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT
03	YOL/SAC	"B"	N/A

CITY OF WEST SACRAMENTO
1110 WEST CAPITOL AVENUE
WEST SACRAMENTO, CA 95691

MARK THOMAS
701 UNIVERSITY AVE, SUITE 200
SACRAMENTO, CA 95825

MODJESKI AND MASTERS, INC.
100 STERLING PARKWAY, SUITE 302
MECHANICSBURG, PA 17050

ALTERNATIVE B

DESIGNED BY J. HICKEY	DATE 2-27-18	E. FREDRICKSON PROJECT ENGINEER	BROADWAY BRIDGE PROJECT
DRAWN BY J. DOTY	DATE 2-27-18		GENERAL PLAN
CHECKED BY	DATE		BRIDGE NO. XXX / UNIT:
APPROVED	DATE		SCALE: AS SHOWN / PROJECT NUMBER & PHASE: 03-XXXXXX

CONTRACT NO.: X PROJECT ID: 00000000000

ADVANCE PLANNING STUDY SHEET (ENGLISH) (REV. 7/16/10)

FILE => GP_B.DWG

USERNAME => JDOTY DATE PLOTTED => 28-Feb-18 TIME PLOTTED => 11:07 AM

Graphics ... 0020517 NES (10-26-20) JC

Figure 6
Proposed Broadway Bridge: Plan View, Profile, Elevation

Appendix B
Species Lists

From: Taylor, Brooks M@DOT
To: NMFSWCRCA Specieslist - NOAA Service Account
Cc: Kozlowski, Jeff
Subject: Broadway Bridge 5447 (043)
Date: Wednesday, October 21, 2020 1:14:25 PM
Attachments: image003.png

Federal Agency: Federal Highway Administration – California Division

Federal Agency Address: 650 Capitol Mall, Suite 4-100, Sacramento, CA 95814-4708

Non-Federal Agency Representative: California Department of Transportation

Non-Federal Agency Representative Address: 703 B Street, Marysville, CA 95901

City of West Sacramento Broadway bridge replacement 5447 (043)
Point-of-Contact Brooks Taylor, brooks_taylor@dot.ca.gov, (530) 741-4449

Quad Name **Sacramento West**

Quad Number **38121-E5**

ESA Anadromous Fish

SONCC Coho ESU (T) -
CCC Coho ESU (E) -
CC Chinook Salmon ESU (T) -
CVSR Chinook Salmon ESU (T) - **X**
SRWR Chinook Salmon ESU (E) - **X**
NC Steelhead DPS (T) -
CCC Steelhead DPS (T) -
SCCC Steelhead DPS (T) -
SC Steelhead DPS (E) -
CCV Steelhead DPS (T) - **X**
Eulachon (T) -
sDPS Green Sturgeon (T) - **X**

ESA Anadromous Fish Critical Habitat

SONCC Coho Critical Habitat -
CCC Coho Critical Habitat -
CC Chinook Salmon Critical Habitat -
CVSR Chinook Salmon Critical Habitat - **X**
SRWR Chinook Salmon Critical Habitat - **X**
NC Steelhead Critical Habitat -
CCC Steelhead Critical Habitat -
SCCC Steelhead Critical Habitat -
SC Steelhead Critical Habitat -

CCV Steelhead Critical Habitat - X

Eulachon Critical Habitat -

sDPS Green Sturgeon Critical Habitat - X

ESA Marine Invertebrates

Range Black Abalone (E) -

Range White Abalone (E) -

ESA Marine Invertebrates Critical Habitat

Black Abalone Critical Habitat -

ESA Sea Turtles

East Pacific Green Sea Turtle (T) -

Olive Ridley Sea Turtle (T/E) -

Leatherback Sea Turtle (E) -

North Pacific Loggerhead Sea Turtle (E) -

ESA Whales

Blue Whale (E) -

Fin Whale (E) -

Humpback Whale (E) -

Southern Resident Killer Whale (E) -

North Pacific Right Whale (E) -

Sei Whale (E) -

Sperm Whale (E) -

ESA Pinnipeds

Guadalupe Fur Seal (T) -

Steller Sea Lion Critical Habitat -

Essential Fish Habitat

Coho EFH -

Chinook Salmon EFH - X

Groundfish EFH - X

Coastal Pelagics EFH -

Highly Migratory Species EFH -

MMPA Species (See list at left)

ESA and MMPA Cetaceans/Pinnipeds

See list at left and consult the NMFS Long Beach office 562-980-4000

MMPA Cetaceans -

MMPA Pinnipeds -

Brooks Taylor

Associate Environmental Planner
530-741-4449
530-521-9343 (Cell)
Eventually, all things merge into one, and a river runs through it. Norman Maclean

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
Phone: (916) 414-6600 Fax: (916) 414-6713

In Reply Refer To:
Consultation Code: 08ESMF00-2017-SLI-1773
Event Code: 08ESMF00-2020-E-09318
Project Name: Broadway Bridge

September 30, 2020

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, under the jurisdiction of the U.S. Fish and Wildlife Service (Service) that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Please follow the link below to see if your proposed project has the potential to affect other species or their habitats under the jurisdiction of the National Marine Fisheries Service:

http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
(916) 414-6600

This project's location is within the jurisdiction of multiple offices. Expect additional species list documents from the following office, and expect that the species and critical habitats in each document reflect only those that fall in the office's jurisdiction:

San Francisco Bay-Delta Fish And Wildlife
650 Capitol Mall
Suite 8-300
Sacramento, CA 95814
(916) 930-5603

Project Summary

Consultation Code: 08ESMF00-2017-SLI-1773

Event Code: 08ESMF00-2020-E-09318

Project Name: Broadway Bridge

Project Type: BRIDGE CONSTRUCTION / MAINTENANCE

Project Description: Construction of new bridge off of Broadway in Sacramento across the Sacramento River to West Sacramento.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/38.57704005752997N121.51308186662763W

Counties: Sacramento, CA | Yolo, CA

Endangered Species Act Species

There is a total of 8 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Least Bell's Vireo *Vireo bellii pusillus*	Endangered

There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/5945

Reptiles

NAME	STATUS
Giant Garter Snake *Thamnophis gigas*	Threatened

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/4482

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii*	Threatened

There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/2891
Species survey guidelines:
https://ecos.fws.gov/ipac/guideline/survey/population/205/office/11420.pdf

California Tiger Salamander *Ambystoma californiense*	Threatened

Population: U.S.A. (Central CA DPS)
There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/2076

Fishes

NAME	STATUS
Delta Smelt *Hypomesus transpacificus*	Threatened

There is **final** critical habitat for this species. Your location overlaps the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/321

Insects

NAME	STATUS
Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus*	Threatened

There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/7850
Habitat assessment guidelines:
https://ecos.fws.gov/ipac/guideline/assessment/population/436/office/11420.pdf

Crustaceans

NAME	STATUS
Vernal Pool Fairy Shrimp *Branchinecta lynchi*	Threatened

There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/498

Vernal Pool Tadpole Shrimp *Lepidurus packardi*	Endangered

There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/2246

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
San Francisco Bay-Delta Fish And Wildlife
650 Capitol Mall
Suite 8-300
Sacramento, CA 95814
Phone: (916) 930-5603 Fax: (916) 930-5654
http://kim_squires@fws.gov

In Reply Refer To: September 30, 2020
Consultation Code: 08FBDT00-2017-SLI-0152
Event Code: 08FBDT00-2020-E-00656
Project Name: Broadway Bridge

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

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Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

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Suite 8-300
Sacramento, CA 95814
(916) 930-5603

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Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
(916) 414-6600

Project Summary

Consultation Code: 08FBDT00-2017-SLI-0152

Event Code: 08FBDT00-2020-E-00656

Project Name: Broadway Bridge

Project Type: BRIDGE CONSTRUCTION / MAINTENANCE

Project Description: Construction of new bridge off of Broadway in Sacramento across the Sacramento River to West Sacramento.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/38.57704005752997N121.51308186662763W

Counties: Sacramento, CA | Yolo, CA

Endangered Species Act Species

There is a total of 8 threatened, endangered, or candidate species on this species list.

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---

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Birds

NAME	STATUS
Least Bell's Vireo *Vireo bellii pusillus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5945	Endangered

Reptiles

NAME	STATUS
Giant Garter Snake *Thamnophis gigas* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4482	Threatened

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2891	Threatened
California Tiger Salamander *Ambystoma californiense* Population: U.S.A. (Central CA DPS) There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2076	Threatened

Fishes

NAME	STATUS
Delta Smelt *Hypomesus transpacificus* There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/321	Threatened

Insects

NAME	STATUS
Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7850	Threatened

Crustaceans

NAME	STATUS
Vernal Pool Fairy Shrimp *Branchinecta lynchi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/498	Threatened
Vernal Pool Tadpole Shrimp *Lepidurus packardi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2246	Endangered

Critical habitats

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Delta Smelt *Hypomesus transpacificus* https://ecos.fws.gov/ecp/species/321#crithab	Final

Appendix C Representative Photographs

Photo 1. Cottonwood riparian forest, West Sacramento, facing north.

Photo 2. Cottonwood riparian forest (red sesbania in foreground), West Sacramento, facing north.

Photo 3. Cottonwood riparian forest, Sacramento, facing north.

Photo 4. Cottonwood riparian forest, Sacramento, facing southeast.

Photo 5. Ruderal habitat, West Sacramento, facing east.

Photo 6. Ruderal habitat, Sacramento, facing north.

Photo 7. Ruderal habitat, Sacramento, facing east.

Photo 8. Landscaped habitat, West Sacramento, facing east.

Photo 9. Landscaped habitat, Sacramento, facing south.

Photo 10. Landscaped habitat, Sacramento, facing southeast.

Photo 11. Elderberry shrub, Sacramento, facing north.