California
WATER COMMISSION

Mitigated Negative Declaration

Mitigated Negative Declaration

and

Initial Study

Engineering Geotechnical Studies for the

Bay Delta Conservation Plan and/or

Preliminary Engineering Studies for the

Delta Habitat Conservation and Conveyance Program

Prepared by:
Department of Water Resources
Division of Environmental Services
Mitigation and Restoration Branch
3500 Industrial Boulevard
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Mitigated Negative Declaration

Project: Engineering Geotechnical Studies for the Bay Delta Conservation Plan and/or Preliminary Engineering Studies for the Delta Habitat Conservation and Conveyance Program

Lead Agency: California Department of Water Resources (DWR)

Availability of Documents:

The Department of Water Resources (DWR) prepared a Draft Initial Study in support of this Mitigated Negative Declaration. Copies of the draft Initial Study/Mitigated Negative Declaration were provided to the State Clearinghouse on June 15, 2010 initiating a 30-day review period. DWR made minor changes to the IS/MND and filed a supplemental IS/MND with the State Clearinghouse on June 30, 2010, initiating an additional 30-day review period. The review period was open from June 15, 2010 to July 31, 2010.

Statement of No Significant Effect

Pursuant to section 21082 of the California Environmental Quality Act, DWR has independently reviewed and analyzed the IS/MND for the proposed project and finds that this study reflects the independent judgment of DWR. In addition, DWR has reviewed and responded to comments from attorney's offices and individuals as well as state, federal, and local agencies. The comments are addressed in Appendix A; actual comments to the IS/MND are shown in Appendix B.

As the lead agency for the project, DWR further finds that the project mitigation and conservation measures will be implemented as stated in the MND. With implementation of these mitigation and conservation measures, the proposed project as modified would have no significant effect on the environment.

I hereby approve these project activities for geotechnical exploratory drilling.

Dean F. Messer 9/23/10

Dean F. Messer, Chief — Date
Division of Environmental Services

Project Description

The Department of Water Resources (DWR) plans to do further geotechnical information gathering in the Delta. The work includes overwater and land geotechnical borings, cone penetration tests (CPT) and small test pits in order to investigate soils in the Sacramento-San Joaquin Delta between 2010 and 2012. This testing is necessary because of the lack of geotechnical data available to the Department of Water Resources in the relevant area for evaluation possible conservations measured in the Delta. The Department of Water Resources is tasked with providing information for the Bay Delta Conservation Plan for developing conveyance alternatives and the development of the broader goals for Delta improvements addressed by the Delta Stewardship Council for its Delta Plan. Work will continue under this process to gather geotechnical data on proposed conveyance alternatives, and the additional geotechnical exploration proposed in this project will aid the Department of Water Resources in meeting its statutory responsibilities with respect to evaluating the feasibility of the proposed conveyance alternatives.

The Department of Water Resources' geotechnical staff and/or its consultants will investigate the engineering properties of the soils in the Delta along various alignment options, including auxiliary structures, as well as the proposed intakes and the proposed forebays for all options. The purpose of the investigation is to gather necessary geotechnical information to support the preparation of a draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the proposed Bay Delta Conservation Plan and/or for preliminary engineering studies for the Delta Habitat Conservation and Conveyance Program. The Department of Water Resources requires Delta soils and groundwater information for conceptual design and construction costs of conveyance facilities and to identify possible constraints and feasibility in developing conveyance alternatives.

Findings

The Initial Study has been prepared to assess the proposed activity's potential effects on the environment and significance of those effects. Based on this study, it has been determined that the proposed activities would not have any significant environmental effects. This is because construction/geotechnical impacts are minor in scope and short term in duration, and conservation measures will be implemented to avoid, minimize and mitigate impacts to environmentally sensitive resources. Short-term impacts, reduced to less than significant impacts with conservation measures, include increased noise levels and small vibrations created primarily from the drill rig engine and short durations from the standard penetration tests. No long-term impacts are anticipated.

Best management practices and conservation measures will be implemented by the Department of Water Resources to avoid, minimize, and mitigate environmental impacts. Implementation of these measures will reduce the environmental impacts of the proposed activities to less than significant levels. These conservation measures are fully discussed on page 8 of the Initial Study.

Permits

The proposed activities will require the following permits and authorizations:

- California Fish and Game Code section 1600, Streambed Alteration Agreement
- Central Valley Flood Protection Board approval
- U.S. Army Corps of Engineers, section 404 of the Clean Water Act and section 10 of the Rivers and Harbors Act, Nationwide Permit 6
- Regional Water Quality Control Board Clean Water Act section 401
- Letter of Concurrence or Biological Opinion from U.S. Fish and Wildlife Service for federal species under the Endangered Species Act under their jurisdiction
- Letter of Concurrence or Biological Opinion from National Oceanic and Atmospheric Agency Fisheries Unit for federal species under the Endangered Species Act under their jurisdiction

Supplemental to Mitigated Negative Declaration

The Department of Water Resources (DWR) is the Lead State Agency under the California Environmental Quality Act and has prepared a Draft Initial Study and Mitigated Negative Declaration. DWR is planning additional land and overwater geotechnical borings in the Sacramento-San Joaquin Delta to obtain information for proposed alignments of the water conveyance facilities associated with the Bay Delta Conservation Plan and preliminary engineering studies for the Delta Habitat Conservation and Conveyance Program.

DWR supplemented the Draft IS/MND due to proposed minor technical changes. This geotechnical information is needed for preliminary engineering studies for the Delta Habitat Conservation and Conveyance Program, BDCP, and other Delta related programs/plans.

DWR recirculated the Supplemental Draft IS/MND describing the changes in the geotechnical borings to give the public and agencies ample time to review these changes.

1. DWR has determined that additional depth is necessary at approximately 20 boring locations described herein for the construction shafts for the proposed Tunnel/Pipeline Alignment Option. Exploration to a depth of 300 feet (rather than 225 feet) is required to determine foundation conditions for potential construction shafts and tunnel segments. The exploration would provide soils data and groundwater conditions. The additional depth will add approximately 5 days to each of these 20 boring locations.

2. Additional tests will be performed for geophysical information along the Tunnel/Pipeline Alignment Option including various structures. Downhole geophysical methods are necessary to characterize the soils, liquefaction potential, and to determine shear wave velocities for seismic stability analysis.

3. On page 1 of the Mitigated Negative, it is stated that approximately 30 test pits will be performed; however, on page 5, it is incorrectly stated that approximately 15 test pits will be performed. For consistency, page 5 should state that approximately 30 test pits will be performed.

DWR considered this additional scope of work and determined that there were no additional significant impacts to the environment.

Revised

Initial Study

for the

Engineering Geotechnical Studies for the

Bay Delta Conservation Plan and/or

Preliminary Engineering Studies for the

Delta Habitat Conservation and Conveyance Program

Prepared by:

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The Department of Water Resources (DWR) proposes to conduct further overwater and land geotechnical exploration and information gathering as part of the Bay Delta Conservation Plan focused analysis and/or to provide information for preliminary engineering design for the Delta Habitat Conservation and Conveyance Program. The Department of Water Resources is the State Lead Agency under California Environmental Quality Act (CEQA) and has prepared this Initial Study to assess the activity's effects on the environment. Part I of this Initial Study is a description of the proposed activities and the environmental setting. Part II is the Initial Study Checklist form and an evaluation of potential impacts.

Changes to the Draft Initial Study Text, Figures, and Tables

Corrections and revisions have been made to the Draft Initial Study. Substantial text changes are presented in this Draft Initial Study. New text is indicated with an underline and text deleted is reflected by a ~~strike through~~. DWR has prepared written responses to the comments (Appendix A). The responses correct, clarify, and amplify text in the Draft IS/MND, as appropriate. These changes do not alter the conclusions of the Draft IS/MND. Comments received have been included as Appendix B.

The changes identified are clarifications or amplification of the information and analysis contained in the Draft Initial Study. None of the changes identified results in a significant impact. Furthermore, none of the impacts identified in the Draft Initial Study were found to be substantially more severe as a result of these changes. For these reasons, a Final Initial Study is being filed with the State Clearinghouse.

Part I. Project Description

Background

The proposed Bay Delta Conservation Plan is being developed to contribute to enhancing and restoring the ecosystem processes and functions of the Delta, including seasonal floodplain habitat, subtidal and intertidal habitat, hydrologic conditions, and salinity within the Delta estuary, as well as reducing direct losses of fish and other aquatic organisms. Because it is a permitting process, the Bay Delta Conservation Plan is in a unique position to implement restoration while simultaneously securing a reliable water source for human use.

The Delta was once a vast marsh and floodplain dissected by meandering channels and sloughs that provided a dynamic habitat for a rich diversity of fish, wildlife and plants. The Delta of today has been altered by a system of artificial levees and dredged waterways constructed to support farming and urban development on islands as well as to provide flood control. These waterways also provide transportation corridors for ships and convey water for urban and agricultural uses inside and outside the Delta.

To meet both ecosystem and water supply goals, the Department of Water Resources and other state and federal agencies and interested parties are focusing on potential habitat benefits that could be realized by implementing a new water conveyance regime. In December 2008, the Bay Delta Conservation Plan Steering Committee released *An Overview of the Draft Conservation Strategy for the Bay Delta Conservation Plan* to share key components of the draft Conservation Strategy as well as the approach and direction being taken by the Bay Delta Conservation Plan Steering Committee. Additional detail to this brief summary, including a discussion of assumptions, rationale, issues, concerns, and next steps, is available by reading *An Overview of the Draft Conservation Strategy for the Bay Delta Conservation Plan* dated January 12, 2009. For more information, go online to http://baydeltaconservationplan.com/NewsLtrBackgroundDoc/Overview_of_Conservation_Strategy_1-12-2009.pdf. The Overview identified a number of elements that demonstrated the integrated nature of the draft Conservation Strategy. These elements were selected based on the following attributes:

A. Elements that shape the overall architecture of a new hydrodynamic system that would be developed as a result of the Bay Delta Conservation Plan.

B. Measures that would likely be included in any scenario to rehabilitate the Delta ecosystem and water supply system.

C. Elements that could be planned or constructed in the next 5 to 10 years.

Project Description

The Department of Water Resources is planning to conduct overwater and land geotechnical borings, perform cone penetration tests (CPT) and dig approximately 30 small test pits in order to test soils in the Sacramento-San Joaquin Delta between August 1, 2010 and December 31, 2012. This testing is necessary because of the lack of geotechnical data available to the Department of Water Resources in the relevant area. Pursuant to subdivisions (b)(2)(B) and (c) of section 85320 of the Water Code. The additional geotechnical exploration proposed in this project will aid the Department of Water Resources in meeting its statutory responsibilities with respect to evaluating the feasibility of the proposed conveyance alternatives.

The Department of Water Resources' geotechnical staff and/or its consultants will investigate the engineering properties of the soils in the Delta along various alignment options, including auxiliary structures, as well as the proposed intakes and the proposed forebays for all options. For more information about the Bay Delta Conservation Plan and proposed intake locations and forebays, see http://baydeltaconservationplan.com/default.aspx. The purpose of the investigation is to gather necessary geotechnical information to support the preparation of a draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the proposed Bay Delta Conservation Plan and/or to provide preliminary engineering design for the Delta Habitat Conservation and Conveyance Program. The Department of Water Resources requires Delta soils and groundwater information for conceptual design and construction costs of conveyance facilities and to identify possible constraints in developing conveyance alignments.

Project Location

The overwater and land geotechnical exploration will be conducted within areas delineated on Figure 1. Boring locations will be reviewed by Environmental Scientists to evaluate the potential impacts, if any, to environmental and cultural resources, and locations to avoid and minimize any identified impacts to environmental and cultural resources.

Project Activities

The project activities for overwater and land geotechnical exploration are described separately below.

Overwater Exploration

The Department of Water Resources is planning approximately 80 overwater geotechnical borings in the Delta waterways between 2010 and 2012 (Figure 1). These include approximately 50 overwater geotechnical borings in the Sacramento River to obtain information for possible intake structures for the water conveyance facilities associated with the Bay Delta Conservation Plan. Approximately 20 overwater borings are planned at the 12 major water crossings along the planned Pipeline/Tunnel Option conceptual alignment. An additional 5 to 12 overwater geotechnical borings are proposed to obtain conceptual information for docking facilities. The depths of borings are planned to range between 100 and 200 feet below the mud line (i.e., river bottom).

The Department of Water Resources plans to conduct overwater drilling only during the time period from August 1 until October 31 between the hours of sunrise and sunset. This period is the recognized window of opportunity to avoid and/or minimize disturbance for sensitive environmental resources. Duration of drilling at each location will vary depending on the number and depth of the holes at each location, drill rate, and weather conditions, but are not expected to exceed 60 days at any one location.

The overwater geotechnical borings are proposed to be conducted in the following areas:

- At the anticipated locations of five possible intake structures located on the Sacramento River between Courtland and the Clarksburg area, approximately 9 to 12 borings at each site.
- Where the Pipeline/Tunnel Option alignment would intersect major waterways, including:
  - Snodgrass Slough – North of Lambert Rd

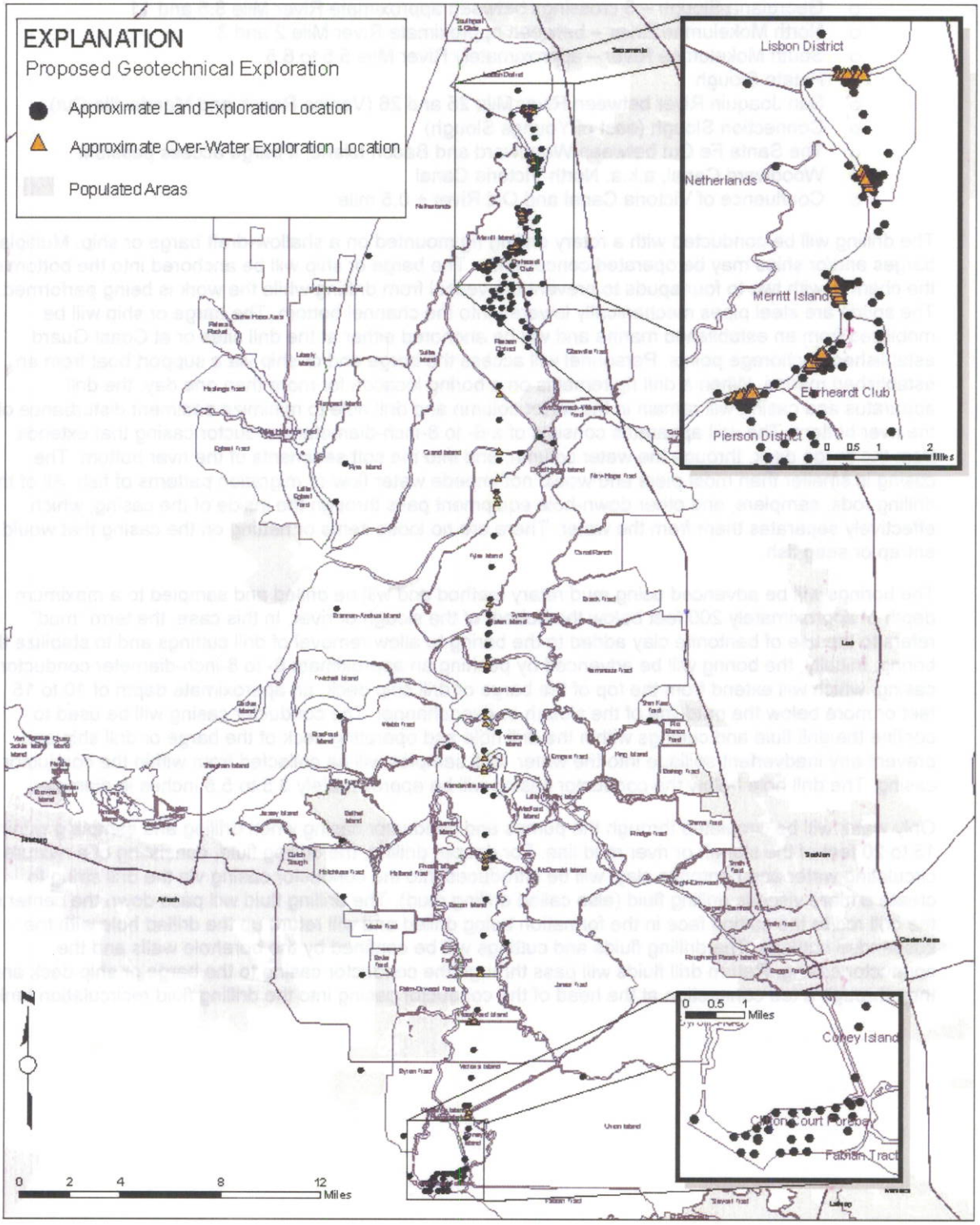
- Sacramento River between approximate River Mile 29 and 30
- Sacramento River between approximate River Mile 25 and 26
- Georgiana Slough – 3 crossings between approximate River Mile 8.5 and 11
- North Mokelumne River – between approximate River Mile 2 and 3
- South Mokelumne River – approximately River Mile 5.5 to 6.5
- Potato Slough
- San Joaquin River between River Mile 25 and 26 (Venice Reach and Mandeville Cut)
- Connection Slough (east of Youngs Slough)
- The Santa Fe Cut between Woodward and Bacon Island, if barge access possible
- Woodward Canal, a.k.a. North Victoria Canal
- Confluence of Victoria Canal and Old River ± 0.5 mile

The drilling will be conducted with a rotary drilling rig mounted on a shallow-draft barge or ship. Multiple barges and/or ships may be operated concurrently. The barge or ship will be anchored into the bottom of the channel with two to four spuds to prevent the vessel from drifting while the work is being performed. The spuds are steel pipes mechanically lowered into the channel bottom. The barge or ship will be mobilized from an established marina and will be anchored either at the drill sites or at Coast Guard established anchorage points. Personnel will access the barge and/or ship via a support boat from an established marina. When a drill rig remains on a boring location for more than one day, the drill apparatus and casing will remain in the water column and drill hole to minimize sediment disturbance of the river bottom. The drill apparatus consists of a 6- to 8-inch-diameter conductor casing that extends from the barge deck, through the water column, and into the soft sediments of the river bottom. The casing is smaller than most piers and would not impede water flow or migration patterns of fish. All of the drilling rods, samplers, and other down-hole equipment pass through the inside of the casing, which effectively separates them from the water. There are no loose items or netting on the casing that would entrap or snag fish.

The borings will be advanced using mud rotary method and will be drilled and sampled to a maximum depth of approximately 200 feet below the bottom of the slough or river. In this case, the term "mud" refers to the use of bentonite clay added to the boring to allow removal of drill cuttings and to stabilize the boring. Initially, the boring will be advanced by pushing an approximate 6- to 8-inch-diameter conductor casing, which will extend from the top of the barge or drill ship deck, an approximate depth of 10 to 15 feet or more below the mud line of the slough or river channel. The conductor casing will be used to confine the drill fluid and cuttings within the drill hole and operating deck of the barge or drill ship and prevent any inadvertent spillage into the water. Soil samples will be collected from within the conductor casing. The drill hole below the conductor casing will be approximately 3.5 to 5.5 inches in diameter.

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

Figure 1. Proposed Exploration Area Map.



With the conductor casing in place, the drilling fluids will be kept in the closed system formed by the conductor casing and a tank at the top of the hole on the barge deck and a precautionary provision of a heavy plastic sleeve over the conductor casing which drapes into an external mud tank. This system will provide a reliable seal and prevent significant spillage of the drilling fluid into the water. The drill rod and sample rod connections will be disconnected either directly over the conductor casing or the recirculation tank. Furthermore, positive barriers consisting of hay waddles and/or other suitable type of spill-stoppage materials will be placed around the work area on the barge and ship decks.

Drill cuttings that settle out in the recirculation tank will be collected into 55-gallon storage drums. Good work practices will be observed and maintained in containing the drilling fluid, including taking care when transferring drill cuttings from the recirculation tank to the drums. The drums will be placed adjacent to the recirculation tank. If drilling fluid or drill cuttings material accidently spill onto the barge deck outside of the containment area, they will be immediately picked up with a flat blade shovel and placed either into the recirculation tank or a storage drum, and the affected area will then be cleaned and mopped. Discarded soil samples will also be placed in the storage drums.

Samples will be obtained using a combination of split spoon samples, thin-walled tubes (Shelby tubes or piston samplers), and soil coring techniques. Standard penetration tests, a process of conducting split spoon sampling, will be taken in the sandy and clayey soils, and Shelby and piston tube (push) undisturbed soil samples will be taken in soft clay soils. Standard penetration tests are performed by dropping a 140 pound automatic hammer on the drill string to drive a sampler about 1.5 feet. This is a test conducted in short durations (a few minutes for each test) using a relatively small energy source. Vibrations from the test are minimal. The Shelby tube and piston samplers are collected by pushing on the drill string with the weight of the drill rig. No vibrations are produced from pushing tube samples. A punch core or similar soil coring technique will be utilized to retain disturbed soil samples in an inner core barrel within the drill string.

Upon completion of each hole, the borings will be grouted from the bottom of the borehole to within approximately 10 to 15 feet of the top with 5 percent (by weight) bentonite and 95 percent (by weight) cement grout. Water will first be introduced inside the drilled hole and circulated within the conductor casing to clear out any remaining drilling mud prior to grouting. Grouting of the drilled hole will be accomplished by the tremie method[1] from the bottom upward to a depth of approximately 10 feet below the bottom of the river based on a calculated grout take volume to prevent grout migration into the river water. At the completion of the grouting, the conductor casing will then be pulled out of the channel bottom to complete the overwater boring operation.

An Environmental Scientist stationed on the barge or ship will observe the drilling operation to ensure that all drilling fluid and cuttings are kept and confined within the recirculation tanks and storage drums. The Environmental Scientist will pay special attention to the river water for the presence of colored or increasingly opaque plumes when drilling, grouting, and pulling casing. All personnel on the barge or ship will report any observations of colored plumes in the water or leaking of the drilling fluids to the Environmental Scientist. Colored plumes are an indication that material may be leaking into the water. If an unauthorized discharge is discovered by any of the personnel on board the barge or ship, drilling activities will cease until appropriate corrective measures have been completed. Cuttings and excess drilling fluid will be contained in drums or bins, periodically off-loaded to a land-based staging area, and disposed of at a State-approved landfill site. The overwater borings will be supervised by a licensed drilling contractor under the direction of Department of Water Resources' personnel or its Contractor. An Engineering Geologist or Engineer will be on site at the drill rig to supervise activities at all times during the operation. An Environmental Scientist will be on-site during all active drilling work to monitor activities.

Land Exploration

The geotechnical investigation program on land will consist of approximately 220 to 240 exploration locations (Figure 1), including drilling boreholes and performing cone penetration tests (CPT); as well as

[1] A pipe is lowered to the bottom of the borehole and grout is pumped down to the bottom of the hole. This insures that grout has been placed from the bottom of the hole to the top and prevents bridging.

conducting approximately 30 shallow test pit excavations (typically 4 feet wide x 12 feet long X 12 feet deep) in soils to measure soil load-bearing capacity, physical properties of the sediments, location of the groundwater table, and other typical geologic and geotechnical parameters. Cone penetration testing pushes a cone connected to a series of rods into the ground at a constant rate, allowing continuous measurements of resistance to penetration both at the cone tip and the sleeve behind the cone tip. The resulting information allows the nature and sequence of subsurface soil strata, groundwater conditions, and physical and mechanical properties of the soil to be estimated.

Temporary test wells may be installed at some sites to investigate soil permeability and to allow sampling of dissolved gases in the groundwater. Small test pit excavations may be dug to obtain near-surface soil samples for laboratory analysis in limited locations. Drilling will take place on disturbed soils on properties in the Delta readily accessible by vehicles by established roads or paths.

After each site is investigated, the boring, cone penetration tests and/or well holes will be backfilled with cement-bentonite grout in accordance with California regulations and industry standards (Water Well Standards, DWR 74-81 and 74-90). Test pits will be backfilled with the excavated material on the same day as they are dug, with the stockpiled topsoil placed at the surface and the area restored as close as possible to its original condition.

Site investigation activities may consist of auger and mud-rotary drilling with soils sampling using a standard penetration test (SPT) barrel (split spoon sampler) and Shelby tubes; cone penetrometer testing; temporary well installation; test pits; and electrical resistivity and other geophysical surveys. All exploration methods will require a drill rig and support vehicle for the drillers and vehicles for the Geologists and Environmental Scientists. The Department of Water Resources will implement best management practices that include measures for air quality, noise, greenhouse gases, and water quality. The different investigation methods may last from a few hours to several days and are described in the following paragraphs.

1) Drilling activities will generally be performed using a rotary drill rig with auger capabilities. Auger techniques will drill an approximate 6.5- to 8-inch-diameter boring and will be used only for shallow depths. Mud-rotary drilling and sampling will generate 4- to 6-inch-diameter borings, unless casing is required, which will increase the boring diameter to 6 to 8 inches. Depths of test holes will generally vary from about 5 to 225 feet. At three selected locations, drilling may extend to a depth of approximately 500 feet to allow for a better understanding of the deeper subsoil formation with the measurements of the geophysical properties such as shear and compression wave velocities. Drilling time required for each drill hole is approximately 3 work days for drill holes less than 100 feet deep, approximately 5 work days for drill holes to 225 feet deep, and up to 3 weeks or more for deeper drill holes up to 500 feet deep. Upon completion of soil sampling and testing, holes will be sealed using cement-bentonite grout in accordance with California regulations and industry standards (Water Well Standards, DWR 74-81 and 74-90). Drilling boreholes usually requires a truck or track-mounted drill rig typically powered by a 100 to 200 horsepower diesel engine. A drill rig tender vehicle and tool truck generally accompany the drill rig. Track-mounted rigs will be used only if needed to minimize access impacts over soft ground. Trailers will carry track-mounted equipment to the site. Cuttings and excess drilling fluid will be contained in drums, large containers, or vacuum truck and disposed of offsite at an appropriate landfill.

2) Additional depth is at approximately 20 locations described herein for the construction shafts for the Tunnel/Pipeline Alignment Option. Exploration to a depth of 300 feet (rather than 225 feet) is required to determine foundation conditions for potential construction shafts and tunnel segments. The exploration would provide soils data and groundwater conditions. The additional depth will add approximately 5 days to each of these 20 boring locations. Work will be conducted within the established work windows.

3) Additional tests will be performed for geophysical information along the Tunnel/Pipeline Alignment Option including various structures. Downhole geophysical methods are necessary to

characterize the soils, liquefaction potential, and to determine shear wave velocities for seismic stability analysis.

4) The cone penetrometer test sounding usually requires a truck-mounted, 15- to 30-ton push-capacity cone apparatus. The apparatus is typically powered by a 400- to 500-horsepower diesel engine. A drill rig tender vehicle and tool truck generally accompany the cone penetrometer test rig.

5) Select geotechnical drill holes may be completed as groundwater monitoring wells. An additional day or two added to the total drilling time may be required for the completion of each groundwater monitoring well. The wells will be completed in accordance with California regulations and industry standards (Water Well Standards, DWR 74-81 and 74-90). After well tests and monitoring are completed, the well material will be drilled out and the hole will be backfilled with cement-bentonite grout using a tremie pipe.

6) Shallow test pits (typically 4 feet wide x 12 feet long X 12 feet deep) may be dug in limited locations to obtain near-surface soil samples for laboratory analysis. Test pits will not be dug on any levees or in any sensitive habitats. During test pit excavation, any topsoil will be segregated from other material removed from the pit. Test pits will be backfilled with the excavated material on the same day as they are dug, with the stockpiled topsoil placed at the surface and the area restored as close as possible to its original condition.

7) Non-invasive geophysical surveys may be employed to determine the near surface characteristics of the soil. The electrical resistivity surveys consist of driving four steel probes, each one-half inch in diameter, about 12 inches into the ground and measuring the resistance between different pairs of electrodes. The electrode spacing may vary depending upon the depth of investigation. The survey method is considered safe because low amperage currents (usually less than 0.5 amp) are involved. Therefore, the method does not present a danger to fauna. In addition, the duration of applied current is extremely short; just long enough to take a voltmeter reading. The process takes about 30 minutes, and at the completion, the probes and equipment are removed. Other methods of geophysical surveys use similar types of non-destructive equipment that measure parameters such as electrical currents, seismic waves, magnetic fields, or radar reflections in the ground.

Environmental Setting

Existing Conditions

The project area consists of a variety of habitats, from open water of several major waterways within the Sacramento-San Joaquin Delta to rural and agricultural lands with bordering riparian vegetation to wetlands and other habitats of the Delta. The project locations within Sacramento, Yolo, and Solano Counties lie within the northeastern Sacramento Valley geographic subdivision of the Great Central Valley of the California Floristic Province; the project locations found in San Joaquin County lie within the San Joaquin Valley geographic subdivision of the Great Central Valley; and the project locations found in Contra Costa County lie within the San Francisco Bay Area geographic subdivision of the Central Western Coast of the California Floristic Province (Hickman 1993). The climate of the project locations found in the valley is characterized by hot, dry summers and cool, moist winters; while the climate of the project locations found in the San Francisco Bay area is slightly milder with cooler summer and winter temperatures. The average annual precipitation is 36 inches (NOAA 2009). The elevation in some areas of the Delta is at or below mean sea level to approximately 35 feet above mean sea level and the topography is generally a naturally flat valley bottom.

The Sacramento, San Joaquin, and Mokelumne rivers and various sloughs included in the proposed activities are a part of the Sacramento-San Joaquin River Watersheds and the Sacramento-San Joaquin Delta. Some of the rivers and sloughs contain habitat (riparian forest, marsh habitat, and/or scrub vegetation) at the outboard toe of the slope down to the approximate summer water surface location; while other locations have rip-rapped levees and are devoid of habitat. Vegetation at some drilling

locations are dominated by riparian species along the margins including willows (*Salix* spp.), cottonwood (*Populus* spp.), alders (*Alnus* spp.), and oaks (*Quercus* spp.) near the river's edge (Sawyer et. al. 2009). Other areas are open water, with vegetation near the edges including marsh species such as rushes *(Juncus spp.)*, sedges *(Carex spp.)*, bulrush (*Schoenoplectus spp.)*, cattail *(Typha spp.)*, and spike rush *(Eleocharis spp.)* in large clusters.

Agricultural land dominates the Delta. Some small, natural islands remain, with a complex levee system. Levees in the Delta typically have waterside slopes that are fully covered with riprap and are actively maintained, which includes regular herbicide application to control vegetation that could destabilize the levee structure. Land cover types within the project area can be divided into artificial and natural vegetation communities, aquatic communities, and developed land. Agriculture and landscaping are artificial vegetation communities that are continually maintained. Other communities that can be found in the Delta consist of emergent wetlands, cottonwood-willow woodland, valley oak riparian woodland, riparian scrub, willow scrub, agricultural ditches/drainages, giant reed (*Arundo donax*) stand (a noxious weed), and ruderal (herbaceous, nonnative, weedy species).

Soils

Soil associations are groupings of individual soils that occur together in the landscape and are typically named after the two or three dominant soil series (e.g., the dominant soil components in the Gazwell-Rindge soil association in Sacramento County are the Gazwell and Rindge soil series). Associations cover broad areas within the landscape that have a distinctive pattern of soils, relief and drainage. These generalized soil maps are useful for comparing the suitability of large areas for general land use purposes. Larger scale maps showing the individual soil map units that comprise each association are often used for evaluating soil suitability on a project-level scale (e.g., selecting a building site). In areas that could be affected by project activities, soils can be classified based on associations with the following physiographic positions and features:

- Basins, delta, and salt water marsh
- Basin rims
- Floodplains and stream terraces
- Valley fill, alluvial fans, and low terraces
- Uplands and high terraces

Hydrologic Conditions

The study area is located in the Lower Sacramento Hydrologic Unit Number 18020109 and the San Joaquin Hydrologic Unit Number 1804003. Hydrologic units correspond to the natural division between watershed boundaries and are based on the U.S. Geological Survey Hydrologic Unit Maps (USGS 2008).

Watershed Context

The proposed activities are located near the center of California's Central Valley, which is drained by the Sacramento River from the north, the American River from the east, and the San Joaquin River from the south. The Mokelumne River drains to the San Joaquin River. The Sacramento and San Joaquin rivers drain to the Sacramento-San Joaquin Delta, which is the largest estuary on the Pacific Coast. The Sacramento-San Joaquin River Delta is an example of an inverted river delta, one of only a few worldwide. The fan-shaped area of the Delta converges downstream, rather than diverging, as the two rivers are forced to exit the Central Valley through the Coast Range via the narrow channel known as the Carquinez Strait, which leads to the San Francisco Bay and ultimately the Pacific Ocean through the Golden Gate.

The Delta consists of a myriad of small natural and man-made channels (locally called sloughs), creating a system of isolated lowland islands and wetlands defined by dikes or levees. The Delta's so-called "islands" are not really islands in the classic sense, but they are referred to as such because they are completely surrounded by water.

Waters of the United States

The Ordinary High Water Mark typically corresponds to the scour line, a change in vegetation, or water marks that define the bed and bank portions of the channel that flood under normal conditions. No land geotechnical boring locations will be conducted within open water or wetland habitat. However, all the overwater geotechnical boring locations are within the open water channel of a river or slough and are within the Ordinary High Water Mark. Therefore, the proposed activities fall within jurisdictional waters under section 404 of the Clean Water Act and section 10 of the Rivers and Harbors Act regulated by the U.S. Army Corps of Engineers. The Department of Water Resources will obtain required permits under these regulations.

Best Management Practices/Mitigation and Conservation Measures

General: General conservation measures proposed to minimize impacts due to the proposed activities include:

1. An environmental monitor will be stationed near the work areas for land drilling and on the barges/boats for water drilling during all drilling activities. The environmental monitor will observe the immediate area for potentially sensitive environmental resources and/or unauthorized discharges.

2. Stockpiling materials, such as portable equipment, vehicles, and supplies, including chemicals, will be restricted to docks or within the drill ship, exclusive of any riparian and wetlands areas or other sensitive habitat.

3. All litter, debris, unused materials, rubbish, supplies, or other material will be appropriately stored on the ship or barge until it can be removed from project sites and deposited at an appropriate disposal or storage site.

4. For water drilling, a containment area will be established around the drill apparatus, recirculation tanks, and storage drums by laying Visqueen and/or hay waddles around the established work areas on the ships/barges. This will minimize the chances that any drilling mud (bentonite clay) would be discharged into the water. If an unauthorized discharge is discovered by any of the personnel on board the barges/ships, drilling activities shall cease until appropriate corrective measures have been completed. In the event of unauthorized discharge entering the water, the environmental monitor will contact Department of Water Resources' Staff Environmental Scientist (Michelle Beachley, 916-651-9547) who will contact the appropriate agencies.

5. For land drilling, a containment area will be established around the drill apparatus, recirculation tanks, and storage drums by laying Visqueen and/or hay waddles around the established work areas if the boring site is in close proximity to water and could affect water quality of the waterway. If an unauthorized discharge is discovered within the work area, appropriate corrective measures will be completed to clean up the area and dispose of the material according to state regulations.

6. Drill cuttings that settle out in the recirculation tank will be collected into 55-gallon storage drums. Discarded soil samples will also be placed in the storage drums. Good work practices are observed and maintained in containing the drilling fluid, including taking care when transferring drill cuttings from the recirculation tank to the drums. The drums will be placed adjacent to the recirculation tank. If drilling fluid or drill cuttings materials accidently spill onto the barge deck outside of the containment area while transferring the fluid or materials (or during any other operation), they will be immediately picked up with a flat blade shovel or vacuum and placed either into the recirculation tank or a storage drum, and the affected area will then be cleaned.

7. In the event of a contaminant spill of hazardous substance, work will stop immediately and Department of Water Resources' Staff Environmental Scientist shall be notified (Michelle

Beachley, 916-651-9547) who will then contact the necessary resource agencies including but not limited to, the Office of Spill Prevention, Department of Fish and Game (CDFG), National Marine Fisheries Service (NMFS), and U.S. Fish and Wildlife Service (USFWS) as soon as possible. If the Department of Water Resources Staff Environmental Scientist cannot be notified immediately, the aforementioned agencies shall be contacted by the contractor or the environmental monitor on duty. In the case of a spill on-water containment or recovery, equipment shall be available and the shoreline protected. Any spills of hazardous materials will be cleaned immediately and reported to the resource agencies within 24 hours. Any such spills, and the success of the efforts to clean them up, will be reported in post-exploration compliance reports.

8. Contracts will require contractors to prepare and make available to the Department of Water Resources, for review and acceptance prior to formal signing, an Emergency Action Plan. All personnel involved in use of hazardous materials will be trained in emergency response and spill control.

9. All site access and staging shall limit disturbance to the riverbank or levee as much as possible. When possible, existing ingress and egress points shall be used. An environmental monitor will inspect these sites to ensure that potentially sensitive environmental resources are not significantly impacted during operations.

10. Equipment shall be refueled, maintained and serviced at designated staging areas away from the riverbank, levee, or habitat designated as sensitive by an approved environmental monitor.

Air Quality. The generation of direct onsite and offsite air quality impacts would be intermittent and would terminate following completion of drilling activities. Additionally, in order to minimize emissions to the extent feasible, construction/geotechnical contractors would be required to implement the following measures:

1. On-road and off-road vehicle tire pressures shall be maintained to manufacturer specifications. Tires shall be checked and re-inflated at regular intervals.
2. Construction equipment engines shall be maintained to manufacturer's specifications.
3. Using properly tuned equipment that meets current emissions standards.

Administrative Measures

The following are measures from the Department of Fish and Game's 1602 Streambed Alteration Agreement.

1. Documentation at Project Site. Permittee shall make the (1602) Agreement, any extensions and amendments to the Agreement, and all related notification materials and California Environmental Quality Act (CEQA) documents, readily available at the project site at all times and shall be presented to DFG personnel, or personnel from another state, federal, or local agencies upon request.

2. Provide Agreement to Persons at Project Site. DWR shall provide copies of the (1602) Agreement and any extensions and amendments to the Agreement to all persons who will be working on the project at the project site on behalf of Permittee, including but not limited to contractors, subcontractors, inspectors, and monitors.

3. Notification of Conflicting Provisions. DWR shall notify DFG if Permittee determines or learns that a provision in the Agreement might conflict with a provision imposed on the project by another local, state, or federal agency. In that event, DFG shall contact Permittee to resolve any conflict.

4. Project Site Entry. DWR agrees that DFG personnel may enter the project site at any time to verify compliance with the Agreement.

Biology. Specific conservation measures proposed to minimize biological impacts due to the proposed activities include:

1. Drill locations will be reviewed by the Department of Water Resources' Environmental Scientists to evaluate the potential impacts, if any, to environmental resources. Drill locations will be shifted as necessary to avoid any identified impacts to environmental resources or to reduce impacts to a less than significant level. An environmental scientist will review ingress and egress from drill sites before and during drilling operations.

2. No vegetation clearing will be conducted during the geotechnical activities. There may be minor disturbance to vegetation during mobilization of equipment to sites.

3. Construction personnel will receive worker environmental awareness training. This will include descriptions of sensitive species and procedures to follow in the event a sensitive species is encountered as well as procedures to follow in case of a contaminant spill or drilling mud spill.

4. An Environmental Scientist will be stationed near the work areas for land drilling and on the barges/boats for water drilling to act as biological monitor and to assist the construction/geotechnical crew with environmental issues as necessary. If a sensitive species is encountered by a biological monitor during construction/geotechnical activities, activities shall cease until appropriate corrective measures have been completed or it has been determined that the species will not be harmed.

5. Drilling activities for overwater borings will take place during work windows (August 1 to October 31) that have been established when species are at their lowest abundance in the area in order to avoid significant impacts to sensitive species. Exclusion zones and other protections designed to avoid impacts to sensitive species and habitats may also be included as necessary. These measures will ensure that work will not have a significant effect on environmental resources.

6. In addition to the other enumerated efforts DWR will follow a deliberate process to avoid and minimize environmental effects from the proposed activities; any additional avoidance actions or conservation measures established by the U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, National Marine Fisheries Service, Department of Fish and Game, and the Regional Water Quality Control Board will be followed.

7. Access to the overwater sites shall be via a support boat from an established marina. Access to the land-based geotechnical exploration sites shall be via existing roads and access ramps.

8. The perimeter of the terrestrial portion of the work sites shall be adequately flagged to prevent damage to adjacent riparian habitat.

9. All temporary fences, barriers, and/or flagging shall be completely removed from the project sites and properly disposed of upon completion of project activities.

10. Land-based sites that are near waterways and that could be disturbed by project activities shall be protected with correctly installed erosion control measures (straw bales, coconut fiber erosion control fabric, coir logs).

11. No spoils from trenching operations shall be placed on the stream side of the trench.

12. Topsoil shall be stockpiled and redistributed as topsoil as close to its original location as possible for land-based work.

13. At no time shall drill cuttings, drilling mud, and/or materials or water contaminated with bentonite or any other substance deemed deleterious to fish or wildlife be allowed to enter the stream or be placed where they may be washed into the stream. Any contaminated water/materials from the drilling and/or project activities shall be pumped or placed into a

holding facility and removed for proper disposal. At no time shall turbidity increase beyond existing baseline turbidity. In the event of a release of material into the water, a biological monitor shall immediately notify drillers and geologists of the observation of a plume. If material is released into the water, DFG shall be notified within 24 hours of detecting the leak. Project operations shall not be resumed until the source of the leak is identified and remedied. When the situation is remedied to the satisfaction of DFG, project operations may resume.

14. Upon DFG determination that turbidity/siltation levels resulting from project related activities constitute a threat to aquatic life, activities associated with the turbidity/siltation shall be halted until effective DFG approved control devices are installed, or abatement procedures are initiated.

15. DWR shall prepare and implement a hazardous materials control and spill prevention and response plan prior to project activity. Measures that will be included in the plan to minimize project drilling/boring effects shall include the following:

    a. establish a spill prevention and countermeasure plan before the commencement of project activity that includes strict on-site handling rules to keep drilling materials out of drainages and waterways;

    b. raw cement/concrete or washings thereof, asphalt, paint or other coating material, oil or other petroleum products, or any other substances which could be hazardous to aquatic life, wildlife, or riparian habitat resulting from the project-related activities shall be prevented from entering the waters of the State. Any of these materials placed within or where they can enter a stream or lake by DWR or any party working under contract may be subject to a citation;

    c. clean up all project-related spills immediately according to the spill prevention and counter measure plan, and notify Regional Water Quality Control Board (RWQCB) and DFG immediately of spills and cleanup procedures;

    d. conduct periodic inspection during project activities

16. DFG shall review and approve the plan prior to project activity to verify that hazardous material control and spill response measures have been incorporated to control the use of hazardous materials and reduce the chance of spills to the maximum extent practicable.

17. Erosion control measures shall be utilized throughout all phases of operation where sediment runoff from exposed slopes threatens to enter the waters of the State. At no time shall silt-laden runoff be allowed to enter the stream or directed to where it may enter the stream.

18. If test pits are not backfilled the same day they are dug, test pit spoil piles and exposed areas shall be covered with plastic sheeting or Visqueen to avoid losing soil into the stream. These covering materials shall be applied when it is evident rainy conditions threaten to erode loose soils into the stream.

19. At the end of each work day, if test pits have not been backfilled the same day they were dug, an escape ramp shall be placed at the end of the open trench to allow any animals that may have become entrapped in the trench to climb out overnight. The ramp may be constructed of dirt fill or wood planking or any other suitable material that is placed at an angle no greater than 30 degrees.

20. Staging and storage areas for equipment, materials, fuels, lubricants and solvents for overwater drilling sites shall be located on the drill ships. Hay waddles and Visqueen shall be placed around staging and storage areas to prevent spills into the water from equipment. Staging and storage areas for equipment, materials, fuels, lubricants and solvents for land-based drilling sites shall be located outside of the stream and channel banks. Stationary equipment such as motors, pumps, generators, compressors and welders located within or adjacent to the stream shall be positioned over drip pans. Any equipment or vehicles driven and/or operated within or adjacent to the stream must be checked and maintained daily, to

prevent leaks of materials that, if introduced into the water, could be deleterious to aquatic life, wildlife, or riparian habitat. Vehicles must be moved away from the stream prior to fueling and lubrication.

21. All project-related debris and associated materials shall be removed and appropriately disposed of upon completion of the project.
22. Debris, soil, silt, bark, rubbish, creosote-treated wood, raw cement/concrete or washings thereof, asphalt, paint or other coating material, oil or other petroleum products, or any other substances which could be hazardous to aquatic life, resulting from project related activities, shall be prevented from contaminating the soil and/or entering the waters of the State. Any of these materials, placed within or where they may enter a stream or lake, by Permittee or any party working under contract, or with the permission of DWR, shall be removed immediately.
23. If any wildlife is encountered during the course of construction/geotechnical, said wildlife will be allowed to leave the construction/geotechnical area unharmed.

Conservation measures specifically addressing sensitive species are described below:

Delta Smelt: Delta smelt could be affected by activities that degrade water quality. The implementation of best management practices discussed in the Initial Study will prevent any water quality degradation that could significantly affect delta smelt. The proposed activities will not cause any changes to delta smelt habitat. There would be no significant effect on this species. Project activities will take place when fish are at lowest abundance (August 1 to October 31). DFG requires the additional measures:

1. If any overwater drilling occurs during the peak spawning season (March-April), minimize activities on sand shoals and beaches.
2. In the core distribution of Delta smelt, minimize activities on shoals during ebb tides. There is some evidence that Delta smelt may move inshore on ebb tides to avoid getting swept downstream by currents. Hence, reducing work during those periods could provide some protection.
3. A qualified biological monitor shall be on-site during project operations to monitor implementation of conservation measures. If the monitor detects a fish kill during operations, all operations shall cease and all specimens collected and identified to species. Operations cannot be reinitiated until it is confirmed that the specimen is not a sensitive species. If all specimens cannot be captured and identified, all project activity shall cease at that location.

Salmonids: Chinook salmon and steelhead require similar habitat components and are analyzed together. Actions that have no effect on listed salmonids or their habitat are defined as having no measurable or discernable effect to the species or their habitat. As described in the Initial Study, the proposed activities would not disturb soil structure, riparian vegetation, divert water or degrade water quality. Project activities will take place when fish are at lowest abundance (August 1 to October 31).

Green Sturgeon: Geotechnical drilling activities will not have any significant impact on water flow, water quality, or food resources in the Delta or the affected waterways. The narrow work windows (August 1 to October 31) will minimize any incidental take due to disturbance, displacement, and impairment of feeding on juvenile fish near the project sites. The overwater geotechnical drilling work window will avoid adult green sturgeon spawning (February to July) (Moyle et al. 1995; Emmett et al. 1991).

Green sturgeon embryos have poor swimming ability and exhibit a strong drive to remain in contact with structure, preferring cover and dark habitats to open bottom and illuminated habitats (Kynard et al. 2005); therefore, geotechnical drilling will take place near mid-stream in the river and sloughs to avoid impacts to embryos.

Larvae and early juveniles exhibit nocturnal behavior in all activities, actively swimming and initiating downstream migration at night (Van Eenennaam et al. 2001; Deng et al. 2002; Kynard et al. 2005); therefore drilling activities will take place during the day between the hours of sunrise and sunset.

Giant Gartersnake: To the extent practicable, all activities in this area will avoid impacts to aquatic and adjacent uplands within 200 feet. While complete avoidance is anticipated, if it cannot be achieved, no activities with the potential to impact giant gartersnakes will be undertaken until the appropriate authorizations are obtained from the U.S. Fish and Wildlife Service and Department of Fish and Game. The following avoidance and minimization measures will be used to ensure there are no significant impacts to the giant gartersnake.

1. Construction activity within habitat should be conducted between May 1 and October 1. This is the active period for giant gartersnakes and direct mortality is lessened, because snakes are expected to actively move and avoid danger. If construction/geotechnical activities take place outside this window, activities will be confined to more than 200 feet from the banks of giant gartersnake habitat.

2. Avoid construction/geotechnical activities within 200 feet from the banks of giant gartersnake aquatic habitat. Confine movement of heavy equipment to outside 200 feet of banks of potential giant gartersnake habitat to minimize habitat disturbance.

3. Construction personnel should receive Service-approved worker environmental awareness training. This training instructs workers to recognize giant gartersnakes and their habitat(s).

4. Due to time constraints of the project DWR proposes to conduct drilling activities outside of the work window for the snake as recommended in the Corps' *Programmatic Formal Consultation for U.S. Army Corps of Engineers 404 Permitted Projects with Relatively Small Effects on the Giant Garter Snake* (Service file no. 1-1-F-97-149). These work windows are established to coincide with the snake's active period and to minimize adverse effects by allowing snakes the ability to flee or move from an area of construction/geotechnical to avoid injury or death. During consultation and several meetings with biological resource and engineering staff from DWR, FWS examined individual drill sites that could be identified as potentially non-habitat and allow for DWR to drill outside of the work windows. The areas were identified based on current and historical occurrence data, proximity to suitable habitat and in developed areas where snakes were least likely to occur or predicted to be hibernating or aestivating. A list of individual bore sites was identified. These bore sites correspond with GIS data and are currently not for public availability due to property rights issues. For sites determined to be within the snake's range and have suitable aquatic and upland habitat, the Service and DWR has designated these areas as **Priority 1** and will only be drilled during the recommended work windows (active period for snakes) of May 1 to October 1. For those sites which are defined as Priority 1, but if possible, can be moved to a new location more than 200 feet from an existing waterway within a developed site, these locations are designated as **Priority 1.5**. These sites can be drilled outside of the work windows only after further consultation and approval from the Service. Locations determined not to be suitable GGS habitat and not likely to adversely affect GGS are designated as **Priority 2**. Other species restrictions may apply. Bore sites and their corresponding Priority designation are listed below in Table 1.

California Tiger Salamander: To the extent practicable, all activities will avoid impacts to grassland habitat within 100 feet (30 m) that possess cracks or burrows that could be occupied by California tiger salamander. ~~While complete avoidance is anticipated, if it cannot be achieved, no activities with the potential to impact California tiger salamanders will be undertaken until the appropriate authorizations are obtained from the U.S. Fish and Wildlife Service and the California Department of Fish and Game.~~ Pre-construction/geotechnical surveys will be conducted by a qualified biologist. A biological monitor will be present during all drilling activities to ensure there are no significant impacts to CTS. In addition, work will be done outside the wet season and measures, such as having vehicles

follow shortest possible routes from levee road to the drill or CPT sites, will be taken to minimize the overall project footprint.

California Red-legged Frog: To the extent practicable, all activities will avoid impacts to aquatic and adjacent uplands within 100 feet that possesses cracks or burrows that could be occupied by California red-legged frogs. ~~While complete avoidance is anticipated, if it cannot be achieved, no activities with the potential to impact California red-legged frogs will be undertaken until the appropriate authorizations are obtained from the U.S. Fish and Wildlife Service.~~ Pre-construction/geotechnical surveys will be conducted by a qualified biologist. A biological monitor will be present during all drilling activities to ensure there are no significant impacts to CRLF. In addition, work will be done outside the wet season and measures, such as having vehicles follow shortest possible routes from levee road to the drill or CPT sites, will be taken to minimize the overall project footprint.

Western Pond Turtle: Because western pond turtles occupy similar habitats to giant gartersnakes and California red-legged frogs, avoidance of habitat for those species should effectively protect the vast majority of western pond turtle nests; therefore, no additional conservation measures should be necessary.

1. Within 48 hours prior to construction/geotechnical, a qualified biologist hired by DWR will survey the area at the appropriate time of day for the presence of western pond turtles.
2. Western pond turtles are found during field surveys, a qualified wildlife biologist will move the turtle(s) to the nearest suitable habitat outside the project footprint area.
3. Impacts to potential basking sites (e.g. logs and rocks) will be avoided during project-related construction/geotechnical activities whenever feasible.

San Joaquin Kit Fox (*From FWS recommendations*)

1. Vehicles will access the work site following the shortest possible route from the levee road. All site access and staging shall limit disturbance to the riverbank, or levee as much as possible and avoid sensitive habitats. When possible, existing ingress and egress points shall be used. A biological monitor will inspect these sites to ensure that potentially sensitive environmental resources are not significantly impacted during operations.
2. Project activities will not take place at night when kit foxes are most active. Off-road traffic outside of designated project areas will be prohibited.
3. A biological monitor will be stationed near the work areas to act as biological monitor and to assist the construction/geotechnical crew with environmental issues as necessary. If kit foxes are encountered by a biological monitor during construction/geotechnical, activities shall cease until appropriate corrective measures have been completed or it has been determined that the species will not be harmed.
4. To prevent inadvertent entrapment of kit foxes or other animals during the construction/geotechnical phase of a project, all excavated, steep-walled holes or trenches more than 2 feet deep will be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they will be thoroughly inspected for trapped animals.
5. All construction/geotechnical pipes, culverts, or similar structures with a diameter of 4-inches or greater that are stored at a construction/geotechnical site for one or more overnight periods will be thoroughly inspected for kit foxes before the pipe is used or moved in any way. If a kit fox is discovered inside a pipe, that section of pipe will not be moved until the Service has been consulted. If necessary, and under the direct supervision of the biologist, the pipe may be moved once to remove it from the path of construction/geotechnical activity, until the fox has escaped.

6. No firearms shall be allowed on the project site.

7. Noise will be minimized to the extent possible at the work site to avoid disturbing kit foxes.
8. To prevent harassment, mortality of kit foxes or destruction of dens by dogs or cats, no pets are permitted on project sites.

9. Rodenticides and herbicides will not be used during this project.

10. If a San Joaquin kit fox is inadvertently injured or killed, the biological monitor shall immediately report the incident to the DWR Lead Environmental Monitor. The Lead Monitor shall contact the FWS and CDFG immediately in the case of a dead, injured or entrapped kit fox. The CDFG contact for immediate assistance is State Dispatch at (916) 445-0045. They will contact the local warden or biologist. Notification must include the date, time, and location of the incident or of the finding of a dead or injured animal and any other pertinent information.

Valley Elderberry Longhorn Beetle (VELB) *(From FWS guidelines)*

DWR will avoid and protect habitat for VELB whenever possible. If suitable habitat for the beetle is found to occur on the project site (including ingress and egress) or within close proximity where beetles may be affected by the project, these areas will be designated as avoidance areas and will be protected from disturbance during the construction/geotechnical and operation of the project. The project will be designed such that avoidance areas are connected with adjacent habitat to prevent fragmentation and isolation of beetle populations. Beetle habitat will be avoided as described below.

Protective Measures

1. A 100-foot (or wider) buffer will be established around elderberry plants containing stems measuring 1.0 inch in diameter or greater at ground level using fencing and flagging. Complete avoidance (i.e., no adverse effects) will be assumed when a 100-foot (or wider) buffer is established and maintained around elderberry plants during construction/geotechnical activities. In buffer areas construction/geotechnical related disturbance will be minimized and any damaged area will be promptly restored following construction/geotechnical. The U.S. Fish and Wildlife Service will be consulted before any disturbances within the buffer area are considered. In addition, the U.S. Fish and Wildlife Service will be provided with a map identifying the avoidance area and written details describing avoidance measures if requested. In areas where encroachment on the 100-foot buffer has been approved by the U.S. Fish and Wildlife Service, provide a minimum setback of at least 20 feet from the dripline of each elderberry plant.

2. Within the immediate vicinity of drill locations, DWR will place signs every 50 feet along the edge of the avoidance area with the following information: "This area is habitat of the valley elderberry longhorn beetle, a threatened species, and must not be disturbed. This species is protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment." The signs will be clearly readable from a distance of 20 feet, and must be maintained for the duration of construction/geotechnical.

3. DWR will educate work crews about the status of the beetle, the need to avoid damaging its elderberry host plant, and the possible penalties for not complying with these requirements.

4. No insecticides, herbicides, fertilizers, or other chemicals that might harm the beetle or its host plant will be used in the buffer areas, or within 100 feet of any elderberry plant with one or more stems measuring 1.0 inch or greater in diameter at ground level.

Vernal Pool Invertebrates

Vernal pool fairy shrimp (VPFS, *Branchinecta lynchi*) are found in vernal pools and also sandstone rock outcrop pools. VPFS are known to occur in the southern portion of the project area near Clifton Court Forebay and VPFS have also been found just outside of the northeastern portion of this project area. Along with standard project BMPs, measures will be taken to avoid all vernal pool, ephemeral waterways, and wetland areas. In order to accomplish this, topographic depressions that are most likely to serve as seasonal vernal pools will be flagged and avoided. In addition, work will be done outside the wet season and measures, such as having vehicles follow shortest possible routes from levee road to the drill or CPT sites, will be taken to minimize the overall project footprint.

Vernal pool tadpole shrimp (VPTS, *Lepidurus packardi*) are found in vernal pools containing clear to highly turbid water in a wide range of sizes. Habitat for VPTS does occur within the southern portion of project area near Clifton Court Forebay and VPTS have been found in pools just to the northeast of the project area. Along with standard project BMP's, measures will be taken to avoid all vernal pool, ephemeral waterways, and wetland areas. In order to accomplish this, topographic depressions that are most likely to serve as seasonal vernal pools will be flagged and avoided. In addition, work will be done outside the wet season and measures, such as having vehicles follow shortest possible routes from levee road to the drill or CPT sites, will be taken to minimize the overall project footprint.

Nesting Birds: Construction activities are anticipated to be conducted near available nesting habitat within the active nesting season of birds (March to August 15). If work takes place during the active nesting season, an Environmental Scientist will conduct pre-construction/geotechnical surveys prior to the start of work activities to locate all active nest sites within 500 feet and all active Swainson's hawks nests within ¼ mile of work areas per Department of Fish and Game and U.S. Fish and Wildlife Service requirements. If work activities take place during the active nesting season of Swainson's hawks, the Department will survey any potential nesting habitat within ¼ mile of the geotechnical boring locations. If necessary, the Department will establish a ¼-mile buffer zone around all known and suspected Swainson's hawk nests or wait until after the active nesting season is completed to conduct geotechnical borings at those locations. The ¼-mile buffer is an acceptable buffer established by the Department of Fish and Game to prevent disturbance to nesting birds.

1. If project-related activities are scheduled during the nesting season of protected raptors and migratory birds (February 1 to August 31), pre-project surveys shall be conducted by a qualified biologist to identify active Swainson's hawk nests within ½ mile of the proposed project site and nests of other raptors within 500 feet of the proposed project site. If active nesting is identified within the ½ mile radius, consultation with DFG is required.
2. The Swainson's hawk pre-project survey shall be conducted no less than 14 days and no more than 30 days prior to beginning of project activities.
3. If active Swainson's hawk nests are found, project-related impacts shall be avoided by establishment of appropriate buffers. The size of the buffers shall be determined by a qualified biologist in consultation with DFG.
4. If there is a late nesting pair of Swainson's hawks within ½ mile of the project area, a biological monitor will have the authority to immediately stop construction/geotechnical activity that may result in the hawks abandoning the nest and work will cease until the threat has subsided.
5. Project activities shall not occur on the banks on the water side of the levees.

California Least Terns are unlikely to be affected by project activities, as the only known nesting site in the BDCP plan area is in Suisun Bay. However, if work takes place during Least Tern nesting season (mid-April to late-August), and nesting Least Terns are observed near work sites, the following measures will be followed to avoid and/or minimize impacts to this species.

1. Preconstruction/geotechnical surveys for nesting birds will be conducted 2 weeks before any construction/geotechnical activities are anticipated during the nesting season.

2. Noise will be minimized at the work site to avoid disturbing nesting Least Terns.
3. To prevent harassment and mortality of Least Terns or their nests by dogs or cats, no pets will be permitted on project sites.

The greater sandhill crane (*Grus canadensis tabida*) is listed as a state-threatened species under the California Endangered Species Act (Fish and Game Code, sections 2050 et seq.). The species was listed by the California Fish and Game Commission in 1983. The greater sandhill crane is also designated as a state Fully Protected species. The classification of Fully Protected was the State's initial effort in the 1960s to identify and provide additional protection to those animals that were rare or faced possible extinction. Lists were created for fish, mammals, amphibians and reptiles, birds and mammals. Many fully protected species have also been listed as threatened or endangered species under the more recent endangered species laws and regulations.

Fully Protected species may not be taken or possessed at any time and no licenses or permits may be issued for their take except for collecting these species for necessary scientific research and relocation of the bird species for the protection of livestock. Section 2080 of the Fish and Game Code prohibits "take" of any species that the commission determines to be an endangered species or a threatened species. Take is defined in section 86 of the Fish and Game Code as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill."

The greater sandhill crane has no federal regulatory status, but is covered under the Migratory Bird Treaty Act (MBTA). The MBTA makes it illegal for people to "take" migratory birds, their eggs, feathers or nests. Take is defined in the MBTA to include by any means or in any manner, any attempt at hunting, pursuing, wounding, killing, possessing or transporting any migratory bird, nest, egg, or part thereof.

DWR will make every effort to conduct geotechnical exploration activities no closer than ½ mile of an actively used roost of the greater sandhill crane and no closer than ¼ mile from the high use foraging areas (as defined by Gary Ivey, Delta greater sandhill crane authority) during the greater sandhill crane roosting season (October 1 to March 1).

Reporting Measures

1. If any sensitive species are observed in project surveys, DWR shall submit Natural Diversity Data Base (NDDB) forms to the NDDB for all the pre-project survey data with five working days of the sightings, and provide DFG Region 3 with copies of the NDDB forms and survey maps.
2. Notify DFG immediately if take of delta smelt or longfin smelt occurs, is anticipated, or is suspected. Notification must include date, time, and precise location of the incident/specimens, and other pertinent information. Notification shall be made by phone (209) 942-6070 or Notification shall be made by phone (209) 942-6070 or by e-mail to DFG.

Cultural Resources: Drill locations will be reviewed by the Department of Water Resources' Archaeologists to evaluate the potential impacts, if any, to cultural resources. Drill locations will be shifted as necessary to avoid any identified impacts to cultural resources or to reduce impacts to a less than significant level.

Should any archaeological resources be unearthed during the course of construction/geotechnical, all work will stop in the immediate vicinity of the finds until they can be evaluated by a qualified archaeologist and an appropriate plan of action can be determined in consultation with the State Office of Historic Preservation.

Should human remains be unearthed during the course of construction/geotechnical activities, all work will immediately stop in the vicinity of the finds until they can be verified and the requirements of Public Resource Code Section 5097.98 are met.

Greenhouse Gas Emissions. The generation of greenhouse gas emissions would be intermittent and would terminate following completion of drilling activities. Additionally, in order to minimize emissions to the extent feasible, construction/geotechnical contractors would be required to implement the following measures:

1. On-road and off-road vehicle tire pressures shall be maintained to manufacturer specifications. Tires shall be checked and re-inflated at regular intervals.

2. Construction equipment engines shall be maintained to manufacturer's specifications.

3. Using properly tuned equipment that meets current emissions standards.

Hazards and Hazardous Materials. Diesel fuel and oil as well as bentonite clay and cement will be used for geotechnical exploratory drilling. These materials will be stored and disposed of in accordance with standard protocols for handling of hazardous materials. All personnel involved in use of hazardous materials will be trained in emergency response and spill control. Hazardous waste management practices are implemented on construction/geotechnical projects that generate waste from the use of:

- Petroleum products
- Asphalt products
- Concrete
- Pesticides
- Acids
- Paints
- Stains
- Solvents
- Wood Preservatives
- Roofing Tar
- Any material deemed hazardous waste in California, title 22, Division 4.5, or listed in 40 CFR parts 110, 117,261, OR 302.

1. Storage Procedures

   a. Waste shall be stored in sealed containers constructed of suitable material and shall be labeled as required by title 22 CCR, division 4.5 and 49 CFR Parts 172,173,178, and 179.

   b. All hazardous waste shall be stored, transported, and disposed of as required in title 22 CCR, Division 4.5 and 49 CFR 261-263

   c. Waste containers shall be stored in a temporary containment facility that shall comply with the following requirements:

      i. Temporary containment facility shall provide for a spill containment volume able to contain precipitation from a 24-hour, 25-year storm event, plus the greater of 10 percent of the aggregate volume of all containers or 100 percent of the capacity of the largest tank within its boundary, whichever is greater.

      ii Temporary containment facility shall be impervious to the material stored there for a minimum contact time of 72 hours.

      iii. Temporary containment facility shall be maintained free of accumulated rainwater and spills. In the event of spill or leak, accumulated rainwater and spill shall be placed into drums after each rainfall. These liquids shall be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids shall be sent to an approved disposal site.

iv. Sufficient space shall be provided between stored containers to allow for spill cleanup and emergency response.

v. Incompatible materials, such a chlorine and ammonia, shall not be stored in the same temporary containment facility.

vi. Throughout the rainy season, temporary containment facilities shall be covered during the non-working days and prior to rain events.

d. Drums shall not be overfilled and waste shall not be mixed.

e. All hazardous waste containers will be labeled with the waste being stored and the date of accumulation.

f. Waste disposal

i. Waste storage shall not exceed requirements in title 22 CCR, section 66262.34

ii. Waste disposal shall be disposed of by a licensed waste transporter at an authorized licensed disposal facility or recycling facility.

iii. Uniform Hazardous Waste Manifest shall comply with title 22 CCR, division 4.5

Hydrology and Water Quality. No significant impacts to water quality are anticipated. Best management practices will be used to reduce impacts to less than significant levels. See General conservation measures above for more information.

Noise. Short-term impacts resulting from the proposed activities may include increased noise level and small vibrations created primarily from the drill rig engine and short durations from the Standard Penetration Tests. These noises will last approximately 1 minute each for a total of 10 to 15 times throughout the day. Equipment will be properly tuned and will utilize appropriate mufflers. Drilling activities will take place between sunrise and sunset.

Transportation/Traffic. A higher volume of boating traffic occurs within the main waterways of the Delta. This geotechnical exploration program has several drilling locations within the waterways with higher traffic areas. To reduce the risk of a boat collision with the drilling ships/barges, the drilling location of the ships/barges will be positioned where they can be easily viewed by oncoming watercraft and away from the main flow of traffic, whenever possible. The anchored boats/barge(s) will be well-marked and positioned so as not to pose a hazard to, nor significantly impede navigation of, commercial or recreational navigation. For low light conditions the barge is outfitted with lighting in compliance and standards of the U.S. Coast Guard for boating visualization. In higher boating traffic areas it may be deemed necessary to have warning buoys near the barge/ship and/or a 5 mph zone will be requested from the U.S. Coast Guard near the drilling operation. These precautions will result in reduced boat speed in the area of the drilling barge. If anchors are needed while drilling, the barge must display warnings for underwater anchors so that other boaters are aware of the potential danger beneath the water in compliance with U.S. Coast Guard regulations.

If a collision occurs resulting in a contaminant spill, the barge/ship contractor's Emergency Action Plan will go into effect and absorbents and containment booms will be used from the barge to prevent the spill from spreading. In the unlikely event that these measures cannot contain the spill, as required, local emergency services, the Office of Emergency Services (OES) and the United States Coast Guard will be contacted. Once emergency services have been notified, responders will be dispatched to control the spill and assist in the cleanup. If a collision occurs, emergency services will be notified as needed. In the event of a spill, appropriate resource agencies, including, but not limited to the California Department of Fish and Game and the U.S. Fish and Wildlife Service, will be contacted and any recommended remediation measures will be followed.

List of Permits Required for the Project

The proposed activities will require the following permits and authorizations:

- California Fish and Game Code section 1600, Streambed Alteration Agreement
- California Endangered Species Act section 2081, Department of Fish and Game, as necessary
- Central Valley Flood Protection Board approval
- Regional Water Quality Control Board Clean Water Act section 401
- U.S. Army Corps of Engineers, section 404 of the Clean Water Act and section 10 of the Rivers and Harbors Act, Nationwide Permit 6
- Letter of Concurrence from U.S. Fish and Wildlife Service for federal species under the Endangered Species Act under their jurisdiction
- Letter of Concurrence from National Marine Fisheries Service for federal species under the Endangered Species Act under their jurisdiction

Part II. Initial Study Checklist

This checklist identifies environmental and other factors that might be affected by the proposed activities. Please refer to the checklist table in each section for the corresponding discussion.

I. Aesthetics

Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Have a substantial adverse effect on a scenic vista?				X
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway?				X
c) Substantially degrade existing visual character or quality of the site and its surroundings?				X
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?				X

The scenic character of the project area is defined mostly by the rivers and sloughs, including riparian or marsh habitat along the banks. In the southwest Delta, views are dominated by sunsets and Mt. Diablo in the distance. The general public would view these areas from boats or along levee roads adjacent to the boring locations.

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

No impact. Project activities are short term in duration and will not have an adverse effect on a scenic vista. No vegetation will be removed nor will the visual nature of the channels be changed by proposed activities. There may be minor disturbance to vegetation during mobilization of equipment to land exploration sites.

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

No impact. The project area is not eligible or designated as a scenic corridor or scenic river. There are several listed or eligible scenic highways within the project vicinity. However, the project activities are short term in duration and will not have an adverse effect or substantially damage scenic resources. No trees, large rocks, or buildings will be damaged by proposed activities. There may be minor disturbance to vegetation during mobilization of equipment to land exploration sites.

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

No impact. Project activities will not remove any existing vegetation or change the nature of the channels and therefore, will not have a significant impact on the visual character of the area. There may be minor disturbance to vegetation during mobilization of equipment to land exploration sites.

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

No impact. The project activities will not create new sources of light. All work will be conducted between the hours of sunrise and sunset. The boats/barges will be properly lighted at night per the U.S. Coast Guard safety standards. These lights will not create substantial light or glare which would affect day or nighttime views in the area.

II. Agricultural Resources

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as a model in assessing impacts on agriculture and farmland. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?				X
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?				X
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?				X

Agricultural lands can be found throughout the Sacramento-San Joaquin Delta. The proposed activities will take place on agricultural lands but will not convert prime or unique farmland or farmland of Statewide importance. The project activities will not conflict with any existing zoning or involve changes in the existing environment.

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

No impact. The project will not convert prime farmland, unique farmland, or farmland of Statewide importance.

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

No impact. The project will not conflict with existing zoning of agricultural use or a Williamson Act contract.

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

No impact. The project will not involve other changes in the existing environment that could result in conversion of farmland to non-agricultural use.

III. Air Quality

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
Where available, significance criteria established by applicable air quality management or air pollution control district may be relied on to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?			X	
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?			X	
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or State ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?			X	
d) Expose sensitive receptors to substantial pollutant concentrations?			X	
e) Create objectionable odors affecting a substantial number of people?			X	

a) Would the project conflict with or obstruct implementation of the applicable air quality plan consistent with Air Quality Management Plans

Less than significant impact. The project area falls within a non-attainment area for ozone and for PM_{10} (fine particulate matter). A project is deemed inconsistent with air quality plans if it would result in population and/or employment growth that exceeds growth estimates included in the applicable air quality plan. Therefore, the proposed project has been evaluated to determine whether it would generate population and employment growth. The proposed project is not a population or growth-inducing project and is of a temporary nature. Therefore, no significant local or regional air quality impacts are anticipated.

b) Would the project violate any air quality standard or contribute substantially to an existing or projected air quality violation

Less than significant impact. Activities are anticipated to take fewer than 12 months and would result in short-term impacts on ambient air quality in the area that would not contribute substantially to an existing or projected air quality violation. The proposed project will involve the use of diesel and gasoline burning equipment. The proposed project may result in the generation of short-term work-related air emissions. Using the latest version of URBEMIS model (2007, version 9.2.4), the emissions levels of criteria pollutants of greatest concern would not exceed the most stringent significance thresholds among the regional air quality management agencies. Localized concentration of air pollutants would not exceed National and State Ambient Air Quality Standards. To minimize the temporary work-related emission impacts to the extent feasible, contractors will be required to implement best management practices including:

- On-road and off-road vehicle tire pressures shall be maintained to manufacturer specifications. Tires shall be checked and re-inflated at regular intervals.
- Construction equipment engines shall be maintained to manufacturer's specifications.
- Use properly tuned equipment that meets current emissions standards.

c) Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions, which exceed quantitative thresholds for ozone precursors)?

Less than significant impact. The project would generate pollutants with quantities less than the threshold values set by jurisdictional Air Quality Management Districts. The project would not generate emissions after geotechnical investigation is done, and any impact would be short-term and temporary in nature. The project is short in duration and small in scale; therefore, it will not have cumulative effects on air quality.

d) Would the project expose sensitive receptors to substantial pollutant concentrations?

Less than significant impact. The project would generate pollutants with quantities less than the threshold values set by jurisdictional Air Quality Management Districts, and the concentration of possible air pollutants would be low. The project sites are located in open spaces with a sparse population, no sensitive receptors were identified within close proximity to the project site; as a result, the project will not expose sensitive receptors to substantial pollutant concentrations.

e) Would the project create objectionable odors affecting a substantial number of people?

Less than significant impact. Implementation of the proposed project would not involve activities that would generate objectionable odors. In addition, the project is located in open spaces with a sparse population.

Air pollutants are regulated at the national, state, air basin and local level; each agency has a different degree of responsibility. The U.S. Environmental Protection Agency (USEPA or EPA) regulates at the national level. The California Air Resources Board (CARB) regulates at the state level. Regional air-quality management agencies regulate at the air-basin level. The counties and cities regulate at the local level.

Federal Regulations

The Federal Clean Air Act (FCAA) of 1963 and its amendments in 1970, 1977, and 1990 are major federal laws regulating air quality issues at the national level. The Federal Clean Air Act defines the U.S. Environmental Protection Agency's responsibilities for protecting and improving the nation's air quality and the stratospheric ozone layer. The contents of the Federal Clean Air Act include air pollution prevention and control, emission standards for moving sources, acid deposition control, stratospheric ozone protection, and permits. The U.S. U.S. Environmental Protection Agency enforces Federal Clean Air Act, establishes National Ambient Air Quality Standards (NAAQS), and regulates emission sources such as aircraft, ships, and certain types of locomotives. The National Ambient Air Quality Standards, also referred to as Federal Standards, were established for six common air pollutants referred to as criteria pollutants: ozone, particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide (NO_x), carbon monoxide (CO), lead, and sulfur dioxide (SO_2). The National Ambient Air Quality Standards were set to protect the health of sensitive individuals; thus, the standards continue to change as more medical research is available regarding the health effects of the criteria pollutants. Pursuant to the 1990 Amendments of Federal Clean Air Act, the U.S. Environmental Protection Agency classifies air basins (or portions thereof) as "attainment" or "nonattainment" for each criteria air pollutant based on whether or not the National Ambient Air Quality Standards have been achieved. The states with "nonattainment" air basins are required to prepare a State Implementation Plan (SIP) that describes existing air quality conditions and measures to be followed to attain and maintain National Ambient Air Quality Standards in their state. The U.S. Environmental Protection Agency is responsible for overseeing approval of all State Implementation Plans.

State and Local Regulations

The California Clean Air Act (CCAA) and AB 1807, Air Toxics Contaminants Act, are major state laws that regulate air quality issues in the state of California. The California Air Resources Board (CARB) has overall responsibility for statewide air quality maintenance and air pollution prevention. The California Air Resources Board implements California Clean Air Act and meets state requirements of Federal Clean Air Act. The California Air Resources Board is responsible for the administration of the State Implementation

Plan of California and oversees the activities of regional air-quality management agencies. The California Air Resources Board regulates mobile emissions sources and establishes vehicle emissions standards. The California Air Resources Board also set up California's Ambient Air Quality Standards (CAAQS), which are often referred to as State Standards, for six criteria air pollutants as well as a number of other air pollutants such as visibility-reducing particulates, hydrogen sulfide, sulfates, and vinyl chloride. The State Standards are more stringent than the Federal Standards for some of the criteria pollutants.

Regional air-quality management agencies such as Air Quality Management Districts (AQMD) and Air Pollution Control Districts (APCD) manage air quality or air pollution issues in an air basin or in portions of an air basin. California is divided geographically into 15 air basins for the purpose of managing the air resources of the State on a regional basis. An air basin generally has similar meteorological and geographic conditions throughout. The proposed project falls in three air basins: the San Francisco Bay Area Air Basin (San Francisco Bay Area Air Basin), the San Joaquin Valley Air Basin (SJVAB), and the Sacramento Valley Air Basin (SVAB). Both of the San Francisco Bay Area Air Basin and the SJVAB are comprised of a single district: the Bay Area Air Quality Management District (BAAQMD) and the San Joaquin Valley Air Pollution Control District (SJVAPCD) respectively; while the Sacramento Valley Air Basin is comprised of nine air districts among which are the Yolo-Solano Air Quality Management District (YSAQMD) and the Sacramento Metro Air Quality Management District (SMAQMD). An Air Quality Management District (or APCD) monitors air quality, designs programs to attain and maintains state and federal ambient air quality standards, develops air quality rules that regulate point source, area source and certain mobile source emissions, establishes permitting requirements for stationary sources, and enforces air quality rules through inspections, education, training, or fines. If the jurisdictional area was designated as "nonattainment" for any air pollutants based on either National Ambient Air Quality Standards or California Ambient Air Quality Standards, the Air Quality Management Districts or Air Pollution Control District are required to develop, update, and implement a comprehensive plan called Air Quality Management Plan (AQMP) to bring the area into compliance with the requirements of the national and/or state ambient air quality standards.

The Air Quality Management Districts and Air Pollution Control District also review and comment on air quality analysis of California Environmental Quality Act documents prepared by other organizations for projects within their jurisdictional areas and have published handbooks or guides to streamline the California Environmental Quality Act review process. For instance, the Bay Area Air Quality Management District published "Bay Area Air Quality Management District California Environmental Quality Act Guidelines", the San Joaquin Valley Air Pollution Control District published "Guide for Assessing and Mitigating Air Quality Impacts", the Yolo Solano Air Quality Management District published "Handbook for Assessing and Mitigating Air Quality Impacts of the Yolo-Solano Air Quality Management District", and the Sacramento Metro Air Quality Management District published "Guide to Air Quality Assessment in Sacramento County" to provide guidance for analyzing and mitigating project-specific air quality impacts. These publications provide standards, methodologies and procedures for conducting air quality analyses. This section has been prepared using methods and assumptions recommended in those handbooks.

Other local agencies such as Sacramento Area Council of Governments, county transportation and planning departments, cities and counties, and various non-governmental organizations also play an important role in improving air quality in the area through a variety of programs. These agencies control or mitigate air pollution through police powers and land use decision-making authority, General Plan air quality elements, congestion management program, local ordinances, administrative actions, and California Environmental Quality Act review and mitigation monitoring.

Environmental Setting and Existing Air Quality

The proposed project would conduct land and overwater geotechnical exploration at over 200 locations within the Sacramento-San Joaquin Delta. The drilling locations would spread within a "corridor" approximately 45 miles long and up to 3 miles wide. The project site is located at a bordering area of three air basins: the San Francisco Bay Area Air Basin, San Joaquin Valley Air Basin and Sacramento Valley Air Basin. Nearly half of the "corridor" falls into the south end of the Sacramento Valley Air Basin, half of the "corridor" falls in the north end of the San Joaquin Valley Air Basin, and the remaining small portion at the south end of the "corridor" falls into the San Francisco Bay Area Air Basin. As a result, the project is under jurisdiction of four regional air-management districts: the Sacramento Metro Air Quality

Management District, Yolo Solano Air Quality Management District, Bay Area Air Quality Management District and San Joaquin Valley Air Pollution Control District. The attainment status for the jurisdictional Air Quality Management Districts is shown in Table 1.

Table 1. Attainment status for jurisdictional regional air districts[2]

		SMAQMD		YSAQMD		BAAQMD		SJVAPCD	
		State	Federal	State	Federal	State	Federal	State	Federal
O_3	1-hr	N	N/A	N	N/A	N	N/A	N	N/A
	8-hr	N	N	N	N	N	N	N	N
PM10	24-hr	N	N	N	U	N	U	N	U
	Annual	N	N/A	N	N/A	N	N/A	N	N/A
PM2.5	24-hr	N/A	A	N/A	U	N/A	N	N/A	N
	Annual	N	U	N/A	U	N	A	N	N

Notes:
A: attainment means the concentration of the pollutant does not exceed national or state Ambient Air Quality Standards.
N: non-attainment means the concentration of the pollutant exceeds national or state Ambient Air Quality Standards.
N/A: means not applicable, state or federal standard does not exist for the combination of pollutant and averaging time.
U: means unclassified areas are those for which air monitoring has not been conducted but which are assumed to be in attainment.

Sacramento Valley Air Basin. The Sacramento Valley Air Basin covers all of Shasta, Tehama, Glenn, Colusa, Butte, Sutter, Yuba, Sacramento, and Yolo Counties, the westernmost portion of Placer County and the northeastern half of Solano County. The Sacramento Valley Air Basin is bound by the North Coast Ranges to the west and the Northern Sierra Nevada Mountains to the east. The intervening terrain is relatively flat. It has a Mediterranean climate characterized by hot dry summers and mild rainy winters. During the year the temperature may range from 20 to 115 °F, with summer highs usually in the 90s and winter lows occasionally below freezing. Average annual rainfall is approximately 20 inches, with about 75 percent of the rain occurring during the rainy season generally from November through March. Ozone is the primary criteria pollutants of concern in the SVAB.

Parts of project site are within in the Sacramento Federal Ozone Nonattainment Area (SFNA), which is comprised of Sacramento and Yolo Counties, and portions of El Dorado, Placer, Solano and Sutter Counties. The U.S. Environmental Protection Agency designated Sacramento Federal Ozone Nonattainment Area as a "severe" ozone nonattainment area with an attainment date of 2005 for the federal one-hour ozone standard. Another criteria pollutant that exceeds National Ambient Air Quality Standards or California Ambient Air Quality Standards is particular matter. The Sacramento Metro Air Quality Management District was designated as "nonattainment" for PM_{10} and $PM_{2.5}$ based on both National Ambient Air Quality Standards and California Ambient Air Quality Standards, and the classification is moderate for 24-hour PM_{10} by the national standard. Yolo County was also designated as a nonattainment area for the state PM_{10} standard.

San Joaquin Valley Air Basin. The San Joaquin Valley Air Basin consists of San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, and Tulare counties, and the western portion of Kern County. The San Joaquin Valley Air Basin is bound by the Coast Ranges to the west, the Sierra Nevada Mountains to the east and the Tehachapi mountains to the south. The intervening terrain is relatively flat with a slight downward gradient to the northwest. The San Joaquin Valley Air Basin has an "inland Mediterranean"

[2] Based on information collected from http://www.airquality.org/aqdata/attainmentstat.shtml and Handbook for Assessing and Mitigating Air Quality Impacts of the Yolo-Solano Air Quality Management District, Page A-5.

climate averaging over 260 sunny days per year. Summers are dry and warm, high temperatures often exceed 100ºF, and the average high temperature in the north valley is in the low 90ºs. Winters are mild and humid, temperatures below freezing are unusual and the average daily low temperature is 45ºF. Average annual rainfall is approximately 20 inches in the north part of the air basin, and the majority of the precipitation is produced by those storms during the winter.

The topographic features in the area restrict air movement through and out of the basin. Local climatological effects, including wind speed and direction, temperature, inversion layers, and precipitation and fog, can exacerbate the air quality problem in the San Joaquin Valley Air Basin.

The San Joaquin Valley Air Basin is classified "severe nonattainment" for the state and the federal ozone standard and "serious nonattainment" for the federal PM_{10} standard.

San Francisco Bay Area Air Basin. The San Francisco Bay Area Air Basin consists of Napa, Marin, San Francisco, Contra Costa, Alameda, San Mateo, and Santa Clara counties, the southern portion of Sonoma County, and the western portion of Solano County. The proposed project is located at the east edge of the San Francisco Bay Area Air Basin, near the border line of Contra Costa, Alameda and San Joaquin counties. While the topography of the San Francisco Bay Area Air Basin is characterized by complex terrain, consisting of coastal mountain ranges and inland valleys and bays, the project area within this air basin is located in the Sacramento-San Joaquin Delta, with a flat terrain and lower elevation. A semi-permanent, high-pressure area centered over the northeastern Pacific Ocean dominates the summer climate, and in winter the Pacific high weakens and shifts southward. As a result, the area is characterized by moderately wet winters and dry summers. Winter rains account for about 75 percent of the average annual rainfall. The amount of annual precipitation can vary greatly from one part of the air basin to another even within short distances. In general, total annual rainfall can reach 40 inches in the mountains, but it is often fewer than 16 inches in sheltered valleys. The annual rainfall at the project site is approximately 11 inches. The temperatures can also vary greatly from one part of the air basin to another. In the project area, high temperatures in summers often exceed 100 ºF, and the average high temperature is in the low 90s. The average low temperature in winters is in the high 30s.

The San Francisco Bay Area Air Basin is classified as non-attainment for the State and Federal Ozone standards, the State PM_{10} and $PM_{2.5}$ standards and the Federal $PM_{2.5}$ standards.[3]

Threshold of Significance

According to the California Environmental Quality Act Guidelines' Appendix G Environmental Checklist, to determine whether impacts to air quality are significant environmental effects, the following questions are analyzed and evaluated.

Would the project:

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

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

c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions, which exceed quantitative thresholds for ozone precursors)?

d) Expose sensitive receptors to substantial pollutant concentrations?

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

Regional air quality management agencies set up thresholds to determine whether environmental effects from the project are considered as "significant" or "not significant" in their jurisdictional area. A project may have emissions during its construction and operation. The emissions during the construction phase of a project are typically short in duration and thus of a temporary nature while the emissions as a result of project operations could occur throughout the lifespan of the project, and therefore, would be long-term and of a permanent nature.

[3] http://hank.baaqmd.gov/pln/air_quality/ambient_air_quality.htm

The project is a geotechnical investigation and all activities will cease when the study has been completed. The project will not build any permanent facilities or structures that would generate air pollutant emissions during project operation; as a result, the following discussions are focused on short-term construction/geotechnical emissions. The impact assessment methodology and procedure, as well as thresholds of significance adopted by each of the agencies, are presented in the following sections.

Yolo Solano Air Quality Management District. The Yolo Solano Air Quality Management District sets project-level thresholds for pollutants of concern in the district. Table 2 lists the threshold values for criteria pollutants that apply to both construction and operational impacts. For PM_{10} emissions, even projects not exceeding the district PM_{10} thresholds should comply with applicable district rules and implement best management practices to reduce dust emissions and avoid localized health impacts (Yolo Solano Air Quality Management District, 2007).

Table 2. Yolo Solano Air Quality Management District Thresholds of Significance for Criteria Pollutants

Pollutant	Thresholds of Significance
reactive organic gases	10 tons/year
nitrogen oxides	10 tons/year
particulate matter	80 lbs/day
carbon monoxide	Violation of a state ambient air quality standard for carbon monoxide

Besides setting thresholds for criteria pollutants, the Yolo Solano Air Quality Management District has adopted several other thresholds for toxics, odors and cumulative impacts.

The Yolo Solano Air Quality Management District encourages using URBEMIS (URBan EMISsions model 2007, Version 9.2.4) emissions model to perform quantified, screening-level air quality analyses.

Sacramento Metro Air Quality Management District. Because the Sacramento region exceeds state and federal ozone ambient air quality standards, ozone precursors such as nitrogen oxide are of greatest concern in the district. The Sacramento Metro Air Quality Management District has adopted a construction/geotechnical emissions threshold of 85 pounds per day of nitrogen oxide. The recommended approaches of estimating localized air quality impacts associated with the construction/geotechnical projects including URBEMIS and manual calculation. The Sacramento Metro Air Quality Management District generally accepts the following screening level assumption for determining the construction/geotechnical activity emissions' level of significance. If the project's nitrogen oxide mass emissions from heavy-duty, mobile sources are determined not potentially significant using the recommended methodologies, then it can be assumed that exhaust emissions of other pollutants from operation of equipment and worker commute vehicles are also not significant.

Besides setting thresholds for criteria pollutants, the Sacramento Metro Air Quality Management District has adopted several other thresholds for toxics, odors and cumulative impacts. A project is considered significant if anticipated emissions of certain pollutants exceed, or contribute substantially to an existing or projected violation of an ambient air quality standard, or expose sensitive receptors (e.g., children, athletes, elderly, sick populations) to substantial pollutant concentrations.

Bay Area Air Quality Management District. The Bay Area Air Quality Management District considers PM_{10} (fine particulate matter) as the pollutant of greatest concern with respect to construction/geotechnical activities. The Bay Area Air Quality Management District's approach to California Environmental Quality Act analyses of construction/geotechnical impacts is to emphasize implementation of effective and comprehensive control measures rather than detailed quantification of emissions. The determination of significance with respect to construction/geotechnical emissions should be based on a consideration of the control measures to be implemented. The Bay Area Air Quality Management District does not require quantification of construction/geotechnical emissions, although a Lead Agency may elect to do so. If all of the control measures indicated in Table 2 of the "Bay Area Air Quality Management District California Environmental Quality Act Guidelines" (as appropriate, depending on the size of the project area) will be

implemented, then PM_{10} emissions from construction/geotechnical activities would be considered a less than significant impact.

San Joaquin Valley Air Pollution Control District. The San Joaquin Valley Air Pollution Control District also regards PM_{10} (fine particulate matter) as the pollutant of greatest concern for project construction/geotechnical activities. The San Joaquin Valley Air Pollution Control District's approach to California Environmental Quality Act analyses of construction/geotechnical PM_{10} impacts is to require implementation of effective and comprehensive control measures rather than to require detailed quantification of emissions. The San Joaquin Valley Air Pollution Control District has determined that compliance with Regulation VIII for all sites and implementation of all other control measures indicated in Tables 6-2 and 6-3 of the "San Joaquin Valley Air Pollution Control District Guide" will constitute sufficient mitigation to reduce PM_{10} impacts to a level considered less than significant.

Impact Assessment

The proposed project is a geotechnical investigation and it does not involve building any permanent structures or facilities that would generate air pollutants. When the investigation has been completed, all activities will cease and no emissions will be generated. Impact to air quality would only occur during the period when geotechnical investigation is being performed. As a result, this study will focus on air pollutant emissions from project construction/geotechnical. Project impacts to air quality were assessed by using methods and assumptions recommended in handbooks or guidelines published by the jurisdictional regional air districts.

Criteria Air Pollutants Threshold. URBEMIS software was recommended by both of Sacramento Metro Air Quality Management District and Yolo Solano Air Quality Management District for construction/geotechnical emission evaluation. The emissions rates from the project would be compared with the most stringent threshold values among the districts to determine the level of significance.

In this study, the latest version of URBEMIS software (2007, version 9.2.4) was used. URBEMIS calculates criteria pollutants emissions from project construction/geotechnical based on the input information such as project schedule, equipment list (type, horsepower and operating hours), and on-road vehicles for equipment mobilization and worker commute. Tables 3 and 4 summarize the project's criteria pollutant emission levels (in pounds per day) for each piece of equipment generated by URBEMIS model.

Table 3. Daily Criteria Air Pollutants Emission for On-land Exploration (lbs/day)

	Emission Sources	Work Days	ROG	NO_x	PM10	PM2.5
On-land	Worker Trip	970	0.644	0.434	0.056	-
	Drill Rig	850	0.83	10.01	0.34	0.31
	CPT Rig (include mobilization)	113	1.4	15.65	0.56	0.51
	Support Truck	970	0.21	1.83	0.07	0.06
	Backhoe	7	0.66	4.05	0.37	0.34
	Maximum Daily		3.744	31.97	1.40	1.22

Table 4. Daily Criteria Air Pollutants Emission for Overwater Exploration (lbs/day)

	Emission Sources	Work Days	ROG	NOx	PM10	PM2.5
Intakes	Worker Trip	160	1.909	1.2865	0.166	-
	Drill Rig	160	0.92	11.12	0.37	0.34
	Mobilization (Push Boat)	10	1.33	12.76	0.48	0.44
	Maximum Daily		4.159	25.1665	1.016	0.78
Waterway Crossings	Worker Trip	90	1.679	1.1315	0.0146	-
	Drill Rig	80	0.92	11.12	0.37	0.34
	Mobilization (Push Boat)	20	1.33	12.76	0.48	0.44
	Maximum Daily		3.93	25.01	0.86	0.78
Docking /Tunnel Shaft Access	Worker Trip	40	2.53	1.705	0.022	-
	Drill Rig	25	0.92	11.12	0.37	0.34
	Mobilization (Crane + Push Boat)	18 + 20	1.33	12.76	0.48	0.44
	Maximum Daily		4.78	25.56	0.87	0.78

The pollutants of greatest concern at regional air quality management agencies include ozone precursors (such as reactive organic gases and nitrogen oxides) and particular matters (PM_{10} and $PM_{2.5}$). The emission level of the criteria pollutants of concern listed in the tables above are well below the most stringent significant thresholds of among the jurisdictional regional air quality management district (85 lbs per day for SMAQMD). DWR will schedule more than one drill rigs, CPT rigs and backhoes to perform drilling both on-land and overwater on a same day. DWR would use the emission data in the tables above to determine the maximum number of equipment to be used on a given day, so that the total emission from these equipments will not exceed the threshold value.

Due to the small scale of the project, the number and type of construction/geotechnical equipment required to complete project activities will be limited. In addition, unlike typical land use projects, the proposed project will not have large-scale earth-moving operations such as cut and fill, soil compaction and grading, and the drilling equipment would only disturb a very small area on land; therefore, only fugitive dust from soil disturbance would be minor.

Other Thresholds. The project would not involve demolition of old buildings; therefore, it will not generate such hazardous materials as asbestos. The project will not use chemical substances, and it will not generate substantial amount of air toxics except particulate matters from combustion of diesel engines of construction/geotechnical equipment. The project will not generate odors. In addition, many of the drilling locations would be overwater, and the others would be in areas away from residences and businesses; therefore, it will not expose sensitive receptors to any pollutant concentration exceeding any limits set by any health agencies.

Best Management Practices

The generation of direct onsite and offsite air quality impacts would be intermittent and would terminate following completion of drilling activities. Additionally, in order to minimize emissions to the extent feasible, construction/geotechnical contractors would be required to implement the following measures:

1. On-road and off-road vehicle tire pressures shall be maintained to manufacturer specifications. Tires shall be checked and re-inflated at regular intervals.
2. Construction equipment engines shall be maintained to manufacturer's specifications.
3. Using properly tuned equipment that meets current emissions standards.

IV. Biological Resources

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFG, FWS, or NMFS?		X		
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies or regulations or by the CDFG, FWS, or NMFS?				X
c) Have a substantial adverse effect on federally protected wetlands as defined by section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?				X
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?		X		
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?				X
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or State habitat conservation plan?				X

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFG or FWS?

Less than significant impacts with mitigation. A list of sensitive species with the potential to occur in the area was compiled from United States Fish and Wildlife Service (USFWS) and California Department of Fish and Game (CDFG) resources (CDFG 2009) (Table 5). Species' ranges and habitat requirements were compared with the project boundaries and available habitat in the project area as identified on aerial photographs (FSA 2010) and through vegetation mapping data created by DFG (Sawyer et. al. 2009) to determine if the species has potential to be found in the area. If potential habitat is present or the species was actually found during surveys, potential impacts due to the project were assessed and conservation measures are provided below.

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies or regulations or by the CDFG or FWS?

No impact. Riparian habitat and/or special status plant species will not be impacted during project activities. The project activities have been designed to avoid significant impacts to sensitive resources. See the Environmental Setting section (page 7) for a more complete description of habitat. See page 8 for conservation measures.

c) Have a substantial adverse effect on federally protected wetlands as defined by section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

No impact. The project activities do not fall within federally protected wetlands.

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

Less than significant impacts with mitigation. The Department of Water Resources does not anticipate impacts to fish species and will implement specific conservation measures to avoid, minimize, or mitigate potential impacts to wildlife species. See page 46 for further discussion of biological resources.

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

No impact. The project activities will not conflict with any local policies or ordinances protecting biological resources.

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

No impact. The project activities will not conflict with the provisions of an adopted HCP, NCCP, or other conservation plan.

Research Conducted

Department of Water Resources' Environmental Scientists reviewed the following existing resource information to develop a list of special-status species or other sensitive biological resources (e.g., wetlands) that could occur in the proposed project area:

A. The U.S. Fish and Wildlife Service's list of endangered, threatened, and proposed species for the 7.5-minute Quadrangles Saxon, Clarksburg, Florin, Liberty Island, Courtland, Bruceville, Rio Vista, Isleton, Thornton, Jersey Island, Bouldin Island, Terminous, Brentwood, Woodward Island, Holt, Byron Hot Springs, Clifton Court Forebay, Union Island were obtained from the U.S. Fish and Wildlife Service web site (USFWS 2010);

B. Records in the California Natural Diversity Database (CNDDB) for U.S. Geological Survey (USGS) 7.5-minute Quadrangles Saxon, Clarksburg, Florin, Liberty Island, Courtland, Bruceville, Rio Vista, Isleton, Thornton, Jersey Island, Bouldin Island, Terminous, Brentwood, Woodward Island, Holt, Byron Hot Springs, Clifton Court Forebay, Union Island (CDFG 2010).

C. The California Native Plant Society's (CNPS') 2010 online *Inventory of Rare and Endangered Plants of California* (California Native Plant Society 2010); and

D. Department of Water Resources' file information.

E. Biogeographic Information and Observation System. Online mapping tool designed to enable the visualization, management, and analysis of a wide range of biogeographic data collected by the Department of Fish and Game and partner organizations.

F. California Wildlife Habitat Relationships. The California Wildlife Habitat Relationship contains life history, geographic range, habitat relationships, and management information on 692 species of amphibians, reptiles, birds, and mammals in California.

Table 5 summarizes the listing status, habitat requirements, presence or absence of suitable habitat within or adjacent to the project area, and the potential for the presence of special status plant and animal species occurring in the general vicinity of the project limits based on suitable habitat. Habitat requirements for each species were compared with habitat features in the project area to determine if the species has potential to be found in the area. If potential habitat is present or the species was actually found in surveys, potential impacts due to the project were assessed and conservation measures proposed.

Field Surveys

The project activities have been designed to avoid significant impacts to sensitive resources. Department of Water Resources' Environmental Scientists will conduct reconnaissance level field surveys prior to geotechnical exploration to determine suitability of boring sites. Drill locations will be reviewed by the Department of Water Resources' Environmental Scientists to evaluate the potential impacts, if any, to environmental and cultural resources. Drill locations will be shifted as necessary to avoid any identified impacts to environmental and cultural resources or to reduce impacts to a less than significant level. The general purposes of the site visits are to:

A. Characterize and map biological communities and their associated wildlife habitat values.
B. Determine whether suitable habitat is present for special-status plant and wildlife species that have the potential to occur in the project vicinity.
C. Conduct focused surveys for raptors, including Swainson's hawk and white-tailed kites.
D. Identify potential waters of the United States (including wetlands).

Table 5. Listed species with the potential to occur within the Project action area from the USFWS and CNDDB Lists

Common Name *Species Name*	Status[1] (F/S/X/CNPS)	Habitat	Potential to Occur in Action Area	Potential for Project Impacts
INVERTEBRATES				
Sacramento Anthicid Beetle *Anthicus sacramento*	SC/--/--/--	Interior sand dunes and sand bars with some vegetative cover. Also can be found in dredge spoil heaps. Found in locations along the Sacramento, San Joaquin rivers from Shasta to San Joaquin Counties, and at one site along the Feather River.	**Likely** – can occur in dredge spoil heaps and loose sands among *Arundo* and *Salix* along the Sacramento River.	**Unlikely** – within known range, but loose sands and dredge spoil heaps should be left undisturbed.
Conservancy Fairy Shrimp *Branchinecta conservatio*	E/--/--/--	Large, cool-water vernal pools with moderately turbid water	**Unlikely** – habitat does exist within the project area, although this species has not been found within the project area.	**Unlikely** – Measures will be taken to avoid all vernal pool, ephemeral water ways, and wetland areas.
Longhorn Fairy Shrimp *Branchinecta longiantenna*	E/--/--/--	Found in pools with alkali sink and alkali scrub plant communities, sandstone outcrop pools, and alkaline grassland vernal pools.	**Unlikely** – habitat does exist within the project area, although this species has not been found within the project area.	**Unlikely** – Measures will be taken to avoid all vernal pool, ephemeral water ways, and wetland areas.
Vernal Pool Fairy Shrimp *Branchinecta lynchi*	T/--/X/--	Vernal pools; also sandstone rock outcrop pools	**Likely** – This species is known to occur in the southern portion of the project area and has also been found just outside of the northeastern portion of this project area.	**Unlikely** – Measures will be taken to avoid all vernal pool, ephemeral water ways, and wetland areas.
Mid-valley Fairy Shrimp *Branchinecta mesovallensis*	SC/--/--/--	Found in small short-lived vernal pools and grass-bottomed swales ranging from 4-663 square feet in area and averaging less than 4 inches in depth.	**Unlikely** – habitat does exist within the project area, although this species has not been found within the project area. It has been recorded just outside of the project boundary in the southern portion of the project area.	**Unlikely** – Measures will be taken to avoid all vernal pool, ephemeral water ways, and wetland areas.
Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus*	T/--/X/--	Riparian and oak savanna habitats with blue elderberry shrubs; elderberries are the host plant	**Likely** – Habitat likely exists within riparian areas along the rivers within the project area.	**Unlikely** – Measures will be taken to avoid all elderberry shrubs.
Curved-foot hygrotus diving beetle *Hygrotus curvipes*	SC/--/--/--	Small seasonal pools associated with alkaline plant communities.	**Unlikely** – Has been recorded in pools just to the southwest of the project area.	**Unlikely** – Measures will be taken to avoid all vernal pool, ephemeral water ways, and wetland areas.
Vernal Pool Tadpole Shrimp *Lepidurus packardi*	E/--/X/--	Vernal pools containing clear to highly turbid water in a wide range of sizes	**Likely** – This species has been found in pools just to the northeast of the project area. Habitat does exist within the project area.	**Unlikely** – Measures will be taken to avoid all vernal pool, ephemeral water ways, and wetland areas.

Common Name *Species Name*	Status[1] (F/S/X/CNPS)	Habitat	Potential to Occur in Action Area	Potential for Project Impacts
Antioch Dunes anthicid beetle *Anthicus antiochensis*	FSC/--/--/--	Interior sand dunes and sand bars.	Low: Species most likely occurs in bare, unvegetated loose sands.	**Unlikely** – within known range, but loose sands and dredge spoil heaps should be left undisturbed.
Ricksecker's water scavenger beetle *Hydrochara ricksecker*i	FSC/--/--/--	Weedy, shallow, open water associated with fresh water seeps, springs, farm ponds, vernal pools, and slow moving stream habitats.	Low: Closest species account within 3 miles. Known throughout the bay area, at Jepson Prairie, and the Sacramento area.	**Unlikely** – Measures will be taken to avoid all habitats associated with seasonal and permanent water sources.
Molestan blister beetle *Lytta molesta*	FSC/--/--/--	May be associated with dried vernal pools; wetlands. Often found on flowers of *Lupinus*, *Trifolium wormskioldii*, and *Eriodium*	Medium: Closest species (2.5 miles) account is in an area that has been developed. Plant types are fairly common throughout the central valley, along with dried vernal pool habitats.	**Unlikely** – Measures will be taken to avoid all vernal pool type habitat, ephemeral water ways, and wetland areas.
Antioch andrenid bee *Perdita scitula antiochensis*	FSC/--/--/--	Sandy substrates of the Antioch Dunes area. Known to visit flowers of CA matchweed (*Gutierrezia californica*), buckwheat (*eriogonum sp.)*, telegraph weed, and *Lessingia sp.*	Low: Closest species account is within 3 miles, however, the area has been developed. The Antioch dunes are at least 7 miles from any boring site.	**Unlikely** – within known range, but loose sands and dredge spoil heaps should be left undisturbed.
California Linderiella Linderiella occidentalis	SC/--/--/--	Found in vernal pools of most land forms, geologic formations, and soil types within California. Tend to be in deeper vernal pools.	**Likely** – habitat does exist within the project area.	**Unlikely** – Measures will be taken to avoid all vernal pool, ephemeral water ways, and wetland areas.
FISH				
Green Sturgeon Acipenser medirostris	T/--/--/--	Large, main stem rivers with cool water and cobble, clean sand, or bedrock for spawning.	**Likely** – within Southern Distinct Population Segment. Adult and juvenile sturgeon may occur within the project area.	**Unlikely** – project activities are minor in scope and mitigation measures will avoid in stream borings during spawning; drilling will take place mid-stream and during daylight hours to avoid migration activities.
Delta Smelt Hypomesus transpacificus	T/E/X/--	Tidal areas from fresh water up to 18 ppt, but primarily near and upstream of the brackish zone where bottom salinity is approximately 2 ppt. Spawning occurs in tidal areas, most commonly upstream of salinity at 2 ppt. High turbidity levels (e.g. >10 ntu) and moderate temperatures (<25°C) are required for all life stages.	**Medium** – within known range and critical habitat of Delta smelt. Adult migration and juvenile rearing not known within the project area during the limited work window.	**Unlikely** – project activities are minor in scope and will occur outside known fish range and before potential spawning migration.
Central Valley Steelhead Oncorhynchus mykiss	T/--/X/--	Rivers and streams with cold water, clean gravel of appropriate size for spawning, and suitable rearing habitat; rear in freshwater >1 years.	**Likely** – within known range and critical habitat of steelhead. Adult and juvenile steelhead may be present in the project area.	**Unlikely** – project activities are minor in scope and in stream borings would not disturb soil structure, riparian vegetation, divert water or degrade water quality.

Common Name *Species Name*	Status[1] (F/S/X/CNPS)	Habitat	Potential to Occur in Action Area	Potential for Project Impacts
Central California Coast steelhead *Oncorhynchus mykiss*	T/--/X/--	Rivers and streams with cold water, clean gravel of appropriate size for spawning, and suitable rearing habitat; rear in freshwater >1 years.	**Unlikely** – not within known range or critical habitat of CCC steelhead.	**Unlikely** – project activities are minor in scope and in stream borings would not disturb soil structure, riparian vegetation, divert water or degrade water quality.
Winter-run Chinook salmon *Oncorhynchus tshawytscha*	E/E/X/--	Main stem river reaches with cool water and available spawning; rear 5 to 10 months in the river and estuary; migrate to the ocean to feed and grow until sexually active.	**Likely** – within known range of winter-run Chinook.	**Unlikely** – project activities are minor in scope and in stream borings would not disturb soil structure, riparian vegetation, divert water or degrade water quality.
Central Valley Spring-run Chinook Salmon *Oncorhynchus tshawytscha*	T/T/X/--	Low- to mid-elevation rivers and streams with cold water, clean gravel of appropriate size for spawning, and suitable rearing habitat; typically rear in freshwater for one or more years before migrating to the ocean.	**Likely** – within known range of and critical habitat of spring-run Chinook. Adult and juvenile Chinook are not known to occur in project area within narrow work window (August 1 to October 31).	**Unlikely** – project activities are minor in scope and in stream borings would not disturb soil structure, riparian vegetation, divert water or degrade water quality.
Central Valley Fall and Late Fall Run Chinook Salmon *Oncorhynchus tshawytscha*	SC/--/--/--	Main stem river reaches with cool water and available spawning; typically rear in freshwater for less than one year before migrating to the ocean.	**Unlikely** – within known range of fall/late fall run Chinook. Adults may be present towards later period of work window (August 1 to October 31).	**Unlikely** – project activities are minor in scope and in stream borings would not disturb soil structure, riparian vegetation, divert water or degrade water quality.
Longfin Smelt *Spirinchus thaleichthys*	--/T/--/--	Euryhaline (capable of tolerating a wide range of salinities), pelagic and anadromous species found in scattered bays and estuaries from California to Alaska.	**Likely** – within know range of longfin smelt.	**Unlikely** – project activities are minor in scope and in stream borings would not disturb soil structure, riparian vegetation, divert water or degrade water quality.

Common Name Species Name	Status1 (F/S/X/CNPS)	Habitat	Potential to Occur in Action Area	Potential for Project Impacts
MAMMALS				
Western Red Bat *Lasiurus blossevillii*	--/SSC/--/--	Roosts primarily in tree foliage, occasionally shrubs; roosts in small family groups rather than large colonies as other bats; prefers habitat edges and mosaics with trees that are protected from above and open below with open areas for foraging, including grasslands, shrublands, and open woodlands.	**Likely** – Year-round range spans the Central Valley, Sierra Nevada foothills, Coast Ranges, and coast except Humboldt and Del Norte counties; documented foraging in most habitat types in the Delta; roosting documented in the Delta in Brannan Island State Recreation Area near the central portion of the western conveyance.	**Unlikely** – project will not impact habitat of this species.
Riparian (San Joaquin Valley) Woodrat *Neotoma fuscipes riparia*	E/--/--/--	Riparian forest	**Unlikely** – supporting habitat not expected to occur where project activities will occur.	**Unlikely** – supporting habitat not found within project area.
Riparian Brush Rabbit *Sylvilagus bachmani riparius*	E/--/--/--	Riparian forest.	**Unlikely** – supporting habitat not found where project activities will occur.	**Unlikely** – supporting habitat not found within project area.
San Joaquin Kit Fox *Vulpes macrotis mutica*	E/--/--/--	Chaparral, grasslands, and scrubland communities.	**Unlikely** – supporting habitat not found where project activities will occur.	**Unlikely** – supporting habitat not found within project area.
AMPHIBIANS				
California Tiger Salamander, central population *Ambystoma californiense*	T/T/X/--	Natural vernal pools or seasonal ponds and in burrows in adjacent uplands up to 1.3 miles away in parts of the Central Valley grasslands and low foothill regions.	**Likely** – California tiger salamanders are known to occur near the southwestern boundary of the Action Area; however, little suitable habitat exists, so they are not expected to occur.	**Unlikely** – Attempts will be made to avoid aquatic and upland habitat; however, if complete avoidance cannot be accomplished, there is a slight chance of impacting this species through habitat disturbance or crushing burrows that contain them.
California Red-legged Frog *Rana (aurora) draytonii*	T/SC/X/--	Permanent and semi permanent aquatic habitats such as creeks and cold-water ponds, with emergent and submergent vegetation and in cracks and burrows in adjacent uplands up to 1.3 miles away.	**Likely** – The southwestern boundary of the Action Area overlaps slightly with the eastern boundary of the known range and recent observation of the California red-legged frog.	**Unlikely** – Attempts will be made to avoid aquatic and upland habitat; however, if complete avoidance cannot be accomplished, there is a slight chance of impacting the frog through habitat disturbance or crushing burrows that contain them.

REPTILES				
Western Pond Turtle *Actinemys marmorata*	--/SC/--/--	Variety of permanent and intermittent aquatic habitats throughout the state, including rivers, streams, lakes, ponds, marshes, vernal pools, and human-constructed environments such as ponds associated with waste-water, stock, and logging operations. Nest in grassy uplands and overwinter under mud, dirt, or leaf litter.	**Likely** – Western pond turtles are relatively common throughout the rivers, sloughs, ponds, and irrigation ditches in the Action Area.	**Unlikely** – Western pond turtles may be temporarily disturbed from basking sites by water operations. There is a small chance of impacting nests during land operations.
California Legless Lizard *Anniella pulchra*	--/SC/--/--	Restricted to moist, loose, sandy soils such as sand, loam, or humus from near Antioch south in the Coast Ranges, Transverse Mountains, and Peninsular Ranges into northwestern Baja California. Commonly found in coastal dunes and oak woodlands.	**Unlikely** – The southwestern boundary of the Action Area is on the very fringe of the species' range, and the specific locations for disturbance do not appear to overlap with suitable habitat.	**Unlikely** – Attempts will be made to avoid sandy soils because they support numerous sensitive species.
San Joaquin Whipsnake *Coluber (= Masticophis) lateralis euryxanthus*	--/SC/--/--	Occurs in open, dry, treeless areas, including grassland and saltbush scrub in the Coast Ranges and nearby Valley floor south of San Francisco Bay.	**Unlikely** – The southwestern boundary of the Action Area is on the northeastern fringe of the species' range.	**Unlikely** – Attempts will be made to avoid grassland or saltbush scrub areas that could support this species.
Blainville's Horned Lizard *Phrynosoma blainvilli*	--/SC/--/--	Inhabits open areas of sandy soil and low vegetation in valleys, foothills and semiarid mountains from sea level to 8,000 ft. in elevation. Found in grasslands, coniferous forests, woodlands, and chaparral, with open areas and patches of loose soil. Often found in lowlands along sandy washes with scattered shrubs and along dirt roads, and frequently found near ant hills.	**Unlikely** – The southwestern boundary of the Action Area is on the very fringe of the species' range, and the specific locations for disturbance do not appear to overlap with suitable habitat.	**Unlikely** – Attempts will be made to avoid sandy soils because they support numerous sensitive species.
Giant Gartersnake *Thamnophis gigas*	T/T/--/--	Sloughs, canals, low-gradient streams and marsh habitats; irrigation ditches and rice fields; grassy banks and emergent vegetation for basking; high ground crack or burrows protected from flooding in the Central Valley.	**Medium** – The distribution of giant gartersnakes in the Action Area is poorly understood; however, given the poor quality of most of the available habitat and the lack of observations in the Action Area, they are not expected to occur.	**Unlikely** – Attempts will be made to completely avoid impacts through avoiding habitat and working within the snake's active season (May 1 – Oct 1); however, if complete avoidance cannot be accomplished, there is a very slight chance of impacting the snake or its habitat through habitat disturbance or being run over by vehicles.

Common Name *Species Name*	Status[1] (F/S/X/CNPS)	Habitat	Potential to Occur in Action Area	Potential for Project Impacts
BIRDS				
Cooper's Hawk *Accipiter cooperii*	–/WL (nesting)	Nests and forages primarily in riparian woodlands and other wooded habitats.	**Unlikely** – Year-round range spans most of the wooded portions of California; could occur throughout the BDCP Planning Area where patches of suitable wooded habitat are present but likely in low numbers.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
Tricolored Blackbird *Agelaius tricolor*	BCC/SSC (nesting)	Nests colonially in large, dense stands of freshwater marsh, riparian scrub, and other shrubs and herbs; forages in grasslands and agricultural fields.	**Likely** – Ranges primarily throughout the Central Valley and the central and southern coasts, with additional scattered locations throughout California; year-round resident; could occur throughout the BDCP Planning Area.	**Unlikely** – drilling will take place outside of nesting season as much as possible. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
Grasshopper Sparrow *Ammodramus savannarum*	–/SSC (nesting)	Nests and forages in dense grasslands; favors a mix of native grasses, forbs, and scattered shrubs.	**Likely** – Breeding range spans much of the Central Valley and California coast, but populations are typically localized and disjunct; most individuals migrate, although some may be present year-round; known to occur in the Yolo Bypass Wildlife Area and the northeast and southeast portions of the BDCP Planning Area; may occur in other portions of the BDCP Planning Area.	**Unlikely** – drilling will take place outside of nesting season as much as possible. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
Tule Greater White-fronted Goose *Anser albifrons elgasi*	–/SSC (wintering)	Forages primarily in marshes dominated by tules, bulrushes, and cattails; forages to a lesser extent in rice and other grain fields.	**Likely** – Does not breed in California; wintering populations are concentrated primarily in Sacramento Valley wildlife refuges and surrounding rice fields; Suisun Marsh, uplands in Grizzly Island Wildlife Area, and nearby duck clubs; and marginally the Napa Marshes; occurs primarily west of the BDCP Planning Area and at Stone Lakes NWR.	**Unlikely** – this species does not nest in the Action Area. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing roosting and foraging flocks.
Golden Eagle *Aquila chrysaetos*	BCC/ FP, WL	Nests and forages in a variety of open habitats, including grassland, shrubland, and cropland; most common in foothill habitats; rare foothill breeder; nests in cliffs, rock outcrops, and large trees.	**Likely** – winter range spans most of California; breeding range excludes the Central Valley floor; not expected to nest in the BDCP Planning Area; non-breeding individuals may forage throughout the area's uplands; most likely to occur in the scrub and grasslands of southern part near Clifton Court Forebay.	**Unlikely** – this species does not nest in the Action Area.

Common Name *Species Name*	Status[1] (F/S/X/CNPS)	Habitat	Potential to Occur in Action Area	Potential for Project Impacts
Great Egret *Ardea alba*	–/CFGC, Rookeries	Nests colonially in tall trees; forages in freshwater and saline marshes, shallow open water, and occasionally cropland or low, open upland habitats, such as pastures.	**Likely** – year-round range spans the Central Valley, central coast, and portions of southern California; winter range expands to include the remainder of the coast; may nest and forage throughout the BDCP Planning Area; rookeries have been documented throughout the BDCP Planning Area, especially on protected lands and instream islands.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing rookeries.
Great Blue Heron *Ardea herodias*	–/CFGC, Rookeries	Nests colonially in tall trees; forages in freshwater and saline marshes, shallow open water, and occasionally cropland or low, open upland habitats, such as pastures.	**Likely** – year-round range spans most of California except the eastern portion of the State and the highest elevations; winter range expands to include eastern California; nests and forages throughout the BDCP Planning Area, especially on protected lands and instream islands.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing rookeries.
Short-eared Owl *Asio flammeus*	–/SSC (nesting)	Nests on the ground among herbaceous vegetation, such as grasses or cattails; forages in grasslands, agricultural fields, and marshes.	**Unlikely** – breeding range is patchily distributed throughout the State and BDCP Planning Area, including portions of the Sacramento and San Joaquin valleys, northeastern California, and a few scattered coastal sites; Grizzly Island in Suisun Marsh supports the only known breeding population in the BDCP Planning Area, although small numbers have been documented episodically at the Cosumnes River Preserve and in Byron in Contra Costa County.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
Burrowing Owl *Athene cunicularia hypugea*	BCC/SSC (nesting)	Nests and forages in grasslands, agricultural fields, and low scrub habitats, especially where ground squirrel burrows are present; occasionally inhabits artificial structures and small patches of disturbed habitat.	**Likely** – Year-round range includes the Central Valley and Delta and portions of the central coast, eastern California, and southern California; may occur throughout the BDCP Planning Area where habitat is suitable; documented on Brannan Island and near Suisun Bay and Clifton Court Forebay.	**Unlikely** – Drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
Redhead *Aythya americana*	–/SSC (nesting)	Nests in freshwater emergent wetlands with dense patches of tules or cattails interspersed with open water more than 1 meter deep; forages by diving in deep open water.	**Unlikely** – year-round range is patchily distributed through portions of the Central Valley, northeastern California, and southern California; not expected to nest in the BDCP Planning Area, although a low potential exists at freshwater duck clubs that maintain summer water at depths greater than 3 feet with suitable surrounding marsh; known to nest in the Yolo Bypass, but no recent nesting records occur elsewhere in the BDCP Planning Area.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.

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Ferruginous Hawk *Buteo regalis*	–/WL	Forages most commonly in grasslands and shrublands; also forages in agricultural fields.	**Unlikely** – winter range spans most of California except the higher elevations of the Sierra Nevada and northern Coast Ranges; does not nest in California; may forage in winter throughout the uplands of the BDCP Planning Area; most likely to occur in the scrub and grasslands of the southern portion near Clifton Court Forebay.	**Unlikely** – this species does not nest in the Action Area.
Swainson's Hawk *Buteo swainsoni*	BCC/ST (nesting)	Nests in isolated trees, open woodlands, and woodland margins; forages in grasslands and agricultural fields.	**Likely** – breeding range spans the Central Valley and Delta west of Suisun Marsh, northeastern California, and a few additional scattered sites; most of the population migrates south of California in fall/winter, although a small number winters in the Delta; a minimum of 85 nests were documented throughout the Delta during limited surveys in 2009.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found nesting at drilling sites during pre-construction/geotechnical surveys, drilling activities will be avoided within a ½ mile buffer of nests.
Western Snowy Plover *Charadrius alexandrinus nivosus*	FT/SSC	Nests and forages on sandy and gravelly beaches along the coast and the shores of inland alkali lakes.	**Unlikely** – breeds in coastal California and near alkali lakes in eastern California and remnant alkali playas in the southern San Joaquin Valley; not expected to occur in the Delta or Suisun Marsh because these areas are outside of the species' known range; nesting has been documented in three Yolo County sites: the Yolo Bypass, Davis Sewage Ponds, and Woodland Sugar Ponds; no other recent records exist for the Delta or Sacramento Valley.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
Mountain Plover *Charadrius montanus*	BCC/ SSC (wintering)	Forages in short grasslands and plowed agricultural fields where vegetation is sparse and trees are absent.	**Unlikely** – winter range spans the western Central Valley, including areas of the Delta east of Suisun Marsh, and portions of southern California; does not breed in California; may occur throughout the BDCP Planning Area where habitat is suitable.	**Unlikely** – this species does not nest in the Action Area.
Northern Harrier *Circus cyaneus*	–/SSC (nesting)	Nests on the ground among herbaceous vegetation, such as grasses or cattails; forages in grasslands, agricultural fields, and marshes.	**Likely** – breeding range encompasses much of lowland California; winter range expands to include the remaining lowland areas; may nest and forage throughout the BDCP Planning Area; nesting has been documented in the eastern portion of Suisun Marsh and near Clifton Court Forebay.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.

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Western Yellow-billed cuckoo *Coccyzus americanus occidentalis*	C/E	Nests in valley, foothill, and desert riparian forest with densely foliaged deciduous trees and shrubs, especially willows; other associated vegetation includes cottonwood trees, blackberry, nettle, and wild grape.	**Unlikely** – historically common but now a rare summer resident at isolated sites in Sacramento Valley in northern California and along Kern and Colorado River systems in southern California; occasionally documented in Colusa, Glenn, Butte, Sutter, and Yolo counties within the last 20 years; present, but unconfirmed breeding within the BDCP Planning Area during 2009 BDCP surveys at a location north of Walnut Grove, California.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
Yellow Warbler *Dendroica petechia brewsteri*	–/SSC (nesting)	Nests and forages in early successional riparian habitats.	**Likely** – range includes coastal and northern California and the Sierra Nevada below approximately 7,000 feet; mostly extirpated from the southern Sacramento and San Joaquin valleys; has recently been documented (1998–2002) in limited locations in the BDCP Planning Area during the breeding season.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
Snowy Egret *Egretta thula*	–/CFGC, Rookeries	Nests colonially in dense marshes and low trees; forages in freshwater and saline marshes, shallow open water, and occasionally irrigated cropland or wet upland habitats.	**Likely** – year- round range spans the Central Valley, Delta, entire coast, central Coast Ranges, and southeastern California; winter range expands to include northeastern California; may nest and forage throughout the BDCP Planning Area, especially on protected lands near marshes.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing rookeries.
White-tailed Kite *Elanus leucurus*	–/FP	Forages in ponds, marshes, slow-moving streams, sloughs, and irrigation/drainage ditches; nests in nearby uplands with low, sparse vegetation.	**Likely** – year- round range spans the Central Valley, Coast Ranges and coast, Sierra Nevada foothills, and Colorado River; may nest and forage throughout the BDCP Planning Area; documented in the Delta along the Sacramento River west of Stone Lake, and in the north-central and east-central Delta.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
California Horned Lark *Eremophila alpestris actia*	–/WL	Nests and forages in open habitats with sparse vegetation, including grasslands and fallow agricultural fields.	**Likely** – year- round range spans most of lowland California; may nest and forage in the BDCP Planning Area where habitat is suitable, particularly in the grasslands and alkali sink habitat in the southern portion near Clifton Court Forebay.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.

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Merlin *Falco columbarius*	–/WL (wintering)	Forages in a wide variety of habitats, but in the Central Valley is most common around agricultural fields and grasslands.	**Likely** – winter range encompasses most of California except the highest elevations; does not breed in California; may forage in winter throughout the BDCP Planning Area.	**Unlikely** – does not nest in the Action Area.
Prairie Falcon *Falco mexicanus*	BCC/WL (nesting)	Forages most commonly in grasslands and low shrublands; also forages in agricultural fields.	**Unlikely** – year-round range includes eastern California, the Coast Ranges, and much of southern California; winter range expands to include the Delta, Central Valley, and coast; low probability of nesting in the BDCP Planning Area, with a higher likelihood of foraging in suitable habitats during post-breeding dispersal, migration, or winter; most likely to occur in the BDCP Planning Area in the southern-most portion near Clifton Court Forebay; known to nest near Byron in Contra Costa County, this area is not generally included in the published breeding range.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
American Peregrine Falcon *Falco peregrinus anatum*	BCC/FP, E (nesting)	Forages in a wide variety of habitats, but is most common near water, where shorebirds and waterfowl are abundant.	**Likely** – year-round range includes the Sierra Nevada, Cascade Range, northeastern California, Coast Ranges, and coast; winter range expands to include the Central Valley and the BDCP Planning Area and additional portions of eastern and southern California; not expected to nest in the BDCP Planning Area because these areas are outside of the published breeding range; may forage in winter in these areas.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
Saltmarsh Common Yellowthroat *Geothlypis trichas sinuosa*	BCC/SSC	Primarily brackish marsh with dense and continuous wetland or riparian vegetation down to the water surface; however, to a lesser degree, also uses woody swamp/riparian and freshwater marsh; often found in rush, tall grass, and willow-dominated communities.	**Likely** – endemic to the greater San Francisco Bay Area with boundaries being Santa Clara County to the south, Carquinez Straight to the east, the Napa Marsh in southern Sonoma County to the north, and western Marin County to the west. CNDDB also documents several occurrences, some nesting, in the Suisun Marsh; however, subspecies identification may be suspect.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
Lesser Sandhill Crane *Grus canadensis canadensis*	–/SSC (wintering)	Forages primarily in croplands with waste grain; also frequents grasslands and emergent wetlands.	**Likely** – Winter range is concentrated in scattered patches in the BDCP Planning Area, northern Sacramento Valley, portions of San Joaquin Valley (especially in Merced County), Carrizo Plain, and southern California south of the Salton Sea; occurs more widely between these areas during migration; does not breed in California; may forage during winter throughout the BDCP Planning Area.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. Drilling activities will be avoided in a ½ mile buffer around known active roost sites.

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Greater Sandhill Crane *Grus canadensis tabida*	–/T, FP	Forages primarily in croplands with waste grain; also frequents grasslands and emergent wetlands.	**Likely** – Winter range includes Central Valley and Delta, Carrizo Plain, southern California south of the Salton Sea, and Colorado River; breeds in NE California; may forage during winter throughout the BDCP Planning Area.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. Drilling activities will be avoided in a ½ mile buffer around known active roost sites.
Bald Eagle *Haliaeetus leucocephalus leucocephalus*	–/E, FP	Forages primarily in large inland fish-bearing waters with adjacent large trees or snags, and occasionally in uplands with abundant rabbits, other small mammals, or carrion.	**Unlikely** – Breeding range includes the Sierra Nevada, Cascade Range, and portions of the Coast Ranges; winter range expands to include most of the State except southeastern California (although the species occurs along the Colorado River); not expected to nest in the BDCP Planning Area; in winter, may forage in the BDCP Planning Area along large rivers and in areas managed for waterfowl.	**Unlikely** – this species does not nest in the Action Area.
Yellow-breasted Chat *Icteria virens*	–/SSC	Nests and forages in riparian thickets of willow and other brushy tangles near water and thick understory in riparian woodland.	**Likely** – Breeding range includes the northern Sacramento Valley, Cascade Range, Sierra Nevada foothills, northwestern California, most of the Coast Ranges, the Colorado River, and other scattered sites, including part of the BDCP Planning Area; migrates south of California in fall/winter; nests in patches of the BDCP Planning Area where habitat is suitable; surveys in 2009 found more nests than expected, but not in all available habitat.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
Least Bittern *Ixobrychus exilis*	–/SSC (nesting)	Nests and forages in cattail and bulrush marshes.	**Likely** – Current breeding range is scattered in patches of the Sacramento and San Joaquin valleys, Clear Lake, marshes around several large lakes in eastern California, and portions of southern California, where they also winter; known to occur on Joice Island in Suisun Marsh; low probability of occurrence in other portions of the BDCP Planning Area, particularly the marshes in the southeast and central Delta, and potentially in private duck clubs; a few individuals have been documented in the Yolo Bypass, Freeport in Sacramento County, and Palm Tract in Contra Costa County, but the Delta is no longer a major population center for the species.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.

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Loggerhead Shrike *Lanius ludovicianus*	BCC/SSC (nesting)	Nests in isolated shrubs and trees and woodland/scrub edges of open habitats; forages in grasslands, agricultural fields, and low scrub habitats.	**Likely** – Breeding range spans much of lowland California, and winter range includes most lowland areas south of Glenn County. May occur throughout the BDCP Planning Area, especially in the Clifton Court Forebay area.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
California Black Rail *Laterallus jamaicensis coturniculus*	BCC/ST, FP	Nests and forages in saline, freshwater, or brackish emergent marshes with gently grading slopes and upland refugia with vegetative cover beyond the high-water line.	**Unlikely** – Year-round range includes Suisun Marsh, San Pablo Bay, Morro Bay, a few patches in the Sierra Nevada foothills, and portions of southern California; winter range expands to include San Francisco Bay and the Marin County coast; several historic nesting occurrences documented in the southern half of the BDCP Planning Area. Survey in 2009 found one nest at White Slough and one in an instream island west of Stockton.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
Song Sparrow "Modesto" Population *Melospiza melodia*	–/SSC	Nests and forages primarily in emergent marsh, riparian scrub, and early successional riparian forest habitats, and infrequently in mature riparian forest and sparsely vegetated ditches and levees.	**Likely** – Year-round range includes the Delta east of Suisun Marsh, the Sacramento Valley, and the northern San Joaquin Valley; known to forage in the Delta, along Threemile Slough; nests and forages throughout the BDCP Planning Area.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
Suisun Song Sparrow *Melospiza melodia maxillaris*	BCC/SSC	Nests and forages in brackish water marshes dominated by cattails, tules, and pickleweed.	**Likely** – Year-round range includes the marshes surrounding Suisun Bay, from the confluence of the Sacramento and San Joaquin rivers to the Carquinez Strait; not expected in the remainder of the Delta or BDCP Planning Area.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
San Pablo Song Sparrow *Melospiza melodiasamuelis*	–/SSC	Coastal salt marshes dominated by pickleweed; nests in gumplant bordering slough channels.	**Unlikely** – Year-round range includes the marshes surrounding San Pablo Bay and northern San Francisco Bay; unlikely to occur in the BDCP Planning Area.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.

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Black-crowned Night-heron *Nycticorax nycticorax*	–/–	Nests colonially in dense marshes, groves of low trees, and dense shrubs; forages in freshwater and saline marshes and in shallow open water at the edge of marsh vegetation.	**Likely** – Year-round range includes much of lowland California; known rookeries are near Clifton Court Forebay and Walnut Grove; may nest and forage throughout the BDCP Planning Area.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats
Osprey *Pandion haliaetus*	–/WL	Forages exclusively in fish-bearing waters; nests in nearby trees or tall, constructed platforms.	**Likely** – Breeding range includes most of northern California, the central Coast Ranges, and the southern Sierra Nevada; winter range also includes the central coast and additional portions of southern California; nests in the BDCP Planning Area and could forage throughout the BDCP Planning Area in winter.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
California Brown Pelican *Pelecanus occidentalis californicus*	–/FP	Nests colonially on small to moderate sized coastal islands, just outside surf line, building nests with sticks on the ground.	**Unlikely** – Usually found on the coast; may occur in the BDCP Planning Area near deeper water where it can forage.	**Unlikely** – this species does not nest in the Action Area.
Double-crested Cormorant *Phalacrocorax auritus*	–/WL (rookeries)	Forages in open water; breeds colonially in rock ledges and trees.	**Likely** – Breeding range spans the BDCP Planning Area, the coast and offshore islands, Clear Lake, the Salton Sea, the Colorado River, and portions of north-eastern California; winter range expands to include the Central Valley and additional portions of southern California; may nest and forage throughout the BDCP Planning Area; a rookery has been documented in the Delta, between Sacramento and Stone Lakes National Wildlife Refuge.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing rookeries.
White-faced Ibis *Plegadis chihi*	–/WL (rookeries)	Forages in wetlands and irrigated or flooded croplands and pastures; breeds colonially in dense freshwater marsh.	**Likely** – Year-round resident in scattered locations in the Central Valley and southern California; also nests in northeastern California; breeds in the Yolo Basin Wildlife Area, but there is a low likelihood of nesting in the remainder of the BDCP Planning Area; may forage there during winter and migration.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
Purple Martin *Progne* subis	–/SSC (nesting)	Nests in tree cavities, bridges, utility poles, lava tubes, and buildings; forages in foothill and low montane oak and riparian woodlands, and less frequently in coniferous forests and open or developed habitats.	**Likely** – Not expected in BDCP Planning Area except small numbers during migration; breeding range includes the Sierra Nevada, Cascade Range, portions of the Coast Ranges and coast, and parts of southern California; migrates south of California in fall/winter; extirpated from the Delta, and nesting in the Central Valley has been reduced to transportation structures in and around the city of Sacramento.	**Unlikely** – this species does not nest in the Action Area.

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California Clapper Rail *Rallus longirostris obsoletus*	E/E, FP	Nests and forages in dense cordgrass and cattail marshes with vegetated refugia during the highest tides.	**Unlikely** – Year-round near coastal range, surrounds San Francisco and San Pablo bays, and documented at several locations in Suisun Bay; range does not include the BDCP Planning Area.	**Unlikely** – this species does not nest in the Action Area.
Bank Swallow *Riparia riparia*	–/T (nesting)	Nests in vertical banks or bluffs, typically adjacent to water, devoid of vegetation, and with friable, eroding soils; forages in a wide variety of habitats.	**Likely** – Breeds in much of lowland and riparian California, with 75% nesting colonies along the Sacramento and Feather rivers and their tributaries; additional breeding locations are scattered throughout northern and central portions of the State; migrates south of California in fall/winter; low probability of nesting in BDCP Planning Area because suitable bank conditions are rare; however, one nesting colony has been documented at Brannan Island SRA.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nesting colonies.
California Least Tern *Sternula antillarum browni*	E/E, FP	Prefers undisturbed nest sites on open or sparsely vegetated, sandy, or gravelly shores on beaches or near shallow-water estuaries where it often feeds; has reportedly also nested on landfills and paved areas.	**Unlikely** – Pacific Coast from San Francisco to Baja; winters in Mexico; when feeding, follows schools of fish and is sometimes seen as far north as southern Oregon; documented nesting in the western portion of BDCP Planning Area in Suisun Bay.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nesting colonies.
Least Bell's Vireo *Vireo bellii pusillus*	E/E	Nests and roosts in low riparian thickets of willows and shrubs, usually near water but sometimes along dry, intermittent streams; other associated vegetation includes cottonwood trees, blackberry, mulefat, and mesquite (in desert).	**Unlikely** – Formerly common and wide-spread summer resident throughout Sacramento and San Joaquin valleys, and in the coastal valleys and foothills from Santa Clara County south, but numbers have drastically declined, and species has vanished from much of its California range; does not occur in the BDCP Planning Area, but could expand range with riparian restoration. (Two males reported singing at Yolo Bypass Wildlife Area in 2010).	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.
Yellow-headed Blackbird *Xanthocephalus xanthocephalus*	–/SSC (nesting)	Nests in freshwater emergent wetlands with dense vegetation and deep water, often along borders of lakes or ponds.	**Likely** – Breeding range primarily the Central Valley, NE California, and portions of So. California; most individuals migrate south of California in winter; may occur in freshwater marshes in the BDCP Planning Area, mainly in the southern half, but also occur in the northern half of the BDCP Planning Area, south of the city of Sacramento.	**Unlikely** – drilling will take place outside of nesting season as much as possible; drilling will not take place in sensitive habitats. If this species is found at drilling sites during pre-construction/geotechnical surveys, appropriate measures will be taken to avoid disturbing nests.

Common Name *Species Name*	Status[1] (F/S/X/CNPS)	Habitat	Potential to Occur in Action Area	Potential for Project Impacts
PLANTS				
Alkali milk-vetch *Astragalus tener var. tener*	--/--/--/1B.2	Found in alkali playa, valley and foothill grassland, vernal pool, and wetland habitats.	**Likely** – found near Clifton Court.	**Unlikely** – with pre-project surveys and avoidance measures.
Bristly sedge *Carex comosa*	--/--/--/2.1	Found in freshwater marsh, marsh and swamp, and wetland habitats.	**Likely** – found along waterways within Action Area.	**Unlikely** – avoiding any impact to water side of levees and stream banks.
Brown fox sedge *Carex vulpinoidea*	--/--/--/2.2	Found in marsh and swamp and riparian woodland habitats.	**Likely** – found within Action Area.	**Unlikely** – avoiding any impact to water side of levees and stream banks.
Caper-fruited tropidocarpum *Tropidocarpum capparideum*	--/--/--/1B.1	Found in valley and foothill grasslands.	**Likely** – found within Action Area.	**Unlikely** – with pre-project surveys and avoidance measures.
Contra Costa goldfields *Lasthenia conjugens* (Critical habitat)	E/--/X/1B	Found in vernal pools.	**Likely** – critical habitat within Action Area.	**Unlikely** – with pre-project surveys and if avoid Critical Habitat in Clifton Court area.
Delta button-celery *Eryngium racemosum*	--/E/--/1B.1	Found in riparian scrub, and wetland habitats.	**Unlikely** – no known occurrences within Action Area.	**Unlikely** – avoiding impacts to riparian scrub.
Delta mudwort *Limosella subulata*	--/--/--/2.1	Found in brackish marsh, freshwater marsh, marsh and swamp, riparian scrub, wetland habitats.	**Likely** – found along waterways within Action Area.	**Unlikely** – avoiding any impact to water side of levees and stream banks.
Delta tule pea *Lathyrus jepsonii var. jepsonii*	--/--/--/1B.2	Found in freshwater marsh, marsh and swamp, and wetland habitats.	**Likely** – found along waterways within Action Area.	**Unlikely** – avoiding any impact to water side of levees and stream banks.
Diamond-petaled California poppy *Eschscholzia rhombipetala*	--/--/--/1B.1	Found in valley and foothill grasslands.	**Unlikely** – no known occurrences within Action Area.	**Unlikely** – with pre-project surveys and avoidance measures.
Dwarf downingia *Downingia pusilla*	--/--/--/2.2	Found in valley and foothill grassland, vernal pool, and wetland habitats.	**Unlikely** – no known occurrences in Action Area but some nearby.	**Unlikely** – avoiding wetlands and vernal pool habitats.
Eel-grass pondweed *Potamogeton zosteriformis*	--/--/--/2.2	Found in marsh and swamp, and wetland habitats.	**Unlikely** – no known occurrences in Action Area but some nearby.	**Unlikely** – if avoid impacts to wetlands and stream banks.

Common Name *Species Name*	Status[1] (F/S/X/CNPS)	Habitat	Potential to Occur in Action Area	Potential for Project Impacts
PLANTS				
Antioch Dunes evening-primrose *Oenothera deltoids ssp. howellii*	E/E/--/1B.1	Found in interior dunes habitats.	**Medium** – no known occurrences in Action Area but some nearby.	**Unlikely** – with pre-project surveys and avoidance measures.
Baker's navarretia *Navarretia leucocephala ssp. bakeri*	--/--/--/1B.2	Found in cismontane woodland, lower montane coniferous forest, meadow and seep, valley and foothill grassland, vernal pool and wetland habitats.	**Unlikely** – no known occurrences within Action Area.	**Unlikely** – with pre-project surveys and avoidance measures.
Big tarplant *Blepharizonia plumosa*	--/--/--/1B.1	Found in valley and foothill grassland habitats.	**Medium** – no known occurrences in Action Area but some nearby.	**Unlikely** – with pre-project surveys and avoidance measures.
Bolander's water-hemlock *Cicuta maculate var. bolanderi*	--/--/--/2.1	Found in marshes and swamps, and coastal, fresh or brackish water habitats.	**Unlikely** – no known occurrences within Action Area.	**Unlikely** – avoiding any impact to water side of levees and stream banks.
Brittlescale *Atriplex depressa*	--/--/--/1B.2	Found in alkali playa, chenopod scrub, meadow and seep, valley and foothill grassland, vernal pool, and wetland habitats.	**Unlikely** – no known occurrences within Action Area.	**Unlikely** – with pre-project surveys and avoidance measures.
Carquinez goldenbush *Isocoma arguta*	--/--/--/1B.1	Found in valley and foothill grassland habitats.	**Unlikely** – no known occurrences within Action Area.	**Unlikely** – with pre-project surveys and avoidance measures.
Chaparral ragwort *Senecio aphanactis*	--/--/--/2.2	Found in cismontane woodland and coastal scrub habitats.	**Medium** – no known occurrences in Action Area but some nearby.	**Unlikely** – with pre-project surveys and avoidance measures.
Colusa grass *Neostapfia colusana*	T/E/--/1B.1	Found in vernal pool and wetland habitats.	**Unlikely** – no known occurrences within Action Area.	**Unlikely** – avoiding wetlands and vernal pool habitats.
Congdon's tarplant *Centromadia parryi ssp. congdonii*	--/--/--/1B.2	Found in valley and foothill grassland habitats.	**Unlikely** – no known occurrences within Action Area.	**Unlikely** – with pre-project surveys and avoidance measures.
Crampton's tuctoria *Tuctoria mucronata*	E/E/--/1B.1	Found in valley and foothill grassland, vernal pool and wetland habitats.	**Unlikely** – no known occurrences within Action Area.	**Unlikely** – with pre-project surveys and avoidance measures.
Diablo helianthella *Helianthella castanea*	--/--/--/1B.2	Found in broadleaved upland forest, chaparral, cismontane woodland, coastal scrub, and valley and foothill grassland habitats.	**Unlikely** – no known occurrences within Action Area.	**Unlikely** – with pre-project surveys and avoidance measures.
Ferris' milk-vetch *Astragalus tener var. ferrisiae*	--/--/--/1B.1	Found in meadow and seep, valley and foothill grassland, and wetland habitats.	**Unlikely** – no known occurrences within Action Area.	**Unlikely** – with pre-project surveys and avoidance measures.
Heartscale *Atriplex cordulata*	--/--/--/1B.2	Found in chenopod scrub, meadows and seeps, valley and foothill grassland (sandy)/saline or alkaline habitats.	**Likely** –occurrences are known near Clifton Court Forebay within Action Area.	**Unlikely** – with pre-project surveys and avoidance measures.

Common Name *Species Name*	Status[1] (F/S/X/CNPS)	Habitat	Potential to Occur in Action Area	Potential for Project Impacts
Heckard's pepper-grass *Lepidium latipes var. heckardii*	--/--/--/1B.1	Found in valley and foothill grassland, vernal pool, and wetland habitats.	**High** –occurrences are known near Stone Lakes within Action Area.	**Unlikely** – with pre-project surveys and avoidance measures.
Legenere *Legenere limosa*	--/--/--/1B.1	Found in vernal pool and wetland habitats.	**Medium** – no known occurrences in Action Area but some nearby.	**Unlikely** – avoiding wetlands and vernal pool habitats.
Little mousetail *Myosurus minimus ssp. apus*	--/--/--/3.1	Found in valley and foothill grassland and alkaline vernal pool habitats.	**Likely** –occurrences are known near Clifton Court Forebay within Action Area.	**Unlikely** – with pre-project surveys and avoidance measures.
Marsh skullcap *Scutellaria galericulata*	--/--/--/2.2	Found in lower montane coniferous forest, marsh and swamp, meadow and seep, and wetland habitats.	**Likely** – found along waterways within Action Area.	**Unlikely** – avoiding impacts to water side of levees and stream banks.
Mason's lilaeopsis *Lilaeopsis masonii*	--/--/--/1B.1	Found in freshwater marsh, marsh and swamp, riparian scrub, and wetland habitats.	**Likely** – found along waterways within Action Area.	**Unlikely** – avoiding impacts to water side of levees and stream banks.
Northern California black walnut *Juglans hindsii*	--/--/--/1B.1	Found in riparian forest and riparian woodland habitats.	**Likely** – found along riparian areas within Action Area.	**Unlikely** – avoiding impacts to riparian habitat.
Recurved larkspur *Delphinium recurvatum*	--/--/--/1B.2	Found in chenopod scrub, cismontane woodland, and valley and foothill grassland habitats.	**Likely** – found within Action Area.	**Unlikely** – with pre-project surveys and avoidance measures.
Round-leaved filaree *California macrophylla*	--/--/--/1B.1	Found in cismontane woodland, and valley and foothill grassland habitats.	**Unlikely** – no known occurrences within Action Area.	**Unlikely** – with pre-project surveys and avoidance measures.
San Joaquin spearscale *Atriplex joaquiniana*	--/--/--/1B.2	Found in chenopod scrub, meadow and seep, and valley and foothill grassland habitats.	**Likely** – found within Action Area.	**Unlikely** – with pre-project surveys and avoidance measures.
Sanford's arrowhead *Sagittaria sanfordii*	--/--/--/1B.2	Found in marsh and swamp, and wetland habitats.	**Likely** – found along waterways within Action Area.	**Unlikely** – avoiding impacts to water side of levees and stream banks.
Side-flowering skullcap *Scutellaria lateriflora*	--/--/--/2.2	Found in marsh and swamp, meadow and seep, and wetland habitats.	**Likely** – found along waterways within Action Area.	**Unlikely** – avoiding impacts to water side of levees and stream banks.
Soft bird's-beak *Cordylanthus mollis ssp. mollis*	E/--/1B.2	Found in marsh and swamp, salt marsh, and wetland habitats.	**Unlikely** – no known occurrences within Action Area.	**Unlikely** – avoiding impacts to water side of levees and stream banks.
Stinkbells *Fritillaria agrestis*	--/--/--/4.2	Found in chaparral, cismontane woodland, ultramafic, and valley and foothill grassland habitats.	**Unlikely** – no known occurrences within Action Area.	**Unlikely** – with pre-project surveys and avoidance measures.
Suisun Marsh aster *Symphyotrichum lentum*	--/--/--/1B.2	Found in brackish marsh, freshwater marsh, marsh and swamp, and wetland habitats.	**Likely** – found along waterways within Action Area.	**Unlikely** – avoiding impacts to water side of levees and stream banks.
Woolly rose-mallow *Hibiscus lasiocarpos var. occidentalis*	--/--/--/2.2	Found in freshwater marsh, marsh and swamp, and wetland habitats.	**Likely** – found along waterways within Action Area.	**Unlikely** – avoiding impacts to water side of levees and stream banks.

STATUS[1]

E = listed as endangered under the federal or State Endangered Species Act
T = listed as threatened under the federal or State Endangered Species Act
SC = species of concern
X = Critical habitat designation
C = candidate species
D = delisted
CNPS = California Native Plant Society Listing

Global Rank:

GH	=	Possibly Extinct (species)—Missing; known from only historical occurrences but still some hope of rediscovery
G1	=	Critically Imperiled—At very high risk of extinction because of extreme rarity (often 5 or fewer populations), very steep declines, or other factors
G2	=	Imperiled—At high risk of extinction because of very restricted range, very few populations (often 20 or fewer), steep declines, or other factors
G3	=	Vulnerable—At moderate risk of extinction because of a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors
G4	=	Apparently Secure—Uncommon but not rare; some cause for long-term concern because of declines or other factors
G5	=	Secure—Common; widespread and abundant
G#G#	=	Range Rank—A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community
T	=	Infraspecific Taxon (trinomial)—The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank

State Rank:

SH	=	Possibly Extirpated (Historical)—Species or community occurred historically in the State, and there is some possibility that it may be rediscovered
S1	=	Critically Imperiled—Critically imperiled in the State because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the State
S2	=	Imperiled—Imperiled in the State because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the State
S3	=	Vulnerable—Vulnerable in the State because of a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation
S4	=	Apparently Secure—Uncommon but not rare; some cause for long-term concern because of declines or other factors
S#S#	=	Range Rank—A numeric range rank (e.g., S2S3) is used to indicate the range of uncertainty in the status of a species or community

Sources: CDFG 2009; CDFG 2010; Gardali and Evens 2008; Holland 1986; Hansen and Brode 1980; Mayer and Laudenslayer 1988; FWS 1995a and 1995b.

DETERMINATION[2]

The "likelihood for Project to Impact" is defined as follows:

"Unlikely" - The project site and/or immediate area do not support suitable habitat for a particular species or outside of the species known range or avoidance and minimization measures have been built into the project to avoid significant impacts to these species. These species are not discussed further in this document.

"Likely" – The project site and/or immediate area provide suitable habitat for a particular species.

Discussion of Biological Resources

The following species have potential habitat in the project area. Potential impacts and proposed avoidance and conservation measures are listed below each species.

- Delta smelt
- Longfin smelt
- Central Valley steelhead
- Winter run Chinook salmon
- Central Valley spring-run Chinook salmon
- Central Valley fall and late fall-run Chinook salmon
- Green sturgeon
- California tiger salamander
- California red legged frog
- Giant gartersnake
- Western pond turtle
- Swainson's hawk and other nesting birds

Delta Smelt

Listing Status and Designated Critical Habitat

The U.S. Fish and Wildlife Service (USFWS) listed the delta smelt (*Hypomesus transpacificus*) as threatened under the federal Endangered Species Act on April 5, 1993, based upon its dramatically reduced abundance, threats to its habitat, and the inadequacy of regulatory mechanisms then in effect (58 FR 12854). In 2004, a 5-year status review reaffirmed the need to retain the delta smelt as a threatened species (USFWS 2004). In February 2007, the U.S. Fish and Wildlife Service and the California Fish and Game Commission were jointly petitioned to list the species as endangered under the Endangered Species Act and California Endangered Species Act, respectively (Center for Biological Diversity et al. 2006 and 2007). This re-listing was requested because of a substantial decline in the abundance of this species beginning in 2002 from an already depressed population status, with no recovery in subsequent years, in spite of favorable hydrologic conditions. The U.S. Fish and Wildlife Service is currently considering information to determine if the listing status of delta smelt should be upgraded from threatened to endangered. Delta smelt were originally listed as threatened under CESA on December 9, 1993. On January 20, 2010, the State of California reclassified the delta smelt as a State endangered species.

The U.S. Fish and Wildlife Service designated critical habitat on January 18, 1995 (59 FR 65256). Critical habitat encompasses essentially all waters of the legal Delta extending downstream to western Suisun Marsh and Suisun Bay (USFWS 1994).

Life History

Delta smelt are slender-bodied fish, about 2 to 3 inches long, in the Osmeridae family (smelts). The species is endemic to the Sacramento-San Joaquin Delta. Delta smelt are euryhaline fish that typically rear in shallow (<10 feet), open waters of the estuary (Moyle 2002). They are mostly found within the salinity range of 2 to 7 parts per thousand (ppt) and have been collected from estuarine waters up to 14 parts per thousand (Moyle 2002, USFWS 2007a). The species generally lives about one year, although a small proportion of the population may live to spawn in its second year (Moyle 2002, Bennett 2005).

In general, delta smelt habitat quality and surface area are greater when 2 practical salinity units (psu) isohaline is located in Suisun Bay (Moyle 2002). The 2 psu isohaline is located within the low salinity zone and is an indicator of the low salinity zone, which varies seasonally. Beginning in September and October delta smelt slowly but actively migrate from the 2 psu isohaline region of the estuary to upper Delta spawning areas. The upstream migration of delta smelt seems to be triggered or cued by abrupt changes in flow and turbidity associated with the first flush of winter precipitation (Grimaldo et al., 2009) but can also occur after very high flood flows have receded. Grimaldo et al. (2009) noted salvage often occurred

when total inflows exceeded over 25,000 cubic feet per second (cubic feet per second) or when turbidity was elevated above 12 Nephelometric Turbidity Units.

Spawning has been reported as occurring primarily from late February through June (Moyle 2002, Bennett 2005), with a peak in April and May. Delta smelt spawn widely throughout the Delta, but their specific spawning distribution varies from year to year depending on flow conditions. Spawning cannot be easily observed and specific spawning locations are unknown, although the relative importance of spawning areas can be inferred from the catch of larval delta smelt in 20 mm (0.787 inches) townets. The majority of spawning activity occurs in the northern (Sacramento River) side of the delta in the vicinity of Cache Slough and Liberty Island. A minority of adults spawn in the south delta in the vicinity of Franks Tract and the lower San Joaquin River.

Eggs are demersal and adhere to the substrate or plants over which they are spawned. They hatch after 9 to 14 days. Fish absorb their yolk sac and develop jaws over the next 4 to 5 days, then begin to feed on small planktonic organisms. Once this stage of their life begins, they are expected to drift with the predominant currents, perhaps exercising some control through vertical migrations in the water column (Bennett 2005). They become post-larvae about a month later, and juveniles about one month after that (Bennett 2005).

Delta smelt live together in loose aggregations, but they are not strongly schooling (Moyle 2002). They feed on zooplankton throughout their lives, mainly copepods, cladocerans, amphipods and some larval fish (Moyle et al. 1992, Bennett 2005). Primary productivity and the resulting zooplankton biomass are important factors determining growth and survival in the summer and fall (Kimmerer 2008).

Distribution

The delta smelt is endemic to the Sacramento-San Joaquin Delta, including Suisun Bay, but is generally most abundant in the western Delta and eastern Suisun Bay (Honker Bay) (Moyle et al. 1992a, Sweetnam 1999). Distribution varies seasonally with freshwater outflow. Generally, the species inhabits areas of the San Francisco Estuary upstream of the 2 psu isohaline. This biologically productive area meets specific requirements for freshwater inflow, salinity, water temperature, and shallow open water habitat.

Delta smelt spawn widely throughout the Delta, but their specific spawning distribution varies from year to year depending on flow conditions. The majority of spawning activity occurs in the northern (Sacramento River) side of the delta in the vicinity of Cache Slough and Liberty Island, with some spawning in the vicinity of Franks Tract and the lower San Joaquin River. In wetter years spawning occurs in Napa River, Suisun Bay and Suisun Marsh (Sweetnam and Stevens 1991, Wang 1991, Hobbs et al. 2006).

Spawning Habitat

Delta smelt adults seek shallow, fresh, or slightly brackish backwater sloughs and edge-waters for spawning. Specific areas identified as important delta smelt spawning habitat include Barker, Lindsey, Cache, Prospect, Georgiana, Beaver, Hog, and Sycamore Sloughs; the Sacramento River in the Delta; and tributaries of northern Suisun Bay.

Primary constituent units are those areas that have the physical and biological habitat features that species need to survive and reproduce. Primary constituent units can include: cover or shelter; sites for reproduction and rearing of offspring; space for individual and population growth and normal behavior; migration corridors; and food, water and other nutritional or physiological requirements. Spawning delta smelt require all four primary constituent units, but spawners and embryos are the only life stages of delta smelt that are known to require specific structural components of habitat. Spawning delta smelt require sandy or small gravel substrates for egg deposition. Migrating, staging, and spawning delta smelt also require low-salinity and freshwater habitats, turbidity, and water temperatures less than 20°C (68°F) (Bennett 2005).

Spawning occurs primarily late February through early June, peaking in April through mid-may (Moyle 2002). Historically, delta smelt ranged as far up the San Joaquin River as Mossdale, indicating

that areas of the lower San Joaquin and its tributaries support conditions appropriate for spawning. Little data exists on delta smelt spawning activity in the lower San Joaquin region. Larval and young juvenile delta smelt collected at South delta stations in the Department of Fish and Game's 20-millimeter Survey, indicate that appropriate spawning conditions exist there. However, the few delta smelt that are collected in the lower San Joaquin region are a likely indicator that changes in flow patterns entrain spawning adults and newly hatched larvae into water diversions (Moyle et al. 1992a).

Adult Migration

Adult delta smelt must be provided unrestricted access to suitable spawning habitat in a period that may extend from December to July. Adequate flow and suitable water quality may need to be maintained to attract migrating adults in the Sacramento and San Joaquin river channels and their associated tributaries, including Cache and Montezuma Sloughs and their tributaries. These areas also should be protected from physical disturbance and flow disruption during migratory periods (USFWS 1994).

Potential for Impacts in the Project Area

All life stages of delta smelt as well as some designated critical habitat can be found in the Project Area. However, the proposed project activities are not likely to adversely affect the delta smelt as project activities are minor in scope and duration and all project activities will be conducted between August 1 and October 31 when fish are at their lowest abundance in the waterways (USFWS 2008).

Longfin Smelt

Listing Status and Designated Critical Habitat

The California Fish and Game Commission listed longfin smelt under the California Endangered Species Act as threatened on April 9, 2010. Longfin smelt are not federally listed.

Life History

The following life history discussion has been taken directly from Rosenfield and Baxter (2007). The longfin smelt is a small (~90–110 mm standard length [SL] at maturity), semelparous, pelagic fish that usually has a 2-year life cycle (Moulton 1974). Anadromous and resident populations are native to the Pacific Coast of North America. The San Francisco Estuary population is the southernmost in the species' range and is, by far, the largest known population in California (Moyle 2002). Young juveniles feed primarily on copepods, whereas older juveniles and adults feed principally on opossum shrimp, *Acanthomysis* spp. and *Neomysis mercedis*, when available (Hobbs et al. 2006). The latter species has declined substantially in the estuary since the early 1970s (Orsi and Mecum 1996); when opossum shrimp are less available, adult longfin smelt return to feeding primarily on copepods (Feyrer et al. 2003; Hobbs et al. 2006). Substantial published research on longfin smelt ecology and behavior comes from a resident population in Lake Washington, Washington (e.g., Dryfoos 1965; Moulton 1974; Chigbu and Sibley 1994; Chigbu et al. 1998; Chigbu 2000); the behavior and ecology of this species in the San Francisco Estuary are less well understood.

Potential for Impacts in the Project Area

Longfin smelt can be found in the Project Area. However, the proposed project activities are not likely to adversely affect the longfin smelt as project activities are minor in scope and in stream borings would not disturb soil structure, riparian vegetation, divert water or degrade water quality.

Chinook Salmon and Steelhead

The National Marine Fisheries Service (NMFS) completed an updated status review of 16 salmon Evolutionarily Significant Units that includes the Sacramento River winter-run Chinook salmon ("winter-run Chinook") and Central Valley spring-run Chinook salmon ("spring-run Chinook") in 2005. The review concluded that the species' status should remain as previously listed (June 28, 2005, 70 FR 37160). In addition, the National Marine Fisheries Service published a final listing determination for 10 steelhead

Distinct Population Segments, and concluded that Central Valley steelhead will remain listed as threatened (January 5, 2006, 71 FR 834).

The California Fish and Game Commission listed the Sacramento River winter-run Chinook salmon as Endangered on September 22, 1989 and the Central Valley spring-run Chinook salmon as threatened on February 5, 1999. The Central Valley steelhead and Central California Coast steelhead are not listed under the California Endangered Species Act.

The following federally listed anadromous species Evolutionarily Significant Units or Distinct Population Segments and designated critical habitats occur in the Action Area.

Sacramento River winter-run Chinook salmon. Winter-run Chinook salmon (*Oncorhynchus tshawytscha*) were listed as threatened in August 1989 under emergency provisions of the Endangered Species Act, and listed as threatened in November 1990 (55 CFR 46515). The Evolutionarily Significant Unit consists of only one population that is confined to the upper Sacramento River. The Livingston Stone National Fish Hatchery population has been included in the listed winter-run Chinook population as of June 28, 2005 (70 FR 37160). The Evolutionarily Significant Unit was reclassified as endangered on February 3, 1994 (59 FR 440), due to increased variability of run sizes, expected weak returns as a result of two small year classes in 1991 and 1993, and a 99 percent decline between 1966 and 1991. The National Marine Fisheries Service reaffirmed the listing as endangered on June 28, 2005 (70 FR 37160) and included the Livingston Stone National Fish Hatchery population in this listed Evolutionarily Significant Unit.

The National Marine Fisheries Service designated critical habitat on July 16, 1993 (58 FR 33212). Critical habitat is delineated as the Sacramento River from Keswick Dam at river mile (RM) 302 to Chipps Island (RM 0) at the westward margin of the Sacramento-San Joaquin Delta (Delta), including Kimball Island, Winter Island, and Brown's Island; all waters from Chipps Island westward to the Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and the Carquinez Strait; all waters of San Pablo Bay westward of the Carquinez Bridge, and all waters of San Francisco Bay north of the San Francisco-Oakland Bay Bridge.

Central Valley spring-run Chinook salmon. Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*) were listed as threatened on September 16, 1999 (64 FR 50394). The National Marine Fisheries Service released a five-year status review in June 2004 and proposed that this species remain listed as threatened (69 FR 33102). Although spring-run Chinook productivity trends were positive at the time, the Evolutionarily Significant Unit continued to face risks from: (1) a limited number of remaining populations (three, down from an estimated 17 historical populations); (2) a limited geographic distribution; and (3) potential hybridization with Feather River Fish Hatchery spring-run Chinook salmon, which are genetically divergent from populations in Mill, Deer, and Butte Creeks. The National Marine Fisheries Service final decision on June 28, 2005 retained this species as threatened (70 FR 37160). The Evolutionarily Significant Unit currently consists of spring-run Chinook salmon occurring in the Sacramento River basin, including the Feather River Fish Hatchery spring-run Chinook salmon population. (CDFG 2008b and 1998)

Critical habitat for Central Valley spring-run Chinook salmon was designated on September 2, 2005 (70 FR 52488). Spring-run critical habitat includes the stream channels within numerous streams throughout the Central Valley, including the Sacramento, Feather and Yuba rivers, and Deer, Mill, Battle, Antelope, and Clear creeks in the Sacramento River basin. Critical habitat is also designated within the Sacramento-San Joaquin Delta and the San Francisco-San Pablo-Suisun Bay complex.

Four distinct runs of Chinook salmon spawn in the Sacramento-San Joaquin River system, named for the season when the majority of the run enters freshwater as adults. Spring-run Chinook enter the Sacramento River from late March through September. Adults hold in cool water habitats through the summer, then spawn in the fall from mid-August through early October. Spring-run juveniles migrate soon after emergence as young-of-the-year, or remain in freshwater and migrate as yearlings.

Spring-run Chinook were historically the most abundant race in the Central Valley. Now only remnant runs remain in Butte, Mill, Deer, Antelope, and Beegum Creeks, tributaries to the Sacramento River. In the mainstem Sacramento River and the Feather River, early-running Chinook salmon occur, but

significant hybridization with fall-run has occurred. Due to the small number of non-hybridized populations remaining and low population sizes, Central Valley spring-run were listed as threatened under both the state and federal endangered species acts in 1999.

Central Valley steelhead. Central Valley steelhead (*Oncorhynchus mykiss*) are listed as threatened (January 5, 2006, 71 FR 834). The Central Valley steelhead Distinct Population Segment consists of naturally spawned anadromous populations of *O. mykiss* downstream of natural and manmade impassable barriers in the Sacramento and San Joaquin rivers and their tributaries. Excluded are steelhead from San Francisco and San Pablo bays and their tributaries, as well as two artificial propagation programs: the Coleman Fish Hatchery, and Feather River Fish Hatchery steelhead hatchery programs.

The National Marine Fisheries Service designated critical habitat on September 2, 2005 (70 FR 52488). Central Valley steelhead critical habitat encompasses 2,308 miles of stream habitat in the Central Valley including the Sacramento River and tributaries and the San Joaquin River and tributaries upstream to the Merced River. An additional 254 square miles of estuary habitat in the San Francisco-San Pablo-Suisun Bay complex is also designated critical habitat.

Central Valley Fall and Late Fall Run Chinook Salmon.

The Central Valley fall/late fall-run Chinook salmon is a Candidate for listing by the National Marine Fisheries Service and has been designated a species of special concern by the California Department of Fish and Game. This run of Chinook salmon historically inhabited the entire Sacramento-San Joaquin watershed. Currently populations are found in the Sacramento River and its tributaries and the Cosumnes and Mokelumne Rivers. In the San Joaquin River basin, they are limited to reaches below major dams on the Stanislaus, Tuolumne and Merced Rivers and to the mainstem San Joaquin River downstream of its confluence with the Merced River. Loss of habitat in river reaches blocked by dams is a primary factor in this species decline. Below dams, populations are affected by varying flow conditions, alteration of stream flows, high summer and fall water temperature, over-harvest, and entrainment losses at unscreened diversions.

No Critical Habitat has been designated for fall/late fall-run Chinook salmon.

Life History

Chinook salmon and steelhead are anadromous salmonids of the genus *Oncorhynchus*. This section provides an overview of key life history attributes (Myers et al. 1998, Moyle 2002, NMFS 2008a).

Sacramento River winter-run Chinook and Central Valley spring-run Chinook salmon. Chinook salmon are the largest member of *Oncorhynchus*. Runs are designated on the basis of adult migration timing. However, distinct runs also differ in the degree of maturation at the time of river entry, thermal regime and flow characteristics of their spawning site, and the actual time of spawning (Myers et al. 1998; Slater 1963). Both spring-run and winter-run Chinook tend to enter freshwater as immature fish, migrate far upriver, and delay spawning for weeks or months. In comparison, fall-run Chinook enter freshwater at an advanced stage of maturity, move rapidly to their spawning areas on the mainstem or lower tributaries of the rivers, and spawn within a few days or weeks of freshwater entry. Adequate instream flows and cool water temperatures are more critical for the survival of winter-run and spring-run Chinook salmon due to over-summering by adults and/or juveniles.

This section presents life history attributes common to winter- and spring-run Chinook salmon (reviewed by Myers et al. 1998, Moyle 2002, Snider and Titus 2000). Chinook salmon typically mature between 2 and 6 years of age (Myers et al. 1998). Freshwater entry of migrating adults and spawning timing are generally thought to be related to local water temperature and flow regimes. Adults migrate to spawning habitat in streams well upstream of the Delta (Tillman et al. 1996). Adults spawn in clean, loose gravel in swift, relatively shallow riffles or along the margins of deeper runs.

Upon emergence, fry (young salmon) swim or are displaced downstream. As juvenile Chinook salmon grow, they move into deeper water with higher current velocities, but still seek shelter and velocity refugia

to minimize energy expenditures. Catches of juvenile salmon in the Sacramento River near West Sacramento by the U.S. Fish and Wildlife Service (2001) exhibited larger juvenile captures in the main channel and smaller sized fry along the margins. When the channel of the river is greater than 9 to 10 feet in depth, juvenile salmon tend to inhabit the surface waters.

As Chinook salmon begin the smoltification (adaptation to salt water) stage, they prefer to rear further downstream where ambient salinity is up to 1.5 to 2.5 parts per thousand. Within the Delta, juveniles forage in shallow areas with protective cover, such as tidally-influenced sandy beaches and vegetated zones. Cladocerans, copepods, amphipods, and diptera larvae, as well as small arachnids and ants, are common prey items (Kjelson et al. 1982, Sommer et al. 2001).

Within the estuarine habitat, juvenile Chinook salmon movements are dictated by the tidal cycles, following the rising tide into shallow water habitats from the deeper main channels, and returning to the main channels as the tide recedes. Kjelson et al. (1982) reported that juvenile Chinook salmon demonstrated a diel (involving a 24-hour period including day and night) migration pattern, orienting themselves to nearshore cover and structure during the day, but moving into more open, offshore waters at night. During the night, juveniles were distributed randomly in the water column, but during the day would school up into the upper 9.8 feet of the water column. Juvenile Chinook salmon were found to spend about 40 days migrating through the Delta to the mouth of San Francisco Bay.

Central Valley steelhead. Steelhead can be divided into two life history types, winter (ocean-maturing) and summer (stream-maturing), based on their state of sexual maturity at the time of river entry and the duration of their spawning migration. Only winter steelhead are currently found in Central Valley rivers and streams (McEwan and Jackson 1996). Ocean-maturing steelhead enter freshwater with well-developed gonads and spawn shortly after river entry. A brief description of general life history follows, although variations in period of habitat use can occur. Further details are provided in Busby et al. (1996), McEwan and Jackson (1996), Moyle (2002), Reclamation (2008) and the NMFS (2008a).

Central Valley steelhead generally leave the ocean from August through April and migrate through the estuary to spawning habitat in streams. Spawning takes place from December through April, with peaks from January through March (McEwan and Jackson 1996, Busby et al. 1996). Unlike Pacific salmon, steelhead are iteroparous, or capable of spawning more than once before death (Busby et al. 1996). Steelhead spend the first year or two of life in cool, clear, fast-flowing permanent streams and rivers with ample riffles, cover, and invertebrate prey (Moyle 2002). Juvenile steelhead emigrate from natal streams volitionally or during fall through spring freshets. Sacramento River juveniles migrate downstream most of the year, predominantly in spring (Hallock et al. 1961).

Rearing and ocean-emigrating juvenile steelhead use the lower reaches of the Sacramento River and the Delta including tidal marsh areas, non-tidal freshwater marshes, and other shallow water areas. Central Valley steelhead migrate to the ocean after spending one to three years in freshwater (McEwan and Jackson 1996). They remain in the ocean for one to four years, growing before returning to their natal streams to spawn.

Central Valley Fall and Late Fall Run Chinook Salmon.

Chinook salmon require cold, freshwater streams with suitable gravel for reproduction. Adults spawn in fall when water temperatures decline to 60°F. After emerging, many Chinook salmon fry tend to seek shallow, nearshore habitat with slow water velocities and move to progressively deeper, faster water as they grow (Beauchamp et al. 1983). Many emerging fry are transported downstream into the lower rivers and the Delta, where they rear in shallow marshes and side channels.

Juveniles typically rear in fresh water for up to 5 months before migrating out to sea after reaching a length of 4 to 6 inches.

Potential for Impacts in the Project Area

The Sacramento-San Joaquin Delta serves as the gateway that all listed anadromous species in the Central Valley must pass through on their way to spawning grounds as adults or returning to the ocean as

juveniles or post-spawn adults (for steelhead). However, the proposed project activities are not likely to adversely affect salmonids as all project activities will be conducted between August 1 and October 31 when fish are at their lowest abundance in the waterways (Moyle 2002, Lindley et al. 2007, Yoshiyama et al. 1998, Hallock et al. 1961, Busby et al. 1996, McEwan and Jackson 1996, NMFS 2008a, Nobriga and Cadrett 2001, Hallock and Fisher 1985, NMFS 1997, Vogel and Marine 1991). The project is minor in scope and short in duration and has followed a deliberate process to avoid and minimize environmental effects. Installation and removal of all project equipment will be completed within the 'overwater construction/geotechnical window' established by the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Department of Fish and Game to avoid impacts to sensitive species.

Southern Distinct Population Segment of North American Green Sturgeon

Listing Status and Designated Critical Habitat

The Southern Distinct Population Segment of North American green sturgeon (green sturgeon) was listed by the U.S. Fish and Wildlife Service as threatened on June 6, 2006 (71 FR 17757) and consists of Central Valley and coastal populations south of the Eel River in California. The Southern Distinct Population Segment presently contains only a single known population that spawns and rears in the Sacramento River system, including the Sacramento, Feather and Yuba Rivers, Sacramento-San Joaquin Delta and Suisun, San Pablo and San Francisco bays. Green sturgeon are not listed under the California Endangered Species Act.

Critical habitat for the Southern Distinct Population Segment was designated on November 9, 2009 (NMFS 2009a; 74 FR 52300). Proposed critical habitat includes freshwater riverine habitats (stream channel defined by the ordinary high water line), bay and estuarine habitat (lateral extent of the mean higher high water line), and coastal marine habitat (to the 110 m [361 foot] depth contour).

Life History

Green sturgeon are among the largest of the bony fish (Moyle 2002). Green sturgeon are an anadromous, slow-growing, late-maturing and long-lived species (Nakamoto et al. 1995, Farr et al. 2002). Maximum age is likely 60 to 70 years or more (Moyle 2002). Little is known about the life history of green sturgeon because of its low abundance, low sportfishing value, and limited spawning distribution, but spawning and larval ecology are assumed to be similar to that of white sturgeon (Moyle 2002; Beamsderfer and Webb 2002).

Green sturgeon spend most of their lives in the ocean and their distribution and activities in the marine environment are poorly understood (Moyle et al. 1992b, Beamesderfer et al. 2007). Green sturgeon migrate considerable distances northward along the Pacific Coast and into other estuaries, particularly the Columbia (Adams et al. 2002). Green sturgeon are mostly marine fish. Adults and subadults enter the San Francisco Estuary during the spring and remain until autumn (Kelly et al. 2007). Recent telemetry studies of fish captured in San Pablo Bay found that movements were not related to salinity, current, or temperature, leading Kelly et al. (2007) to surmise that movements are related to resource availability. Green sturgeon were most often found at depths greater than 16.4 feet with low or no current during summer and autumn months, presumably conserving energy (Erickson et al. 2002). Adults may utilize a variety of freshwater and brackish water habitats for up to nine months of the year. The life stages that use freshwater habitats include adult migration, holding and spawning; egg incubation; larval development and growth; and juvenile rearing and downstream migration.

The Southern Distinct Population Segment green sturgeon currently spawn well upstream of the Action Area in the Sacramento River upstream of Hamilton City and perhaps as far upstream as Keswick Dam (CDFG 2002 in Adams et al. 2002). Spawning occurs in the upper river, particularly approximately the Red Bluff Diversion Dam (Brown 2007). Spawning in the San Joaquin River system has not been recorded, but it is likely that sturgeon historically utilized this basin. Spawning occurs in deep pools in large, turbulent river mainstreams from March to July, with a peak in mid-April to mid-June (Moyle et al. 1992b).

Green sturgeon larvae disperse downstream from Sacramento River spawning areas soon after hatching and rear as juveniles and subadults for several years throughout the Sacramento-San Joaquin Delta before migrating into the ocean (Beamesderfer et al. 2007). Little is known about larval rearing habitat requirements (NMFS 2008b). In the Klamath River, juvenile green sturgeon are reported to grow rapidly to 1 foot in one year and to over 2 feet within 2-3 years (Nakomoto et al. 1995).

Green sturgeon feed on benthic invertebrates including shrimp, mollusks and amphipods, and occasionally small fish (Moyle et al. 1992). The non-native overbite clam (*Potamocorbula amurensis*) has also been found in green sturgeon stomachs (Adams et al. 2002).

Green sturgeon were shown to range widely from San Pablo Bay through the San Francisco Estuary, from warm, shallow brackish areas in Suisun Bay to the colder, deeper, oceanic region near the Golden Gate Bridge in a telemetry study (Kelly et al. 2007). In general, they remained in shallow regions of the bay swimming over bottom depths less than 32 feet. Movements were either nondirectional or closely associated with the bottom (presumably foraging), or directional continuous swimming in the upper 20 percent of the water column. Nocturnal behavior has been observed in captive-reared larval and juvenile green sturgeon (9–10 months old). This may be an adaptation for avoiding predation during dispersal migration and first-year wintering in riverine habitat (Adams et al. 2002, Kynard et al. 2005).

Juveniles rear in fresh and estuarine waters for about 1 to 4 years (Nakamoto et al. 1995, NMFS 2008a). Juveniles seem to outmigrate in the summer and fall before the end of their second year (Moyle 2002). They disperse widely in the ocean after their outmigration from freshwater and before their return spawning migration (Moyle et al. 1992b).

Adults reach sexual maturity only after many years of growth: 9-13 years for males and 13-27 years for females (Nakomoto et al. 1995, Van Eenennaam et al. 2006). Spawning periodicity is once every 2-4 years (Erickson and Webb 2007).

Critical Habitat and Primary Constituent Elements

Critical habitat for the Southern Distinct Population Segment of North American Green sturgeon was proposed in 2008 (NMFS 2008b; 73 FR 52084) and finalized in 2009 (NMFS 2009; 74 FR 52300). Designed critical habitat generally has physical and biological features or primary constituent units similar to those described for listed salmonids. The National Marine Fisheries Service Critical Habitat Recovery Team defined the geographical area occupied to range from the California/Mexico border north to the Bering Sea, Alaska. Within the geographical area, 39 occupied specific areas and seven presently unoccupied areas were delineated within freshwater rivers, coastal bays and estuaries, and coastal marine waters.

Potential for Impacts in the Project Area

Adult green sturgeons enter the San Francisco Bay estuary in early winter (January/February) before initiating their upstream spawning migration into the Delta. Adults move through the Delta from February through April, arriving in the upper Sacramento River between April and June (Heublein et al. 2008, Kelly et al. 2007). Following their initial spawning run upriver, adults may hold for a few weeks to months in the upper river or immediately migrate back down river to the Delta.

Adults and sub-adults may also reside for extended periods in the western Delta as well as in Suisun and San Pablo bays. Sub-adults are believed to reside year round in these estuaries prior to moving offshore as adults. Juveniles are believed to use the Delta for rearing for the first 1 to 3 years of their life before moving out to the ocean. Juveniles are recovered at the State Water Project and Central Valley Project fish collection facilities year round (NMFS 2008b).

Geotechnical drilling activities will not have any significant impact on water flow, water quality, or food resources in the Delta or the Sacramento River. The narrow construction/geotechnical windows will minimize any incidental take due to disturbance, displacement, and impairment of feeding on juvenile fish near the Project sites. The overwater geotechnical drilling will be completed between August 1 and October 31 to avoid adult green sturgeon spawning (February to July) (Moyle et al. 1992b, Emmett et al.

1991). Green sturgeon embryos have poor swimming ability and exhibit a strong drive to remain in contact with structure, preferring cover and dark habitats to open bottom and illuminated habitats (Kynard et al. 2005); therefore, geotechnical drilling will take place mid-stream in the river and sloughs to avoid impacts to embryos. Larvae and early juveniles exhibit nocturnal behavior in all activities, actively swimming and initiating downstream migration at night (Van Eenennaam et al. 2001, Deng et al. 2002, Kynard et al. 2005); therefore drilling activities will take place during the day.

Green sturgeon are found throughout the Delta during the construction/geotechnical period and are likely to occur at the Project locations but in low densities during the construction/geotechnical period. Underwater noise generated by drilling would be transient, occurring during the daytime for approximately 30 days. The hearing sensitivity of green sturgeon is unknown. Construction activities would not exceed the National Marine Fisheries Service 2008 interim thresholds for sound pressure levels of 206 decibels peak and 187 decibels accumulated sound. The effects of noise would be transient and localized, and would be less than significant. The project is minor in scope and duration and has followed a deliberate process to avoid and minimize environmental effects. Installation and removal of all project equipment would be completed within the 'overwater construction/geotechnical window' established by the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Department of Fish and Game to avoid impacts to sensitive species.

California Tiger Salamander

Listing Status and Designated Critical Habitat

The U.S. Fish and Wildlife Service recognizes three Distinct Population Segments (DPS) of the California tiger salamander (*Ambystoma californiense*). The project area is located within the Central Distinct Population Segment, which was listed as threatened by the U.S. Fish and Wildlife Service under the federal Endangered Species Act on August 4, 2004 (69 FR 47212), due primarily to loss of breeding habitat throughout the species' range. The entire species was listed as threatened by the California Fish and Game Commission under California Endangered Species Act on March 3, 2010.

The U.S. Fish and Wildlife Service designated nearly 200,000 acres of critical habitat for the Central DPS throughout 19 counties on August 23, 2005 (70 FR 49380); however, none of the critical habitat units are located within the project area.

Life History

The California tiger salamander is an amphibian in the family Ambystomatidae, the mole salamanders. It is a large, stocky, terrestrial salamander with a broad, rounded snout. Adult males are about eight inches long, females a little less than seven. Coloration consists of white or pale yellow spots or bars on a black background on the back and sides. The belly varies from almost uniform white or pale yellow to a variegated pattern of white or pale yellow and black. The salamander's small eyes protrude from their heads and have black irises.

The species occurs in grasslands and oak savannah in lowland and foothill regions where aquatic sites are available for breeding. They prefer natural ephemeral pools or ponds that mimic them (stock ponds that are allowed to go dry) for breeding; however, they will also breed in perennial stock ponds.

Individuals reach sexual maturity after four or five years at which time they migrate to breeding ponds on rainy nights. Females attach their eggs singly or in short rows to vegetation or twigs in the water. Eggs hatch into larvae in 10 to 14 days, and the larval stage typically lasts 3 to 6 months at which point they transform into juvenile salamanders and leave the ponds before they dry for upland refuges.

With the exception of the breeding period, late-fall through winter, California tiger salamanders spend their lives underground or near the surface in uplands adjacent to breeding site as far away as 2 km (1.3 miles) or more. They are poor burrowers and require refuges provided by ground squirrels and other burrowing mammals in which to enter a dormant state called aestivation during the dry months.

Distribution

This species is restricted to California and does not overlap with any other species of tiger salamander. California tiger salamanders are restricted to vernal pools and seasonal ponds, including many constructed stockponds, in grassland and oak savannah plant communities from sea level to about 3,600 feet in central California. In the Coastal region, populations are scattered from Sonoma County in the northern San Francisco Bay Area to Santa Barbara County, and in the Central Valley and Sierra Nevada foothills from Yolo to Kern counties.

Potential for Impacts in the Project Area

California tiger salamanders are known to occur near, and potential habitat exists within, the project area near its southern boundary in the vicinity of Clifton Court Forebay. If geotechnical exploration activities are undertaken in grasslands within 2 miles of a potential breeding site, California tiger salamanders could directly or indirectly be impacted by the ground disturbance. Therefore, to the extent practicable, all activities in this area will avoid impacts to grassland habitat that possess cracks or burrows that could be occupied by California tiger salamanders. While complete avoidance is anticipated, if it cannot be achieved, no activities with the potential to impact California tiger salamanders will be undertaken until the appropriate authorizations are obtained from the U.S. Fish and Wildlife Service and the California Department of Fish and Game.

California Red-legged Frog

Listing Status and Designated Critical Habitat

The California red-legged frog (*Rana draytonii*) was listed as threatened by the U.S. Fish and Wildlife Service under the Endangered Species Act on May 23, 1996 (61 FR 25813) due to loss, fragmentation, and continued degradation of habitat through urbanization, mining, improper management of grazing, recreation, invasion of nonnative plants, impoundments, water diversions, degraded water quality and introduced predators. The species is also considered a California Species of Concern by Department of Fish and Game.

Critical habitat has been designated, withdrawn, and re-designated over the years. The most recent occurred on March 17, 2010 (75 FR 12816) when approximately 1,636,609 acres of critical habitat were designated across 27 counties. The ALA-2 Critical Habitat Unit boundaries approach the southwestern boundary of the project area; however, it does not appear that they overlap.

Life History

The California red-legged frog is an amphibian in the family Ranidae, the true frogs. It is the largest native frog in the western United States, ranging from 1.5 to 5 inches long with females attaining a larger size than males. The abdomen and hind legs of adults are largely red or salmon-colored. The back has small black flecks and larger irregular dark blotches, which have indistinct outlines on a brown, gray, olive, or reddish background color. The spots on the frogs' backs usually have light centers. Lateral folds are prominent on the back. Larvae (tadpoles) range from 0.6 to 3 inches in length, and the background color of the body is dark brown and yellow with darker spots.

The California red-legged frog occupies a fairly distinct habitat, combining both specific aquatic and riparian components. Adults need dense, shrubby or emergent riparian vegetation closely associated with deep (greater than 2.3-feet deep) still or slow moving water. California red-legged frogs aestivate (enter a dormant state during summer or dry weather) in small mammal burrows, moist cracks in the soil, and moist leaf litter. They have been found up to 100 feet from water in adjacent dense riparian vegetation.

Individuals reach sexual maturity in three to four years, and adult California red-legged frogs breed from November through April with earlier breeding records occurring in southern localities. Female California red-legged frogs typically deposit egg masses on emergent vegetation so that the egg mass floats on the surface of the water. Egg masses are the approximate size and shape of a grapefruit and contain about 2,000 to 5,000 moderate-sized (0.1 inch in diameter), dark reddish-brown eggs that hatch into larvae in

one to three weeks. Larvae typically take 4 to 7 months to metamorphose into small frogs in late-summer, early-fall; however, some larvae have been documented to overwinter.

The largest densities of California red-legged frogs are associated with deep-water pools with dense stands of overhanging willows and an intermixed fringe of cattails. Well-vegetated terrestrial areas within the riparian corridor may provide important sheltering habitat during winter.

Distribution

The species is restricted to California and Baja California, Mexico, at elevations ranging from sea level to approximately 5,000 feet. Records of the California red-legged frog are known from Riverside County to Mendocino County along the Coast Range; from Calaveras County to Butte County in the Sierra Nevada; and in Baja California, Mexico.

California red-legged frogs are still locally abundant within portions of the San Francisco Bay area (including Marin County) and the central coast. Within the remaining distribution of the species, only isolated populations have been documented in the Sierra Nevada, northern Coast, and northern Transverse ranges. The species is believed to be extirpated from the southern Transverse and Peninsular ranges, but is still present in Baja California, Mexico.

Potential for Impacts in the Project Area

California red-legged frogs are known to occur in at least one of the waterways within the project area near its southwestern boundary and in nearby ponds. If geotechnical exploration activities are undertaken in areas containing potential upland refugia (burrows, soil cracks, downed woody debris) within 100 feet of potential breeding habitat, California red-legged frogs could be directly or indirectly impacted by the ground disturbance. Therefore, to the extent practicable, all activities in this area will avoid impacts to aquatic and adjacent uplands within 100 feet that possesses cracks or burrows that could be occupied by California red-legged frogs. While complete avoidance is anticipated, if it cannot be achieved, no activities with the potential to impact California red-legged frogs will be undertaken until the appropriate authorizations are obtained from the U.S. Fish and Wildlife Service.

Giant Gartersnake

Listing Status and Designated Critical Habitat

The giant gartersnake (*Thamnophis gigas*) was listed as a rare species by the California Fish and Game Commission on June 27, 1971, because so much of its wetland habitat had been reclaimed for other uses. Its listing was changed to "threatened" when the California Endangered Species Act became law in 1985. The species was subsequently listed as threatened by the U.S. Fish and Wildlife Service under Endangered Species Act on October 20, 1993, due to continued habitat loss, fragmentation, and degradation and inadequacy of the current regulatory protections. Critical habitat has not been designated for this species.

Life History

The giant gartersnake is a reptile in the family Natricidae, the harmless live-bearing snakes. It one of the largest gartersnakes, reaching a total length of at least 63 inches, and females tend to be slightly longer and proportionately heavier than males. Dorsal background coloration (the main color on the snake's back) varies from brownish to olive with a checkered pattern of black spots, separated by a yellow dorsal stripe and two light colored lateral stripes; however, background coloration and prominence of the checkerboard pattern and stripes vary geographically and individually.

The giant gartersnake is a highly aquatic species that inhabits agricultural wetlands and other waterways such as irrigation and drainage canals, sloughs, ponds, small lakes, low gradient streams, and adjacent uplands in the Central Valley. Because of the direct loss of natural habitat, the giant gartersnake relies heavily on rice fields in the Sacramento Valley, but also uses managed marsh areas in Federal National

Wildlife Refuges and State Wildlife Areas. There have been only a few recent sightings of giant gartersnakes in the San Joaquin Valley.

Giant gartersnakes are typically absent from larger rivers because of lack of suitable habitat and emergent vegetative cover, and from wetlands with sand, gravel, or rock substrates. Riparian woodlands typically do not provide suitable habitat because of excessive shade, lack of basking sites, and absence of prey populations. However, some riparian woodlands do provide good habitat.

The giant gartersnake inhabits small mammal burrows and other soil crevices above prevailing flood elevations throughout its winter dormancy period. Giant gartersnakes typically select burrows with sunny exposure along south and west facing slopes.

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Sexual maturity averages three years for males and five years for females. The breeding season extends through March and April, and females give birth to live young from late July through early September. Brood size is variable, ranging from 10 to 46 young, with a mean of 23. Young immediately scatter into dense cover and absorb their yolk sacs, after which they begin feeding on their own.

Distribution

The giant gartersnake is restricted to the suitable wetlands and adjacent uplands within Sacramento and San Joaquin Valleys of California. While they historically ranged from Butte County in the north to Kern County, they have been extirpated from the southern part of their range and now occur only as far south as Fresno County. There were 13 populations recognized at the time of federal listing, one of which is currently extant and located to near the project area on the eastern edge of the Delta and the Yolo Basin/Liberty Farms Population.

Potential for Impacts in the Project Area

Giant gartersnakes are known to occur near the project area in northern San Joaquin County and scattered individuals have been observed over the years throughout the Delta north of Highway 4. If geotechnical exploration activities are undertaken in areas containing potential habitat in the form of agricultural ditches, backwater sloughs, or cattail or tule-dominated marshes or within 200 feet of these potential aquatic habitats, giant gartersnakes could be directly or indirectly impacted by the ground disturbance. Therefore, to the extent practicable, all activities in this area will avoid impacts to aquatic and adjacent uplands within 200 feet. While complete avoidance is anticipated, if it cannot be achieved, no activities with the potential to impact giant gartersnakes will be undertaken until the appropriate authorizations are obtained from the U.S. Fish and Wildlife Service and Department of Fish and Game.

Western Pond Turtle

Listing Status and Designated Critical Habitat

The western pond turtle (*Actinemys marmorata*) is considered a California Species of Concern by Department of Fish and Game. The species has no federal listing or designated critical habitat.

Life History

Western pond turtles are reptiles in the family Emididae, the water and box turtles. A moderate-sized (5 – 8 inch long), drab brown or khaki-colored turtle that lacks prominent markings on its carapace (top of the shell) but regularly possesses a fine, vermiform reticulum of light and dark markings. Males attain larger sizes than females and frequently develop a light, unmottled throat and lower facial area as they become sexually mature, markings that become even more prominent (contrasting) with increasing age, while females typically retain the mottled or darker-colored throat and facial area observed in juveniles.

The western pond turtle is a primarily aquatic species that usually leaves the water to nest, aestivate, and overwinter, although some individuals will overwinter in the water. Western pond turtles occur in a variety of permanent and intermittent aquatic habitats including rivers, streams, lakes, ponds, marshes, vernal pools, and human-constructed environments such as ponds associated with waste-water treatment, livestock grazing, and logging operations and agricultural ditches. They require some slack- or slow-water aquatic habitat, and habitat quality seems to be positively correlated with the availability of aerial and aquatic basking sites. Hatchlings (individuals through their first year of activity) require shallow water habitat with relatively dense submergent or short emergent vegetation in which to forage.

Sexual maturity appears to be tied closer to attaining a minimum body size (approximately 4.3 inches carapace length) than age. Clutch size (number of eggs per breeding effort) and clutch frequency (number of breeding efforts per year) vary geographically and by individual. Females leave the water in spring and early summer to lay eggs and have been documented to nest relatively long distances from the water's edge (over 1,300 feet); however, the majority are laid within 165 feet. They appear to choose grassy areas with little shade, so incubation temperatures are high enough to properly develop the eggs, which are laid in a shallow hole, excavated by the female and covered with surrounding soil and vegetation. Hatchlings may emerge in late-summer or may overwinter in the nest, emerging the following spring.

Distribution

Historically, the western pond turtle had a relatively continuous distribution in most Pacific slope drainages from Washington along the Columbia River northern Baja California, Mexico. Records also exist for the Carson, Humboldt, and Truckee drainages in Nevada, but whether these records represent historical remnants, recent introductions, or a combination of introductions and historical remnants is not known. The elevational range of the western pond turtle extends from near sea level to around 4700 feet. In California, it was historically present in most Pacific slope drainages between the Oregon and Mexican borders, but the species is also known from two drainages on the desert slope in California: the Mojave River (San Bernardino County) and Andreas Canyon (Riverside County)

Potential for Impacts in the Project Area

Western pond turtles are commonly found throughout the project area. Because the species is so shy, turtles may be disturbed off their basking sites when personnel and equipment are nearby, but there is so much available habitat that it is likely they will just move a comfortable distance away and return to basking. Direct impacts could be realized through disturbance of nests, which are nearly impossible to detect. Because western pond turtles occupy similar habitats to giant gartersnakes and California red-legged frogs, avoidance of habitat for those species should effectively protect the vast majority of western pond turtle nests; therefore, impacts to the species are expected to be limited to temporary disturbance of individuals.

Avian Species

Various Threatened and Endangered bird species (Table 5) as well as suitable nesting habitat for many species is known to occur in riparian habitat at some of the project locations within the project area. Non-special-status migratory birds and raptors also have the potential to nest in trees and shrubs adjacent to the proposed project area. Although these species are not considered special-status wildlife species, their occupied nests and eggs are protected by California Fish and Game Code sections 3503 and 3503.5 and the Migratory Bird Treaty Act of 1918 (50 CFR 10 and 21).

Potential for Impacts in the Project Area

The project has followed a deliberate process to avoid and minimize effects to listed species. Noise and other construction/geotechnical-related disturbances may affect nesting birds in the vicinity of the construction/geotechnical corridor during the breeding season (March through August). This impact would be considered significant because construction/geotechnical disturbances of nest sites may contribute to continuing local decline of Swainson's hawks and would violate the Migratory Bird Treaty Act and section

3503 of the California Fish and Game Code, which protects bird's nests. These impacts would be reduced to less than significant with implementation of the following conservation measures.

Construction activities may be conducted near available nesting habitat within the active nesting season of birds (March to August 15). If construction/geotechnical activities take place during the active nesting season, an Environmental Scientist will conduct preconstruction/geotechnical surveys prior to the start of construction/geotechnical to locate all active nest sites within ¼ mile of construction/geotechnical areas per Department of Fish and Game and U.S. Fish and Wildlife Service requirements. If construction/geotechnical activities take place during the active nesting season of Swainson's hawks, the Department will survey any potential nesting habitat within ½ mile of the geotechnical boring locations. If necessary, the Department will establish a ¼-mile buffer zone around all known and suspected Swainson's hawk nests or wait until after the active nesting season is completed to conduct geotechnical borings at those locations. The ¼-mile buffer is an acceptable buffer established by the Department of Fish and Game to prevent disturbance to nesting birds.

Best Management Practices/Mitigation and Conservation Measures

Specific conservation measures proposed to minimize biological impacts due to the proposed activities include:

1. Drill locations will be reviewed by the Department of Water Resources' Environmental Scientists to evaluate the potential impacts, if any, to environmental resources. Drill locations will be shifted as necessary to avoid any identified impacts to environmental resources or to reduce impacts to a less than significant level. An environmental scientist will review ingress and egress from drill sites before and during drilling operations.

2. No vegetation clearing will be conducted during the geotechnical activities. There may be minor disturbance to vegetation during mobilization of equipment to sites.

3. Construction personnel will receive worker environmental awareness training. This will include descriptions of sensitive species and procedures to follow in the event a sensitive species is encountered as well as procedures to follow in case of a contaminant spill or drilling mud spill.

4. An Environmental Scientist will be stationed near the work areas for land drilling and on the barges/boats for water drilling to act as biological monitor and to assist the construction/geotechnical crew with environmental issues as necessary. If a sensitive species is encountered by a biological monitor during construction/geotechnical activities, activities shall cease until appropriate corrective measures have been completed or it has been determined that the species will not be harmed.

5. Drilling activities for overwater borings will take place during work windows (August 1 to October 31) that have been established when species are at their lowest abundance in the area in order to avoid significant impacts to sensitive species. Exclusion zones and other protections designed to avoid impacts to sensitive species and habitats may also be included as necessary. These measures will ensure that work will not have a significant effect on environmental resources.

6. The Department of Water Resources has followed a deliberate process to avoid and minimize environmental effects from the proposed activities. Any additional avoidance or conservation measures established by the U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, National Marine Fisheries Service, Department of Fish and Game, and the Regional Water Quality Control Board will be followed.

7. Access to the overwater sites shall be via a support boat from an established marina. Access to the land-based geotechnical exploration sites shall be via existing roads and access ramps.

8. The perimeter of the terrestrial portion of the work sites shall be adequately flagged to prevent damage to adjacent riparian habitat.
9. All temporary fences, barriers, and/or flagging shall be completely removed from the project sites and properly disposed of upon completion of project activities.
10. Land-based sites that are near waterways and that could be disturbed by project activities shall be protected with correctly installed erosion control measures (straw bales, coconut fiber erosion control fabric, coir logs).
11. No spoils from trenching operations shall be placed on the stream side of the trench.
12. Topsoil shall be stockpiled and redistributed as topsoil as close to its original location as possible for land-based work.
13. At no time shall drill cuttings, drilling mud, and/or materials or water contaminated with bentonite or any other substance deemed deleterious to fish or wildlife be allowed to enter the stream or be placed where they may be washed into the stream. Any contaminated water/materials from the drilling and/or project activities shall be pumped or placed into a holding facility and removed for proper disposal. At no time shall turbidity increase beyond existing baseline turbidity. In the event of a release of material into the water, a biological monitor shall immediately notify drillers and geologists of the observation of a plume. If material is released into the water, DFG shall be notified within 24 hours of detecting the leak. Project operations shall not be resumed until the source of the leak is identified and remedied. When the situation is remedied to the satisfaction of DFG, project operations may resume.
14. Upon DFG determination that turbidity/siltation levels resulting from project related activities constitute a threat to aquatic life, activities associated with the turbidity/siltation shall be halted until effective DFG approved control devices are installed, or abatement procedures are initiated.
15. DWR shall prepare and implement a hazardous materials control and spill prevention and response plan prior to project activity. Measures that will be included in the plan to minimize project drilling/boring effects shall include the following:
    i. establish a spill prevention and countermeasure plan before the commencement of project activity that includes strict on-site handling rules to keep drilling materials out of drainages and waterways;
    ii. raw cement/concrete or washings thereof, asphalt, paint or other coating material, oil or other petroleum products, or any other substances which could be hazardous to aquatic life, wildlife, or riparian habitat resulting from the project-related activities shall be prevented from entering the waters of the State. Any of these materials placed within or where they can enter a stream or lake by DWR or any party working under contract may be subject to a citation;
    iii. clean up all project-related spills immediately according to the spill prevention and counter measure plan, and notify Regional Water Quality Control Board (RWQCB) and DFG immediately of spills and cleanup procedures;
    iv. conduct periodic inspection during project activities
16. DFG shall review and approve the plan prior to project activity to verify that hazardous material control and spill response measures have been incorporated to control the use of hazardous materials and reduce the chance of spills to the maximum extent practicable.
17. Erosion control measures shall be utilized throughout all phases of operation where sediment runoff from exposed slopes threatens to enter the waters of the State. At no time shall silt-laden runoff be allowed to enter the stream or directed to where it may enter the stream.

18. If test pits are not backfilled the same day they are dug, test pit spoil piles and exposed areas shall be covered with plastic sheeting or Visqueen to avoid losing soil into the stream. These covering materials shall be applied when it is evident rainy conditions threaten to erode loose soils into the stream.

19. At the end of each work day, if test pits have not been backfilled the same day they were dug, an escape ramp shall be placed at the end of the open trench to allow any animals that may have become entrapped in the trench to climb out overnight. The ramp may be constructed of dirt fill or wood planking or any other suitable material that is placed at an angle no greater than 30 degrees.

20. Staging and storage areas for equipment, materials, fuels, lubricants and solvents for overwater drilling sites shall be located on the drill ships. Hay waddles and Visqueen shall be placed around staging and storage areas to prevent spills into the water from equipment. Staging and storage areas for equipment, materials, fuels, lubricants and solvents for land-based drilling sites shall be located outside of the stream and channel banks. Stationary equipment such as motors, pumps, generators, compressors and welders located within or adjacent to the stream shall be positioned over drip pans. Any equipment or vehicles driven and/or operated within or adjacent to the stream must be checked and maintained daily, to prevent leaks of materials that, if introduced into the water, could be deleterious to aquatic life, wildlife, or riparian habitat. Vehicles must be moved away from the stream prior to fueling and lubrication.

21. All project-related debris and associated materials shall be removed and appropriately disposed of upon completion of the project.

22. Debris, soil, silt, bark, rubbish, creosote-treated wood, raw cement/concrete or washings thereof, asphalt, paint or other coating material, oil or other petroleum products, or any other substances which could be hazardous to aquatic life, resulting from project related activities, shall be prevented from contaminating the soil and/or entering the waters of the State. Any of these materials, placed within or where they may enter a stream or lake, by DWR or any party working under contract, or with the permission of DWR, shall be removed immediately.

23. If any wildlife is encountered during the course of construction/geotechnical activities, said wildlife will be allowed to leave the construction/geotechnical area unharmed.

Administrative Measures

The following are measures from the Department of Fish and Game's 1602 Streambed Alteration Agreement.

1. Documentation at Project Site. Permittee shall make the (1602) Agreement, any extensions and amendments to the Agreement, and all related notification materials and California Environmental Quality Act (CEQA) documents, readily available at the project site at all times and shall be presented to DFG personnel, or personnel from another state, federal, or local agency upon request.

2. Provide Agreement to Persons at Project Site. Permittee shall provide copies of the (1602) Agreement and any extensions and amendments to the Agreement to all persons who will be working on the project at the project site on behalf of Permittee, including but not limited to contractors, subcontractors, inspectors, and monitors.

3. Notification of Conflicting Provisions. Permittee shall notify DFG if Permittee determines or learns that a provision in the Agreement might conflict with a provision imposed on the project by another local, state, or federal agency. In that event, DFG shall contact Permittee to resolve any conflict.

4. Project Site Entry. Permittee agrees that DFG personnel may enter the project site at any time to verify compliance with the Agreement.

Conservation measures specifically addressing sensitive species are described below:

Delta Smelt: Delta smelt could be affected by activities that degrade water quality. The implementation of best management practices discussed in the Initial Study will prevent any water quality degradation that could significantly affect delta smelt. The proposed activities will not cause any changes to delta smelt habitat. There would be no significant effect on this species. Project activities will take place when fish are at lowest abundance (August 1 to October 31).

1. If any overwater drilling occurs during the peak spawning season (March-April), minimize activities on sand shoals and beaches. It is possible that this is where Delta smelt spawn.

2. In the core distribution of Delta smelt (Chipps Island-Rio Vista), minimize activities on shoals during ebb tides. There is some evidence that Delta smelt may move inshore on ebb tides to avoid getting swept downstream by currents. Hence, reducing work during those periods could provide some protection.

3. A qualified biological monitor shall be on-site during project operations to monitor implementation of conservation measures. If the monitor detects a fish kill during operations, all operations shall cease and all specimens collected and identified to species. Operations cannot be reinitiated until it is confirmed that the specimen is not a sensitive species. If all specimens cannot be captured and identified, all project activity shall cease at that location.

Salmonids: Chinook salmon and steelhead require similar habitat components and are analyzed together. Actions that have no effect on listed salmonids or their habitat are defined as having no measurable or discernable effect to the species or their habitat. As described in the Initial Study, the proposed activities would not disturb soil structure, riparian vegetation, divert water or degrade water quality. Project activities will take place when fish are at lowest abundance (August 1 to October 31).

Green Sturgeon: Geotechnical drilling activities will not have any significant impact on water flow, water quality, or food resources in the Delta or the affected waterways. The narrow construction/geotechnical windows (August 1 to October 31) will minimize any incidental take due to disturbance, displacement, and impairment of feeding on juvenile fish near the project sites. The overwater geotechnical drilling construction/geotechnical window will avoid adult green sturgeon spawning (February to July) (Moyle et al. 1995; Emmett et al. 1991).

Green sturgeon embryos have poor swimming ability and exhibit a strong drive to remain in contact with structure, preferring cover and dark habitats to open bottom and illuminated habitats (Kynard et al. 2005); therefore, geotechnical drilling will take place near mid-stream in the river and sloughs to avoid impacts to embryos.

Larvae and early juveniles exhibit nocturnal behavior in all activities, actively swimming and initiating downstream migration at night (Van Eenennaam et al. 2001; Deng et al. 2002; Kynard et al. 2005); therefore drilling activities will take place during the day between the hours of sunrise and sunset.

Giant Garter Snake: To the extent practicable, all activities in this area will avoid impacts to aquatic and adjacent uplands within 200 feet. While complete avoidance is anticipated, if it cannot be achieved, no activities with the potential to impact giant gartersnakes will be undertaken until the appropriate authorizations are obtained from the U.S. Fish and Wildlife Service and Department of Fish and Game. The following avoidance and minimization measures will be used to ensure there are no significant impacts to the giant gartersnake.

1. Construction activity within habitat should be conducted between May 1 and October 1. This is the active period for giant gartersnakes and direct mortality is lessened, because snakes are expected to actively move and avoid danger. If construction/geotechnical activities take place outside this window, activities will be confined to more than 200 feet from the banks of giant gartersnake habitat.

2. Avoid construction/geotechnical activities within 200 feet from the banks of giant gartersnake aquatic habitat. Confine movement of heavy equipment to outside 200 feet of banks of potential giant gartersnake habitat to minimize habitat disturbance.

3. Construction personnel should receive Service-approved worker environmental awareness training. This training instructs workers to recognize giant gartersnakes and their habitat(s).

4. Due to time constraints of the project DWR proposes to conduct drilling activities outside of the work window for the snake as recommended in the Corps' *Programmatic Formal Consultation for U.S. Army Corps of Engineers 404 Permitted Projects with Relatively Small Effects on the Giant Garter Snake* (Service file no. 1-1-F-97-149). These work windows are established to coincide with the snake's active period and to minimize adverse effects by allowing snakes the ability to flee or move from an area of construction/geotechnical activities to avoid injury or death. During consultation and several meetings with biological resource and engineering staff from DWR, Brian Hansen of the Service examined individual drill sites that could be identified as potentially non-habitat and allow for DWR to drill outside of the work windows. The areas were identified based on current and historical occurrence data, proximity to suitable habitat and in developed areas where snakes were least likely to occur or predicted to be hibernating or aestivating. A list of individual bore sites are listed below. These bore sites correspond with GIS data and are currently not for public availability due to property rights issues. For sites determined to be within the snake's range and have suitable aquatic and upland habitat, the Service and DWR has designated these areas as **Priority 1** and will only be drilled during the recommended work windows (active period for snakes) of May 1 to October 1. For those sites which are defined as Priority 1, but if possible, can be moved to a new location more than 200 feet from an existing waterway within a developed site, these locations are designated as **Priority 1.5**. These sites can be drilled outside of the work windows only after further consultation and approval from the Service. Locations determined not to be suitable GGS habitat and not likely to adversely affect GGS are designated as **Priority 2**. Other species restrictions may apply. Bore sites and their corresponding Priority designation are listed below in Table 1.

   Environmental Permissibility Definitions:

   1.0 – Drill Within Work Window of GGS active season.

   1.5 – Drill Within Work Window of GGS active season if boring is kept in same location; Drill any time of year if the boring is moved AWAY from GGS habitat/waterways and with further consultation from FWS.

   2.0 – Drill anytime of the year.

   Additional Notes from meeting: "DCT-CPT-014" & "668": must stay within Agricultural field to maintain "2" status "DCI-CPT-010" & "DCI-DH-010" cannot be moved toward river, or will status will change to a "1."

California Tiger Salamander: To the extent practicable, all activities will avoid impacts to grassland habitat within 100 feet (30 m) that possess cracks or burrows that could be occupied by California tiger salamander. ~~While complete avoidance is anticipated, if it cannot be achieved, no activities with the potential to impact California tiger salamanders will be undertaken until the appropriate authorizations are obtained from the U.S. Fish and Wildlife Service and the California Department of Fish and Game.~~ Pre-construction/geotechnical surveys will be conducted by a qualified biologist. A biological monitor will be present during all drilling activities to ensure there are no significant impacts to CTS. In addition, work will be done outside the wet season and measures, such as having vehicles follow shortest possible routes from levee road to the drill or CPT sites, will be taken to minimize the overall project footprint.

California Red-legged Frog: To the extent practicable, all activities will avoid impacts to aquatic and adjacent uplands within 100 feet that possesses cracks or burrows that could be occupied by California red-legged frogs. ~~While complete avoidance is anticipated, if it cannot be achieved, no~~

~~activities with the potential to impact California red-legged frogs will be undertaken until the appropriate authorizations are obtained from the U.S. Fish and Wildlife Service.~~ Pre-construction/geotechnical surveys will be conducted by a qualified biologist. A biological monitor will be present during all drilling activities to ensure there are no significant impacts to CRLF. In addition, work will be done outside the wet season and measures, such as having vehicles follow shortest possible routes from levee road to the drill or CPT sites, will be taken to minimize the overall project footprint.

Western Pond Turtle: Because western pond turtles occupy similar habitats to giant gartersnakes and California red-legged frogs, avoidance of habitat for those species should effectively protect the vast majority of western pond turtle nests; therefore, no additional conservation measures should be necessary.

1. Within 48 hours prior to construction/geotechnical activities, a qualified biologist hired by DWR will survey the area at the appropriate time of day for the presence of western pond turtles.
2. Western pond turtles are found during field surveys, a qualified wildlife biologist will move the turtle(s) to the nearest suitable habitat outside the project footprint area.
3. Impacts to potential basking sites (e.g. logs and rocks) will be avoided during project-related construction/geotechnical activities whenever feasible.

San Joaquin Kit Fox (*From FWS recommendations*)

1. Vehicles will access the work site following the shortest possible route from the levee road. All site access and staging shall limit disturbance to the riverbank, or levee as much as possible and avoid sensitive habitats. When possible, existing ingress and egress points shall be used. A biological monitor will inspect these sites to ensure that potentially sensitive environmental resources are not significantly impacted during operations.
2. Project activities will not take place at night when kit foxes are most active. Off-road traffic outside of designated project areas will be prohibited.
3. A biological monitor will be stationed near the work areas to act as biological monitor and to assist the construction/geotechnical crew with environmental issues as necessary. If kit foxes are encountered by a biological monitor during construction/geotechnical activities, activities shall cease until appropriate corrective measures have been completed or it has been determined that the species will not be harmed.
4. To prevent inadvertent entrapment of kit foxes or other animals during the construction/geotechnical activites, all excavated, steep-walled holes or trenches more than 2 feet deep will be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they will be thoroughly inspected for trapped animals.
5. All construction/geotechnical pipes, culverts, or similar structures with a diameter of 4-inches or greater that are stored at a construction/geotechnical site for one or more overnight periods will be thoroughly inspected for kit foxes before the pipe is used or moved in any way. If a kit fox is discovered inside a pipe, that section of pipe will not be moved until the Service has been consulted. If necessary, and under the direct supervision of the biologist, the pipe may be moved once to remove it from the path of construction/geotechnical activity, until the fox has escaped.
6. No firearms shall be allowed on the project site.

7. Noise will be minimized to the extent possible at the work site to avoid disturbing kit foxes.
8. To prevent harassment, mortality of kit foxes or destruction of dens by dogs or cats, no pets are permitted on project sites.
9. Rodenticides and herbicides will not be used during this project.
10. If a San Joaquin kit fox is inadvertently injured or killed, the biological monitor shall immediately report the incident to the DWR Lead Environmental Monitor. The Lead Monitor shall contact the FWS and CDFG immediately in the case of a dead, injured or entrapped kit fox. The CDFG contact for immediate assistance is State Dispatch at (916) 445-0045. They will contact the local warden or biologist. Notification must include the date, time, and location of the incident or of the finding of a dead or injured animal and any other pertinent information.

Valley Elderberry Longhorn Beetle (VELB) *(From FWS guidelines)*

DWR will avoid and protect habitat for VELB whenever possible. If suitable habitat for the beetle is found to occur on the project site (including ingress and egress) or within close proximity where beetles may be affected by the project, these areas will be designated as avoidance areas and will be protected from disturbance during the construction/geotechnical activities. The project will be designed such that avoidance areas are connected with adjacent habitat to prevent fragmentation and isolation of beetle populations. Beetle habitat will be avoided as described below.

Protective Measures

1. A 100-foot (or wider) buffer will be established around elderberry plants containing stems measuring 1.0 inch in diameter or greater at ground level using fencing and flagging. Complete avoidance (i.e., no adverse effects) will be assumed when a 100-foot (or wider) buffer is established and maintained around elderberry plants during construction/geotechnical activities. In buffer areas construction/geotechnical related disturbance will be minimized and any damaged area will be promptly restored following construction/geotechnical activities. The U.S. Fish and Wildlife Service will be consulted before any disturbances within the buffer area are considered. In addition, the U.S. Fish and Wildlife Service will be provided with a map identifying the avoidance area and written details describing avoidance measures if requested. In areas where encroachment on the 100-foot buffer has been approved by the U.S. Fish and Wildlife Service, provide a minimum setback of at least 20 feet from the dripline of each elderberry plant.

2. Within the immediate vicinity of drill locations, DWR will place signs every 50 feet along the edge of the avoidance area with the following information: "This area is habitat of the valley elderberry longhorn beetle, a threatened species, and must not be disturbed. This species is protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment." The signs will be clearly readable from a distance of 20 feet, and must be maintained for the duration of construction/geotechnical activities.

3. DWR will educate work crews about the status of the beetle, the need to avoid damaging its elderberry host plant, and the possible penalties for not complying with these requirements.

4. No insecticides, herbicides, fertilizers, or other chemicals that might harm the beetle or its host plant will be used in the buffer areas, or within 100 feet of any elderberry plant with one or more stems measuring 1.0 inch or greater in diameter at ground level.

Vernal Pool Invertebrates

Vernal pool fairy shrimp (VPFS, *Branchinecta lynchi*) are found in vernal pools and also sandstone rock outcrop pools. VPFS are known to occur in the southern portion of the project area near Clifton

Court Forebay and VPFS have also been found just outside of the northeastern portion of this project area. Along with standard project BMPs, measures will be taken to avoid all vernal pool, ephemeral waterways, and wetland areas. In order to accomplish this, topographic depressions that are most likely to serve as seasonal vernal pools will be flagged and avoided. In addition, work will be done outside the wet season and measures, such as having vehicles follow shortest possible routes from levee road to the drill or CPT sites, will be taken to minimize the overall project footprint.

Vernal pool tadpole shrimp (VPTS, *Lepidurus packardi*) are found in vernal pools containing clear to highly turbid water in a wide range of sizes. Habitat for VPTS does occur within the southern portion of project area near Clifton Court Forebay and VPTS have been found in pools just to the northeast of the project area. Along with standard project BMP's, measures will be taken to avoid all vernal pool, ephemeral waterways, and wetland areas. In order to accomplish this, topographic depressions that are most likely to serve as seasonal vernal pools will be flagged and avoided. In addition, work will be done outside the wet season and measures, such as having vehicles follow shortest possible routes from levee road to the drill or CPT sites, will be taken to minimize the overall project footprint.

Nesting Birds: Construction activities are anticipated to be conducted near available nesting habitat within the active nesting season of birds (March to August 15). If construction/geotechnical activities take place during the active nesting season, an Environmental Scientist will conduct preconstruction/geotechnical surveys prior to the start of construction/geotechnical activities to locate all active nest sites within 500 feet and all active Swainson's hawks nests within ¼ mile of construction/geotechnical areas per Department of Fish and Game and U.S. Fish and Wildlife Service requirements. If construction/geotechnical activities take place during the active nesting season of Swainson's hawks, the Department will survey any potential nesting habitat within ¼ mile of the geotechnical boring locations. If necessary, the Department will establish a ¼-mile buffer zone around all known and suspected Swainson's hawk nests or wait until after the active nesting season is completed to conduct geotechnical borings at those locations. The ¼-mile buffer is an acceptable buffer established by the Department of Fish and Game to prevent disturbance to nesting birds.

1. If project-related activities are scheduled during the nesting season of protected raptors and migratory birds (February 1 to August 31), pre-project surveys shall be conducted by a qualified biologist to identify active Swainson's hawk nests within ½ mile of the proposed project site and nests of other raptors within 500 feet of the proposed project site. If active nesting is identified within the ½ mile radius, consultation with DFG is required.
2. The Swainson's hawk pre-project survey shall be conducted no less than 14 days and no more than 30 days prior to beginning of project activities.
3. If active Swainson's hawk nests are found, project-related impacts shall be avoided by establishment of appropriate buffers. The size of the buffers shall be determined by a qualified biologist in consultation with DFG.
4. If there is a late nesting pair of Swainson's hawks within ½ mile of the project area, a biological monitor will have the authority to immediately stop construction/geotechnical activity that may result in the hawks abandoning the nest and work will cease until the threat has subsided.
5. Project activities shall not occur on the banks on the water side of the levees.

California least terns are unlikely to be affected by project activities, as the only known nesting site in the BDCP plan area is in Suisun Bay. However, if work takes place during Least Tern nesting season (mid-April to late-August), and nesting Least Terns are observed near work sites, the following measures will be followed to avoid and/or minimize impacts to this species.

1. Preconstruction/geotechnical surveys for nesting birds will be conducted 2 weeks before any construction/geotechnical activities are anticipated during the nesting season.
2. Noise will be minimized at the work site to avoid disturbing nesting Least Terns.

3. To prevent harassment and mortality of Least Terns or their nests by dogs or cats, no pets will be permitted on project sites.

The greater sandhill crane (*Grus canadensis tabida*) is listed as a state-threatened species under the California Endangered Species Act (Fish and Game Code, sections 2050 et seq.). The species was listed by the California Fish and Game Commission in 1983. The greater sandhill crane is also designated as a state Fully Protected species. The classification of Fully Protected was the State's initial effort in the 1960s to identify and provide additional protection to those animals that were rare or faced possible extinction. Lists were created for fish, mammals, amphibians and reptiles, birds and mammals. Many fully protected species have also been listed as threatened or endangered species under the more recent endangered species laws and regulations.

Fully Protected species may not be taken or possessed at any time and no licenses or permits may be issued for their take except for collecting these species for necessary scientific research and relocation of the bird species for the protection of livestock. Section 2080 of the Fish and Game Code prohibits "take" of any species that the commission determines to be an endangered species or a threatened species. Take is defined in section 86 of the Fish and Game Code as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill."

The greater sandhill crane has no federal regulatory status, but is covered under the Migratory Bird Treaty Act (MBTA). The MBTA makes it illegal for people to "take" migratory birds, their eggs, feathers or nests. Take is defined in the MBTA to include by any means or in any manner, any attempt at hunting, pursuing, wounding, killing, possessing or transporting any migratory bird, nest, egg, or part thereof.

DWR will make every effort to conduct geotechnical exploration activities no closer than ½ mile of an actively used roost of the greater sandhill crane and no closer than ¼ mile from the high use foraging areas (as defined by Gary Ivey, Delta greater sandhill crane authority) during the greater sandhill crane roosting season (October 1 to March 1).

Reporting Measures

3. If any sensitive species are observed in project surveys, DWR shall submit Natural Diversity Data Base (NDDB) forms to the NDDB for all the pre-project survey data with five working days of the sightings, and provide DFG Region 3 with copies of the NDDB forms and survey maps.

4. Notify DFG immediately if take of delta smelt or longfin smelt occurs, is anticipated, or is suspected. Notification must include date, time, and precise location of the incident/specimens, and other pertinent information. Notification shall be made by phone (209) 942-6070 or Notification shall be made by phone (209) 942-6070 or by e-mail to DFG.

V. Cultural Resources

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

a) Would the project cause a substantial adverse change in the significance of a historical resource as defined in '15064.5?

No impact.

b) Would the project cause a substantial adverse change in the significance of an archaeological resource pursuant to '15064.5?

No impact. No archaeological resources or remains were identified within the proposed project area during the field investigation.

c) Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

No impact. No paleontological resources or unique geologic features are known to exist within the project area.

d) Would the project disturb any human remains, including those interred outside of formal cemeteries?

No impact. No evidence of individual interments or a cemetery was identified during a site visit.

Discussion of Cultural Resources

Cultural resources include prehistoric and historic archaeological resources, buildings and structures, ship wrecks, and traditional cultural properties. Numerous federal and State laws and regulations provide for the protection and management of cultural resources. The most prominent of these statutes include the following:

- National Environmental Policy Act
- California Environmental Quality Act, Section 21083
- State CEQA Guidelines, Section 15064
- Section 106 of the National Historic Preservation Act and in 36 CFR Part 800, as amended

Drill locations will be reviewed by the Department of Water Resources' Archaeologists to evaluate the potential impacts, if any, to cultural resources. Drill locations will be shifted as necessary to avoid any identified impacts to cultural resources or to reduce impacts to a less than significant level.

The Department of Water Resources archaeologists reviewed the California Historical Resources Information System for known cultural resources and the California State Lands Commission records for ship wrecks in the vicinity of the geotechnical borings. No cultural resources or ship wrecks will be affected by project activities. Drill locations will be reviewed by the Department of Water Resources' Archaeologists to evaluate the potential for impacts, if any, to cultural resources. Drill locations will be

shifted as necessary to avoid any identified impacts to cultural resources or to reduce impacts to less than significant level.

Should any archaeological resources be unearthed during construction/geotechnical activities, all work will stop in the immediate vicinity of the finds until they can be evaluated by a qualified archaeologist and an appropriate plan of action can be determined in consultation with the State Office of Historic Preservation. Should human remains be unearthed during construction/geotechnical activites, all work will immediately stop in the vicinity of the finds until they can be verified and the requirements of Public Resource Code section 5097.98 are met.

VI. Geology and Soils

Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				X
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.				X
ii) Strong seismic ground shaking?				X
iii) Seismic-related ground failure, including liquefaction?				X
iv) Landslides?				X
b) Result in substantial soil erosion or the loss of topsoil?				X
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?				X
d) Located on expansive soil, defined in Table 18-1-B of the Uniform Building Code (94), create substantial risks to life or property?				X
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?				X

Project activities will not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving any of the aforementioned issues, including, but not limited to, rupture of earthquake faults or change in soil stability.

a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving i) through iv):

No impact.

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

No impact.

c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?

No impact.

d) Located on expansive soil, defined in Table 18-1-B of the Uniform Building Code (94), create substantial risks to life or property?

No impact.

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

No impact.

VII. Greenhouse Gas Emissions

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?			X	
b) Conflict with applicable plans, policies, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?			X	

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

Less than significant impact. See discussion below.

b) Conflict with applicable plans, policies, regulations adopted for the purpose of reducing the emissions of greenhouse gases?

Less than significant impact. See discussion below.

Discussion of Greenhouse Gas Emissions

California Assembly Bill 32 (AB 32), the Global Warming Solutions Act of 2006 identifies climate change as a "serious threat to the economic well-being, public health, natural resources, and the environment of California". Increases in the atmospheric concentrations of greenhouse gases (GHG) have been clearly linked to climate change and the state of California has taken action to reduce greenhouse gas emissions in an effort to minimize further climate changes. Even with California actions on greenhouse gases, continued warming is projected to increase global average temperature between 2 and 11°F over the next 100 years (Intergovernmental Panel on Climate Change 2007).

The California Environmental Quality Act (CEQA) requires that lead agencies consider the reasonably foreseeable adverse environmental effects of projects they are considering for approval. The California Environmental Quality Act requires that the cumulative impacts of greenhouse gases, even additions that are relatively small on a global basis, need to be considered.

Impact Assessment for Greenhouse Gas Emissions

It is unlikely that any single project by itself could have a significant impact on the environment. However, the cumulative effect of human activities has been clearly linked to quantifiable changes in the composition of the atmosphere, which in turn have been shown to be the main cause of global climate change (IPCC 2007). Therefore, the analysis of the environmental effects of greenhouse gas emissions from this project will be addressed as a cumulative impact analysis.

Consistent with these efforts, an estimation of the greenhouse gas emissions produced by this project is provided in Table 6. The greenhouse gases are reported as carbon dioxide (CO_2) equivalents (CO_2e), which is a convention that converts each greenhouse gas to an equivalent amount of carbon dioxide, accounting for the varying global warming potential of each gas.

The Department of Water Resources has not established a quantitative significance threshold for greenhouse gas emissions; instead each project is evaluated on a case by case basis using the most up to date calculation and analysis methods. The proposed project could result in a significant impact if it would generate greenhouse gas emissions:

- either directly or indirectly, that may have a significant cumulative impact on the environment;

- that would conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases, including the state goal of reducing greenhouse gas emissions in California to 1990 levels by 2020, as set forth by the timetable established in AB 32, California Global Warming Solutions Act of 2006.

For more information, see the draft California Environmental Quality Act Guidelines, Appendix G (CEQA 2009). Note, however, that Appendix G is considered a set of sample questions. Thus additional factors, to be considered on a case by case basis, taking into consideration the project setting, may warrant looking beyond these questions.[1]

Based on the size, scope, and purpose of this project the following significance criteria will be used to determine the significance of greenhouse gas emissions from this project:

A. Whether the proposed project has the potential to conflict with or is consistent with plans to reduce or mitigate greenhouse gases, including:
   - The California Global Warming Solutions Act of 2006 (AB 32) established the first applicable plan for the reduction of greenhouse gas emissions in California;

B. Whether the relative amounts of greenhouse gas emissions over the life of the proposed project are small in comparison to the amount of greenhouse gas emissions for major facilities that are required to report greenhouse gas emissions under AB 32 and the federal Mandatory Greenhouse Gas Reporting Rule (25,000 metric tons of C_{O2}e/yr); and

The total and annual estimated greenhouse emissions from the project, 1,250 metric tons of CO_2e per year, are determined assuming the project is completed in one year. It is possible that the project could be extended over two years in which case the average annual CO_2e would be reduced.

The land-based drilling activities account for approximately 980 metric tons of CO_2e per year and the overwater drilling activity accounts for approximately 150 metric tons of CO_2e per year. Transportation for the water portion includes diesel and gas vehicles together with a speedboat to reach the drilling rig/ barge. The total workforce transportation accounts for approximately 100 metric tons of CO_2e per year. The total workforce greenhouse gas emissions include both the consultants from Gregg Drilling & Testing and the California Department of Water Resource Geologists and Environmental Scientists.

No long-term greenhouse gas emissions would result from this project. The entire project consists of geologic testing and no release of emissions would take place after completion of boring activities.

Significance Determination

Criterion A. The proposed project does not pose any apparent conflict with the goals of AB32, the key elements and greenhouse gas reduction measures in the Climate Change Scoping Plan or any other plans for reduction or mitigation of greenhouse gases.

Criterion B. No state or federal agency has yet established significance criteria (thresholds of significance) for greenhouse gases or other impacts to global climate change. However, some statewide standards have been established that provide information about the order of magnitude of emissions that might be considered significant. Pursuant to AB32, the California Air Resources Board (CARB) mandates that only "large" facilities (i.e., stationary, continuous sources of greenhouse gas emissions) that generate greater than 25,000 metric tons of CO_2 equivalents (CO_2e) per year report their greenhouse gas emissions. In addition, CARB has released a preliminary draft staff proposal that recommends 7,000 metric tons of CO_2e per year be used as the baseline threshold for impacts. It is not the intention of the lead agency to adopt a 25,000 or 7,000 metric tons of CO_2e threshold of significance, but only to provide context to the scale of the emissions from the proposed project. The emissions from the proposed project are two and one order of magnitude lower, respectively, than California Air Resources Boar's current reporting level and proposed significance threshold, respectively.

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[1] Reliance on AB 32 or other regulatory standards can serve as proxies for significance only to the extent that they accurately reflect the level at which an impact can be said to be less than significant. *See, e.g., Protect the Historic Amador Waterways v. Amador Water Agency*, (2004).116 Cal. App. 4th 1099, 1109.

Mitigation

All feasible strategies to reduce emissions have been implemented to minimize the emissions from this project. Best management practices including maintenance of air tire pressure, car-pooling, and the use of the most energy efficient reasonably available practices will be followed. Technologies that reduce greenhouse gas emissions from trucks may include devices that reduce aerodynamic drag and rolling resistance. Aerodynamic drag may be reduced using devices such as cab roof fairings, cab side gap fairings, cab side skirts, and on the trailer side, trailer side skirts, gap fairings, and trailer tail. Rolling resistance may be reduced using single wide tires or low-rolling resistance tires and automatic tire inflation systems on both the tractor and the trailer. An anti-idling enforcement will be followed when possible.

Due to the short-term nature of this project, drilling and testing to be completed within one to two years, this project is not specifically vulnerable to projected long-term impacts of climate change. Therefore, no analysis of the potential impacts of climate change on the project is necessary.

The proposed project is designed to gather data to better characterize the land structure in areas of the Delta where a potential future water conveyance could be proposed. The data gathered from this project will help inform project design including construction/geotechnical methods, conveyance alignment, and conveyance type (open channel or tunnel). In completing the design of a proposed conveyance system this additional information will contribute to developing alternatives that move water most efficiently with the least potential environmental impacts.

The generation of direct onsite and offsite air quality impacts would be intermittent and would terminate following completion of drilling activities. Additionally, in order to minimize emissions to the extent feasible, construction/geotechnical contractors would be required to implement the following measures:

1. On-road and off-road vehicle tire pressures shall be maintained to manufacturer specifications. Tires shall be checked and re-inflated at regular intervals.
2. Construction equipment engines shall be maintained to manufacturer's specifications.
3. Using properly tuned equipment that meets current emissions standards.

Table 6. Geotechnical Greenhouse Gas Emissions Inventory and Calculation

Line No.								
1	**Construction Equipment Emissions**							
2	**Type of Equipment**	**Maximum Number per Day**	**Total Operation Days**	**Total Operation Hours[1]**	**Fuel Consumption Per Hour[2, 7, 8]**	**Total Fuel Consumption (gal. diesel)**	**CO_2e/gal Diesel [3]**	**Total CO_2 Equivalent Emissions (Metric Tons)**
3	**Land Borings**							
4	Backhoe		7	63	3	189	0.010391376	2
5	Drill Rig deep		60	500	4	2000	0.010391376	21
6	Drill Rig std		790	7110	4	28440	0.010391376	296
7	CPT		113	1017	7	7119	0.010391376	74
8	Drill Support Truck		970	8730	6	52380	0.010391	544
9	Backhoes Transport		6	36	8	288	0.010391376	3
10	Drill Rig Transport		40	100	8	800	0.010391376	8
11	CPT Transport		15	38	8	300	0.010391376	3
12	**Overwater Borings**							
13	Drill Rig Intakes		160	1600	4	6400	0.010391376	67
14	Drill Rig Cross		80	800	4	3200	0.010391376	33
15	Drill Rig Tunnel Shaft Access		25	250	4	1000	0.010391376	10
16	Drill Rig Mobilizing Intake		10	80	7	560	0.010391376	6
17	Drill Rig Mobilizing Cross		25	200	7	1400	0.010391376	15
18	Drill Rig Mobilizing Shaft Access		48	380	7	2660	0.010391376	28
19	**TOTAL**					**106,736**		**1109**

20	Construction Workforce Transportation Emissions							
21	Average Number of Workers per Day	Total Number of Workdays	Average Distance Travelled (round trip)	Total Miles Travelled	Average Passenger Vehicle Fuel Efficiency[4]	Total Fuel Consumption (gal. gasoline)	CO_2e/gal Gasoline [3]	Total CO_2 Equivalent Emissions (metric tons)
22	**Land Borings**							
23	2	443	70	62020	20.8	2982	0.00901	27
24	F-250 Diesel Pickup	100	70	49000	6	90	0.010391	1
25	Total Land Transport							28
26	**Overwater Borings**							
27	4	160	160	102400	21	4923	0.00901	44
28	4	160	40	25600	21	1231	0.00901	11
29	4	80	85	27200	21	1308	0.00901	12
30	4	90	90	32400	21	1558	0.00901	14
31	4	38	95	14440	21	694	0.00901	6
32	4	38	120	18240	21	877	0.00901	8
33	Speed Boat 10	240	15	3600	4	947	0.00901	9
34	Total Overwater Transport					12705		104
35	**Total Workforce Transport**							**143**

36	**Summary of Greenhouse Gas Constituents**				
37	**Greenhouse Gas**	**Average Annual Production Emissions (MT)**	**Global Warming Potential[5]**	**CO_2e emissions per year**	
38	Carbon dioxide		1	0	
39	Methane		23	0	
40	Nitrogen oxide		296	0	
41	Sulfur hexafluoride		22000	0	
42	Others as necessary			0	
43	Construction Equipment Emissions			1109	(from line 19 above)
44	Workforce Transportation Emissions			143	(from line 35 above)
45	**Total Greenhouse Gas Emissions**			**1252**	**Metric Ton CO_2 equivalents**
46	Estimated Project Useful life			1	Years
47	**Average Annual Total GHG Emissions[6]**			**1252**	**Metric Ton CO_2 equivalents**
48	[1]Catepillar Performance Handbook, Edition 36.				
	[2]World Resources Institute 2003.				
	[3].U.S. EPA 2008.				
	[4]IPCC Third Assessment Report (2001)				
	[5]short-term construction/geotechnical emissions amortized over life of project				
	[6]Personnel Communication: Tim Boyd, Gregg Drilling, empirical observation				
	[7]Personnel Communication: Scott Sochar, CA Department of Water Resources, empirical observation				
	[8]eHow.com, there is a large range of values because of water conditions and differing boats.				

VIII. Hazards and Hazardous Materials

Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?			X	
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?			X	
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				X
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?				X
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?				X
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?				X
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				X
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?				X

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

Less than significant impact from diesel fuel, oil, and hydraulic fluid used on the project site. There are no known hazardous materials within the project area. The contractor shall have an oil spill kits and booms on site.

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

Less than significant impact from diesel fuel, oil, and hydraulic fluid used on the project site. There are no known hazardous materials within the project area. The project will not create a significant hazard to people due to a reasonably foreseeable accidental release of hazardous materials.

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

No impact. There are no known hazardous materials within the project area.

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

No impact. The project area is not a hazardous site.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?

No impact. The project area is not within an airport land use planning area.

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

No impact. The project activities will not result in a safety hazard as a result of materials used on site.

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

No impact. The project will not impair or physically interfere with an adopted emergency response or evacuation plan and construction/geotechnical personnel are required to be trained in emergency response and spill containment.

h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

No impact. The project will not expose people or structures to a significant risk of loss, injury or death due to wildland fires. The Contractor will prepare a fire prevention and control plan and will provide fire extinguishers and other firefighting equipment on site.

Discussion of Hazards and Hazardous Materials

The construction/geotechnical equipment used will use diesel fuel and oil. However, these materials will be used, stored and disposed of according to standard protocols for handling of hazardous materials. All personnel involved in use of hazardous materials will be trained in emergency response and spill containment.

In the event of a contaminant spill, work will stop immediately and Department of Water Resources' Environmental Scientist (Michelle Beachley, 916-376-9826) shall be notified. The environmental scientist will contact the necessary resource agencies, including but not limited to, the Office of Spill Prevention, Department of Fish and Game, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. If the Department of Water Resources staff cannot be notified immediately, the aforementioned agencies shall be contacted by the contractor. In the case of a spill on-water containment or recovery, equipment shall be available and the shoreline protected. Any spills of hazardous materials will be cleaned immediately and reported to the resource agencies within 24 hours. Any such spills, and the success of the efforts to clean them up, will be reported in post-exploration compliance reports.

Hazardous waste management practices are implemented on construction/geotechnical projects that generate waste from the use of:

- Petroleum products
- Asphalt products
- Concrete
- Pesticides
- Acids
- Paints
- Stains
- Solvents
- Wood Preservatives
- Roofing Tar
- Any material deemed hazardous waste in California, title 22, Division 4.5, or listed in 40 CFR PARTS 110, 117,261, OR 302.

1. Storage Procedures

   a. Waste shall be stored in sealed containers constructed of suitable material and shall be labeled as required by title 22 CCR, division 4.5 and 49 CFR parts 172,173,178, and 179.

   b. All hazardous waste shall be stored and transported, and disposed as required in title 22 CCR, division 4.5.

   c. Waste containers shall be stored in a temporary containment facility that shall comply with the following requirements:

      i. Temporary containment facility shall provide for a spill containment volume able to contain precipitation from a 24-hour, 25-year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest tank within its boundary, whichever is greater.

      ii Temporary containment facility shall be impervious to the material stored there for a minimum contact time of 72 hours.

      iii. Temporary containment facility shall be maintained free of accumulated rainwater and spills. In the event of spill or leak, accumulated rainwater and spill shall be placed into drums after each rainfall. These liquids shall be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids shall be sent to an approved disposal site.

      iv. Sufficient space shall be provided between stored containers to allow for spill cleanup and emergency response.

      v. Incompatible materials, such a chlorine and ammonia, shall not be stored in the same temporary containment facility.

      vi. Throughout the rainy season, temporary containment facilities shall be covered during the non-working days and prior to rain events.

   d. Drums shall not be overfilled and waste shall not be mixed.

   e. All hazardous waste containers will be labeled with the waste being stored and the date of accumulation.

   f. Waste disposal

      i. Waste storage shall not exceed requirements in title 22 CCR, section 66262.34

      ii. Waste disposal shall be disposed of by a licensed waste transporter at an authorized licensed disposal facility or recycling facility.

      iii. Uniform Hazardous Waste Manifest shall comply with title 22 CCR division 4.5

IX. Hydrology and Water Quality

Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Violate any water quality standards or waste discharge requirements?				X
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?				X
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?				X
d) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?				X
e) Otherwise substantially degrade water quality?				X
f) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?				X
g) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?				X
h) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?				X
i) Inundation by seiche, tsunami, or mudflow?				X

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

No impact. The project will not violate any water quality standards or waste discharge requirements.

b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?

No impact. The project will not deplete groundwater supplies or interfere with groundwater recharge.

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

No impact. The project will not alter the existing drainage pattern of a site or area.

d) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?

No impact. The project will not create or contribute runoff water which would exceed the capacity of existing or planned water drainage systems or provide substantial additional sources of polluted runoff.

e) Otherwise substantially degrade water quality?

No impact. The project will not otherwise substantially degrade water quality.

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

No impact. The project will not place housing within a 100-year flood hazard area.

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

No impact. The project will not place any permanent structures within a 100-year flood hazard area.

h) Inundation by seiche, tsunami, or mudflow?

No impact. The project will not create inundation by seiche, tsunami, or mudflow.

Discussion of Hydrology and Water Quality

Overwater Drilling. The geotechnical borings will be advanced using the mud rotary method and will be drilled and sampled to a maximum depth of about 140 to 200 feet below the bottom of the slough or river. Initially, the hole will be advanced by pushing an approximate 6- to 8-inch diameter conductor casing to a depth of at least 15 feet below the bottom of the slough or river channel. The conductor casing extends from the top of the barge or ship deck to at least 15 feet below the bottom of the slough or river. Soil samples can be collected from within the conductor casing. The drill hole below the conductor casing will be approximately 3.5 to 7.0 inches in diameter.

With the conductor casing in place to a minimum of 15 feet below the channel bottom to provide a reliable seal, bentonite powder will be added to the circulating water to create drilling fluid. The pushed conductor casing will provide a reliable seal to contain the drilling fluid within the closed system. The drilling fluids will be kept in a closed system to prevent fluids from escaping. Only water will be circulated through the pumps and drill string while drilling and sampling in the conductor casing and within 15 feet of the slough or river bottom. The drilling fluid will pass down the center of the drill rod to the cutting face in the formation being drilled and will return up the drilled hole with the suspended cuttings. The drilling fluids and cuttings are confined by the drilled hole and the conductor casing. Return drill fluids will pass through the conductor casing to the barge or ship deck and then through a tee connection at the head of the conductor casing into the drilling fluid recirculation tank. Breaking drill rod and sample rod connections will be conducted either directly over the conductor casing or the recirculation tank.

Drill cuttings that settle out in the recirculation tank will be shoveled into drums. Good work practices are important and will be used in containing the drilling fluid, including taking care when shoveling drill cuttings from the recirculation tank to the drums. The drums will be placed adjacent to the recirculation tank. If drilling fluid or drill cuttings materials spill onto the barge deck while shoveling (or during any other operation), they shall be immediately picked up with a flat blade shovel and placed either into the tank or a drum. Discarded samples shall be placed in the cutting drums.

A spill prevention and control plan will be prepared by the contractor prior to construction/geotechnical activities. Best management practices will be included to avoid impacts to water quality. The project will comply with requirements of permits from the Central Valley Regional Water Quality Control Board. Personnel on the barge or ship will watch for colored or increasing opaque plumes in the water when drilling, grouting, and/or pulling casing. Colored plumes are an indication that drilling fluid or other material

is entering the water and may affect water quality. If colored plumes are discovered, activities shall cease until appropriate corrective measures have been completed or it has been determined that the environment will not be harmed.

Land Exploration. Site activities will consist of auger and mud-rotary drilling with soils sampling using a standard penetration test (SPT) barrel and Shelby tubes; cone penetrometer testing; temporary well installation; test pits; and electrical resistivity and other geophysical surveys. All exploration methods will require a drill rig and support vehicle for the drillers and vehicles for the geologists and environmental scientists. The different investigation methods may last from a few hours to several days and are described as follows.

Drilling activities will generally be performed using a rotary drill rig with auger capabilities. Auger techniques will drill an approximate 6.5- to 8-inch-diameter boring and will be used only for shallow depths. Mud rotary drilling and sampling will generate 4- to 6-inch-diameter borings, unless casing is required, which will increase the boring diameter to 6 to 8 inches. Depths of test holes will generally vary from about 5 to 225 feet. At three selected locations, drilling may extend to a depth of approximately 500 feet to allow for the measurements of both shear and compression wave velocities. Drilling time required for each drill hole is approximately three work days for drill holes less than 100 feet deep, approximately five work days for drill holes to 225 feet deep, and up to 3 weeks for deeper drill hole up to 500 feet deep. Upon completion of soil sampling and testing, holes will be sealed using cement-bentonite grout in accordance with California regulations and industry standards (Water Well Standards, DWR 74-81 and 74-90). Drilling boreholes usually requires a truck or track-mounted drill rig typically powered by a 100 to 200 horsepower diesel engine. Noise levels of this equipment are comparable to the noise produced by a diesel truck. A drill rig tender vehicle and tool truck generally accompany the drill rig. This equipment may stir up road dust by driving to and from the drill sites. Track-mounted rigs will be used only if needed to minimize access impacts over soft ground. Trailers will carry track-mounted equipment to the site. Cuttings and excess drilling fluid will be contained in drums, large containers, or vacuum truck and disposed of offsite at an appropriate landfill.

The cone penetrometer test sounding usually requires a truck-mounted, 15- to 30-ton push-capacity cone apparatus. The apparatus is typically powered by a 400- to 500-horsepower diesel engine. Noise levels of this equipment are comparable to the noise produced by a diesel truck. A drill rig tender vehicle and tool truck generally accompany the cone penetrometer test rig. This equipment may stir up road dust driving to and from the drill sites.

Select geotechnical drill holes may be completed as groundwater-monitoring wells. An additional day or two added to the total drilling time may be required for the completion of each groundwater monitoring well. The wells will be completed in accordance with California regulations and industry standards (Water Well Standards, DWR 74-81 and 74-90). After well tests and monitoring are completed, the well material will be drilled out and the hole will be backfilled with cement-bentonite grout using a tremie pipe

Shallow test pits (typically 4 feet wide x 12 feet long X 12 feet deep) may be dug to obtain near-surface soil samples for laboratory analysis in limited locations. Test pits will not be dug on any levees or sensitive habitats. During test pit excavation, any topsoil will be segregated from other material removed from the pit. Test pits will be backfilled with the excavated material on the same day as they are dug, with the stockpiled topsoil placed at the surface and the area restored as close as possible to its original condition.

Non invasive geophysical surveys may be employed to determine the near surface characteristics of the soil. The electrical resistivity surveys consist of driving four steel probes, each one-half inch in diameter, about 12 inches into the ground and measuring the resistance between different pairs of electrodes. The electrode spacing may vary depending upon the depth of investigation. The survey method is considered safe because low amperage currents (usually less than 0.5 amp) are involved. Therefore, the method does not present a danger to fauna. In addition, the duration of applied current is extremely short; just long enough to take a voltmeter reading. The process takes about 30 minutes, and at the completion, the probes and equipment are removed. Other methods of geophysical surveys use similar types of non-destructive equipment that measure parameters such as electrical currents, seismic waves, magnetic fields, or radar reflections in the ground.

X. Land Use and Planning

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

Land use in the project area is primarily agriculture including orchards and row crops with several agricultural structures and single family residences. The orchards are primarily pear, while the row crops are primarily alfalfa and wheat.

a) Physically divide an established community?

No impact. The project activities do not have the potential to divide an established community.

b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

No impact. Project activities for geotechnical exploratory drilling will not conflict with any applicable land use plan, policy, or regulation.

c) Conflict with any applicable habitat conservation plan or natural community conservation plan?

No impact. Project activities will not conflict with any applicable habitat conservation plan or natural community conservation plan.

XI. Mineral Resources

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?				X
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?				X

The Department of Water Resources (DWR) is planning to conduct overwater and land geotechnical borings, perform cone penetration tests (CPT) and dig small test pit in order to test soils in the Sacramento-San Joaquin Delta. The proposed boring locations may encounter peat soils which occur throughout the Sacramento-San Joaquin Delta. Peat soils have historically been mined in the Frank's Tract area of the Delta (USGS 2009). There is no mining of Peat Soils occurring near the proposed boring sites based on the U.S. Geological Survey's (USGS) Mineral Resource Data System (USGS 2009). The project will not result in the loss of any known or locally important mineral resource or recovery site. See also references CGS 2000a and 2000b.

a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

No impact.

b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?

No impact.

XII. Noise

Would the project result in:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?			X	
b) Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels?			X	
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?			X	
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?			X	
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would the project expose people residing or working in the area to excessive noise levels?				X
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?				X

Noise from the geotechnical drilling equipment is generally comparable to the noise produce by diesel trucks. While equipment is working, ambient noise levels will increase slightly. All equipment will be properly tuned and will utilize appropriate mufflers. Construction activities will occur at a distance greater than 100 feet from residences and small business operations. Further, work will generally be limited to daylight hours. Short-term impacts resulting from the project include increased noise level and small vibrations created primarily from the drill rig engine and short durations from the Standard Penetration Tests.

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Less than significant impact.

b) Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels?

Less than significant impact.

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

Less than significant impact.

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

Less than significant impact.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would the project expose people residing or working in the area to excessive noise levels?

No impact. There are no nearby airports.

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

No impact. There are no known private airstrips nearby.

XIII. Population/Housing

Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?				X
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?				X
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?				X

a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

No impact. The proposed project activities will not induce population growth or displace housing or people.

b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?

No impact. Proposed project activities do not have the potential to displace housing.

c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?

No impact. Proposed project activities do not have the potential to displace people.

XIV. Public Services

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				X
• Fire protection?				X
• Police protection?				X
• Schools?				X
• Parks?				X
• Other public facilities?				X

a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services included above?

No impact. The proposed project activities will not result in impacts which would require new or additional fire protection, police protection, schools, parks or other public services.

XV. Recreation

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?				X
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?				X

a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

No impact. No neighborhood or regional parks are found within the project area.

b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

No impact. The project area is currently used for recreational activities such as boating, water skiing, and fishing. However, construction/geotechnical activities will not impair public access to these waterways. Therefore, project activities for geotechnical exploratory drilling would not have a direct impact on use of recreational facilities.

Boating traffic in the project area (Sacramento, Mokelumne, and San Joaquin rivers and adjacent sloughs where project activities are proposed to take place) will be minimal as August to October is the most optimal time of the year to drill in the waterways as summer recreation is winding down and fishing activities occur after this work window (Evangelist 2009).

XVI. Transportation/Traffic

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
Would the project:				
a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?				X
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?				X
c) Result in a change in air traffic patterns, either by an increase in traffic levels or a change in location that results in substantial safety risks?				X
d) Substantially increase hazards due to a design feature (e.g., sharp curve, dangerous intersections) or incompatible uses (e.g., farm equipment)?				X
e) Result in inadequate emergency access?				X
f) Result in inadequate parking capacity?				X
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycles)?				X

a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?

No impact for land drilling exploration. The project construction/geotechnical activities do not have the capacity to increase traffic or cause a substantial change in existing traffic patterns.

No impact for overwater exploration. Construction staging will be from marinas or within the drill barge itself and will not impact transportation or traffic. The general Project area may be accessed by State Route 160 through Freeport; or by State Route 4, State Route 12, or Eight Mile Road, all west of Interstate 5 in Stockton. The project construction/geotechnical activities do not have the capacity to increase traffic or cause a substantial change in existing traffic patterns.

A higher volume of boating traffic occurs within the main waterways of the Delta. This exploration program has several drilling locations within higher traffic areas. To reduce the risk of a boat collision with the drilling ships/barges, the drilling location of the barges/ships will be positioned where they can be easily viewed by oncoming watercraft and away from the main flow of traffic, whenever possible. The anchored boats/barge(s) will be well-marked and positioned so as not to pose a hazard to, nor significantly impede navigation of, commercial or recreational navigation. In higher boating traffic areas it may be deemed necessary to have warning buoys near the barge/ship and/or a 5 mph zone will be requested from the U.S. Coast Guard near the drilling operation. These precautions will result in reduced boat speed in the area of the drilling barge. If anchors are needed while drilling, the barge must display warnings for underwater anchors so that other boaters are aware of the potential

danger beneath the water in compliance with U.S. Coast Guard regulations. The anchored boats/barge(s) will be well-marked and positioned so as not to pose a hazard to, nor significantly impede navigation of, commercial or recreational navigation.

If a collision occurs resulting in a contaminant spill, the barge/ship contractor's Emergency Action Plan will go into effect and absorbents and containment booms will be used from the barge to prevent the spill from spreading. In the unlikely event that these measures cannot contain the spill, as required, local emergency services, the Office of Emergency Services (OES) and the U.S. Coast Guard will be contacted. Once emergency services have been notified, responders will be dispatched to control the spill and assist in the cleanup. If a collision occurs, emergency services will be notified as needed. In the event of a spill, appropriate resource agencies, including, but not limited to the California Department of Fish and Game and the U.S. Fish and Wildlife Service, will be contacted and any recommended remediation measures will be followed.

b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?

No impact. The project will not exceed a level of service standard.

c) Result in a change in air traffic patterns, either by an increase in traffic levels or a change in location that results in substantial safety risks?

No impact. The project will not result in a change in air traffic patterns.

d) Substantially increase hazards due to a design feature (e.g., sharp curve, dangerous intersections) or incompatible uses (e.g., farm equipment)?

No impact. The project will not substantially increase hazards due to a design feature or incompatible use.

e) Result in inadequate emergency access?

No impact. The project will not result in inadequate emergency access.

f) Result in inadequate parking capacity?

No impact. The project will not result in inadequate parking capacity.

g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycles)?

No impact. The project will not conflict with adopted policies or plans.

XVII. Utilities and Service Systems

Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Exceed wastewater treatment requirements of applicable RWQCB?				X
b) Require or result in construction of new water or wastewater treatment facilities or expansion of existing facilities, which could cause significant environmental effects?				X
c) Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, which could cause significant environmental effects?				X
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?				X
e) Result in a determination by the waste-water treatment provider which serves or may serve the project that it has adequate capacity to serve the projects projected demand in addition to providers existing commitments?				X
f) Be served by a landfill with sufficient permitted capacity to accommodate the projects solid waste disposal needs?				X
g) Comply with federal, State, and local statutes and regulations related to solid waste?				X

There will be no change in utility or service systems.

a) Exceed wastewater treatment requirements of applicable RWQCB?

No impact. The project will not affect wastewater treatment requirements.

b) Require or result in construction of new water or wastewater treatment facilities or expansion of existing facilities, which could cause significant environmental effects?

No impact. The project will not require construction of new water or wastewater treatment facilities or expansion of existing facilities.

c) Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, which could cause significant environmental effects?

No impact. The project will not require the construction of new stormwater drainage facilities or expansion of existing facilities.

d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

No impact. The project will not change existing water supplies available.

e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the projects projected demand in addition to providers existing commitments?

No impact. The project will not result in a determination by the wastewater treatment provider for inadequate capacity.

f) Be served by a landfill with sufficient permitted capacity to accommodate the projects solid waste disposal needs?

No impact. The project will not be served by a landfill.

g) Comply with federal, State, and local statutes and regulations related to solid waste?

No impact. All solid waste will be contained in drums or bins and disposed of at an appropriate landfill in accordance with federal, State, and local statutes, and regulations. See section on Hazardous Materials (page 71) of this Initial Study for more information.

XVIII. Mandatory Findings of Significance

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?		X		
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?			X	
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?				X

This Initial Study was prepared to assess the proposed activity's potential effects on the environment and significance of those effects. Based on the Initial Study, it has been determined that the proposed project would not have any significant environmental effects. In part, this is because project activities have been designed to avoid significant impacts to sensitive resources and construction/geotechnical impacts are minor and short term. The proposed project will have less than significant cumulative impacts because impacts are short term and temporary. Short-term impacts resulting from the project include increased noise levels and small vibrations created primarily from the drill rig engine and short durations from the standard penetration tests. No long-term impacts are anticipated.

Sensitive resources and wetland and riparian habitats may be found near the drilling locations, but project activities will avoid these sensitive habitats. Special status species may be found within the project area, but no special status species will likely be impacted during project construction/geotechnical activities. Mitigation and conservation measures will be implemented to bring environmental impacts of the proposed activities to less than significant levels within the project area. Specifically, potential impacts to biological resources, geology and soil (erosion), hydrology (flow patterns) and water quality will be mitigated to less than significant levels.

a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

   Less than significant impact with mitigation. The project does not have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal

community, reduce the number of or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory. Conservation measures have been proposed to reduce impacts to less than significant levels and are described in full detail on page 8.

b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

Less than significant impact. Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this study. Future federal actions that are unrelated to the Project are not considered in this section because they require separate consultation pursuant to section 7 of the Endangered Species Act (ESA).

Non-federal actions that are reasonably certain to occur in the Action Area include: (1) on-going non-Federal water diversions for irrigated agriculture and managed wetlands; (2) State and/or local levee maintenance activities; (3) stormwater and/or irrigation discharges; (4) point and non-point source pollution; (5) oil and gas produce discharges; (6) invasive species introductions; and, (7) climate change.

Related projects and cumulative impacts of those projects in combination with the geotechnical drilling are discussed below. In many instances, no impacts or less-than-significant cumulative impacts would occur because the geotechnical drilling impacts would be short-term and localized. In other cases, significant cumulative impacts would not occur because the geotechnical drilling includes monitoring and sufficient operational flexibility to avoid such impacts. In other cases, they would be beneficial because a number of projects are being proposed to improve aquatic resources in the Delta.

Non-Federal Water Diversions

There are a number of unscreened non-Federal water diversions within the action area. Depending on the size, location, and period of operation, these unscreened diversions are believed to entrain various life stages of aquatic species, including listed salmonids and delta smelt. Although, the results of a study conducted by Nobriga et al. (2008) suggest that entrainment of very many delta smelt is not likely. In general, the littoral location and low-flow operational characteristics of these diversions are thought to reduce the risk of entraining delta smelt. Similar information is not currently available for salmonids.

State and Local Levee Maintenance Activities

Levee maintenance activities by State and local entities within the project area are expected to continue and may include the following. The study areas on Bacon Island and Mandeville Island are actively farmed, and land surrounding the agricultural fields is regularly disked. Portions of Holland Tract are under cultivation, while others are fallow. Maintenance dredging occurs in the agricultural ditches on all islands.

Levees have been constructed along both banks of Old River and Connection Slough. The roads on the Old River levees are private. The road on the Bacon Island side of Connection Slough is public, while the road on Mandeville Island is private. Periodic levee maintenance includes the control of vegetation and repairs of the riprap above the waterline.

Stormwater and Irrigation Discharges

Adverse effects to designated critical habitat for delta smelt, Central Valley spring-run Chinook salmon and Central Valley steelhead, and proposed critical habitat for the southern Distinct Population Segments of North American Green Sturgeon may result from stormwater and/or irrigation discharges which change the balance of important habitat constituents (i.e. salinity, turbidity, water temperature, etc) within the project area.

Point and Non-Point Source Pollution

Adverse effects to designated critical habitat for delta smelt, Central Valley spring-run Chinook salmon and Central Valley steelhead, and proposed critical habitat for the southern Distinct Population Segments of North American Green Sturgeon may result from stormwater and/or irrigation discharges which change the balance of important habitat constituents (i.e. salinity, turbidity, and water temperature, etc.) within the action area.

Oil and Gas Product Discharges

The introduction of contaminants from oil and gasoline product discharges as a result of on-going commercial and private shipping and boating within the project area is expected to continue. Implicated as potential stressors to aquatic species, these contaminants may adversely affect reproductive success and/or survival.

Invasive Species

Invasive species introductions are also expected to continue although it is difficult to predict the types of species introduced and the magnitude of the effects. Adverse effects from these introductions may include changes in water quality (i.e. turbidity), reductions in food supply, competition for space, and predation.

Climate Change

Global warming and climate change is an issue that has become more prominent over the past decade and one that certainly warrants consideration in the long-run. It has been predicted that global warming will increase Central Valley ambient air temperatures by 2°C to 7°C by the end of this century. Such an increase is anticipated to have a profound effect on Central Valley run-off and local hydrology. Within the Delta, anticipated effects are expected to include changes in seasonal flow patterns and increased water levels (as a result of general sea level rise). While difficult to predict, it is anticipated that such events will affect the distribution, and possibly even the abundance, of many aquatic species currently occupying the Delta seasonally or year round.

Department of Water Resources and Reclamation – Franks Tract Project

The Franks Tract Project involves constructing a new flow control facility in the Franks Tract area of the Delta, approximately 3 miles north of the Old River site. The new facility would provide the Department of Water Resources and Reclamation with the operational flexibility to better manage hydrodynamic conditions and salinity concentration in the central and south Delta and thereby improve water quality and fish habitat conditions. The project involves installing and operating flow control gates on up to two Delta waterways (Three Mile Slough and West False River) to protect fish resources and reduce seawater salinity intrusion into the Delta. Four flow control gate locations on Three Mile Slough are under consideration: (1) approximately 700 feet east of the State Route 160 bridge; (2) approximately 4,100 feet from the bridge; (3) approximately 8,600 feet north of the southwestern corner of Twitchell Island along Three Mile Slough, and (4) approximately 1,600 feet north of the southwestern corner of Twitchell Island along Three Mile Slough. On West False River, only one flow control gate location is being considered, approximately 1,800 feet east of the confluence with the San Joaquin River.

The Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for this project is currently under development. A Notice of Preparation was published September 18, 2008. Potential environmental effects of the project include direct effects to the hydrodynamic characteristics and circulation of Delta waterways which would affect the movement and habitat of delta fish species of concern, including delta smelt, longfin smelt, and Chinook salmon. The project could also result in temporary and/or permanent loss of habitat supporting special-status plant or wildlife species, wetlands, or aquatic species residing in the project area. Vessel passage and navigation also could be impeded by the gates, although the control structure would include a boat passage facility for commercial and recreation boats.

Department of Water Resources – Geotechnical Investigation

The Department of Water Resources proposes to conduct geotechnical investigations of levee and subsurface strata to include 45 hollow-stem/mud auger borings or cone penetration tests through the crown of the levee and 27 similar borings or cone penetration tests in landside locations. The information

gathered will provide a geomorphic assessment of conditions in the vicinity of Reclamation District 404 levees in particular to identify potential for under seepage of levees due to underlying soil conditions. The resulting information will be shared between the 2006 State Proposition 1E funded state-wide geomorphic evaluations of the flood control system and locally focused levee repair and flood reduction efforts. A Notice of Exemption was filed on Mar 24, 2010.

Department of Water Resources – San Joaquin River Restoration Program Geotechnical Investigation and Well Installation Project

The Department of Water Resources proposes to gather geotechnical data to support designs to convey both Interim and Restoration flows and allow for adequate fish passage in the restoration sections of the San Joaquin River. The geotechnical investigation will consist of exploration holes at existing and potential new levees, control structures, river crossing structures, and test pits for the identification of possible borrow material. Groundwater monitoring wells will also be installed for the development of a seepage monitoring program for the river. Exact locations for each exploration hole, pit or well will be determined pending landowner agreements and site-specific projects. A Mitigated Negative Declaration was filed on October 12, 2009 and a Notice of Determination was filed on November 25, 2009.

Department of Water Resources – Raising MR barrier weir height

The Department of Water Resources proposes to raise the MR barrier weir height one foot from its current elevation (from 1 foot to 2 feet). The Department of Water Resources is responding to the California State Water Resources Control Board requirements to take actions as necessary to meet water quality objectives in the Delta. The project is located on the Middle River just south of Victoria Canal in the south Delta. A Negative Declaration was filed March 18, 2010. The Department of Water Resources anticipates construction July 2010.

Department of Water Resources and Bureau of Reclamation – 2-Gates Fish Protection Demonstration Project

The proposed 2-Gates Fish Protection Demonstration Project (2-Gates Project) is intended to demonstrate and validate the value of proposed modifications to the flow patterns in the Sacramento-San Joaquin River Delta (Delta) with regard to the protection of sensitive species and management of water supply. The Delta provides habitat for several sensitive species, is a vital source of drinking water for over 23 million Californians, and supports more than 1.3 million acres of irrigated agricultural lands. The 2-Gates Project would install and operate removable gate structures in two key channels in the central Delta in order to control flows and thereby provide reduced entrainment of delta smelt and other sensitive aquatic species at the State Water Project and federal Central Valley Project export pumping facilities. The 2-Gates Project is designed to operate in conjunction and coordination with water management operation criteria established by State and federal water quality and environmental regulators.

Department of Water Resources – Dutch Slough Tidal Marsh Restoration Project

The Dutch Slough Tidal Marsh Restoration Project proposes to restore tidal action to three diked parcels in eastern Contra Costa County near Oakley. Lease holders currently graze beef cattle on the property. The three parcels total 1166 acres, and are bounded on the south by the Contra Costa Canal and on the north by Dutch Slough. The westernmost parcel is bounded on the west by Marsh Creek, and the easternmost parcel is bounded on the east by Jersey Island Road. The central parcel is separated from the other two by Emerson Slough on the west and Little Dutch Slough on the east. The Project has three goals: to provide ecosystem benefits including habitats for sensitive aquatic species, to assess the development of those habitats and measure ecosystem responses so that future Delta restoration projects will be more successful, and to provide opportunities for public access, education, and recreation. The Final Environmental Impact Report was filed in Marcy 22, 2010.

Department of Water Resources – North Delta Flood Control and Ecosystem Restoration Program

The purpose of the North Delta Flood Control and Ecosystem Restoration Project is to implement flood control improvements in a manner that benefits aquatic and terrestrial habitats, species, and ecological processes. Flood control improvements are needed to reduce drainage to land uses, infrastructure, and the Bay-Delta ecosystem resulting from overflows caused by insufficient channel capacities and

catastrophic levee failures in the project study area. The Draft Environmental Impact Report was filed on January 28, 2008.

Department of Fish and Game and Wildlife Conservation Board – Donation of Land

The Department of Fish and Game proposes to donate approximately 4,300 acres of property to protect riparian and upland delta habitat on Liberty Island, immediate west of the Sacramento River deep water shipping channel. A Notice of Exemption was filed on March 1, 2010.

Regional Water Quality Control Board, Region 5 – Bank Stabilization

The project proposes to stabilize a portion of severely eroded bank on the north portion of Tinsley Island, located adjacent to the Stockton Deep Water Channel. The size of the stabilization bank is approximately 215 linear feet by 25 feet wide. A Notice of Exemption was filed on April 29, 2010.

San Joaquin County Area Flood Control Agency – Lower Calaveras River levee system evaluation

The project is being evaluated to demonstrate that the levees meet or exceed the Federal Emergency Management Agency's criteria for providing 100-year flood protection. Geotechnical analyses indicate that a short section of the north bank of the Lower Calaveras River at the Bianchi Road Undercrossing of El Dorado Street as potential seepage and stability issues. To address the issue, the project proponent proposes to install a drain at the landside toe of the levee to mitigate the seepage and stability issues. The toe drain will be installed approximately 5 feet deep at the toe of the levee directly adjacent to Bianchi Road along the roadside shoulder. No trees or vegetation is present along the shoulder; therefore no vegetation will be removed to facilitate installation. A Notice of Exemption was filed on March 4, 2010.

South San Joaquin Irrigation District – Water Transfer

The San Luis Delta Mendota Water Authority, on behalf of its participating member agencies, desires to receive a single year water transfer from Oakdale Irrigation District and South San Joaquin Irrigation District of up to a combined 50,000 acre-feet of water from their pre-1914 water rights supply. The transfer would deliver the water at Goodwin Dam and transferred via release into the Stanislaus River at Goodwin Dam which is tributary to the San Joaquin River and subsequent rediversion, when pumping capacity is available, from the south Delta via the Jones or Banks Pumping Plant to the Delta Mendota Canal, the California Aqueduct, the San Luis Canal and the associated state and federally owned facilities. A federal Warren Act contract will be required to move this non-Central Valley Project water through any Central Valley Project facilities or for storage in the San Luis Reservoir federal space. A wheeling agreement with the Department of Water Resources will be required to move this water in State Water Project facilities. Oakdale Irrigation and San Luis Mendota Water Authority are responsible agencies for this project. A Negative Declaration was filed on April 7, 2010.

Semitropic Water Storage District – Delta Wetlands Project Place of Use

The project would increase the availability of high quality water in the Sacramento-San Joaquin River Delta for export or outflow through its six basic parts: diversion of water in the Delta; water storage on two Reservoir Islands (Bacon Island and Webb Tract); compensation for wetland and wildlife effects of the water storage operations on the Reservoir Islands by implementing a Habitat Management Plan on two Habitat Islands (Bouldin Island and Holland Tract); supplemental water storage in the Semitropic groundwater storage bank and the Antelope Valley water bank south of the Delta; provision of water supply for designated south of Delta users; and release of water for water quality enhancement in the Bay Delta Estuary in the fall as an additional beneficial water use in a designated place of use. The draft EIR was circulated for public review May 5, 2010 through June 23, 2010.

Contra Costa Water District – Water Quality Improvement Projects

The Alternative Intake Project is a drinking water quality improvement project that would protect and improve delivered water quality for Contra Costa Water District customers by enabling the Contra Costa Water District to relocate some of its existing diversions to Victoria Canal, a Delta location with better source water quality than is currently available at its Old River and Rock Slough intakes. The alternative intake would divert up to 250 cubic feet per second from a new intake on Victoria Canal; however, the project would not increase Contra Costa Water District's total Delta diversion capacity and would not change demands or the quantity of water delivered to its service area each year.

The project includes a new, screened water intake and pump station located along the lower third of Victoria Canal, on Victoria Island in the central Delta, and a buried pipeline that would extend 12,000 to 14,000 feet from the new intake directly across Victoria Island and beneath Old River and tie into Contra Costa Water District's existing Old River conveyance system on Byron Tract. The project would also involve adding a new point of diversion to certain existing water rights held by Contra Costa Water District and Reclamation. The Environmental Impact Report/ Environmental Impact Statement for this project was completed and record of decision signed in May 2008. This project is currently under construction and is expected to be operational in 2010.

Contra Costa Canal Replacement Project

The project involves replacing the unlined portion of the Contra Costa Canal, approximately 3.97 miles in length, with a buried pipeline within Reclamation's existing right-of-way. The project site is located in the south Delta in eastern Contra Costa County, in the city of Oakley or its sphere of influence. The purpose of this project is to eliminate shallow groundwater from entering the Canal, eliminate non-engineered berms and improve safety and security in a growing urban area.

An Initial Study/Mitigated Negative Declaration was adopted by the Contra Costa Water District Board of Directors in November 2006 and Reclamation completed an Environmental Assessment and Finding of No Significant Impact for this project in July 2007. No significant impacts are anticipated from this project. In addition the U.S. Fish and Wildlife Service issued a non-jeopardy biological opinion on the delta smelt and determined that the project will not result in the adverse modification or destruction of delta smelt critical habitat. Contra Costa Water District is planning to construct the first 2,000 feet of the Canal Replacement Project from Pumping Plant No. 1 to Marsh Creek in 2009. Ultimately, Contra Costa Water District will replace the entire 21,000 feet of the unlined canal.

Contra Costa Water District and Reclamation – Los Vaqueros Reservoir Expansion Project

Expansion of the Los Vaqueros Reservoir from 100,000 acre-feet to as large as 275,000 acre-feet is being evaluated for the ability to protect and restore Delta fisheries and improve Bay Area water quality and reliability. The Draft Environmental Impact Statement/ Environmental Impact Report was issued in February 2009, and a Final EIS/EIR is expected to be issued in September 2010.

With an expanded reservoir, the Bay Area would have a more reliable supply of higher quality water when faced with water shortages caused by drought, emergencies in the Delta, or regulatory restrictions on Delta pumping. An expanded reservoir could also provide water supplies for environmental water management in the Delta to support fish protection, habitat management and other environmental water needs. In 2007, key decision-makers became increasingly convinced of the need to expand the reservoir as one of many timely actions needed to protect the Delta and the Bay Area's water supplies, and Governor Schwarzenegger specifically named the reservoir expansion in his proposals to upgrade the state's water infrastructure.

The environmental effects of the expansion project have been evaluated in an Environmental Impact Statement/ Environmental Impact Report. The expansion project is being designed to create environmental and water supply reliability benefits without creating any associated impacts on the Delta ecosystem or water quality. General effects of the reservoir expansion may include a net shift in timing of Delta export pumping to periods of less fishery sensitivity and from drier years to wetter years. These effects would help reduce or mitigate for other cumulative impacts on the Delta ecosystem and water quality. Project construction is expected to commence as early as 2012.

Central Valley Project Improvement Act Required Program

The Central Valley Project Improvement Act includes a requirement for Reclamation to develop and implement a program to mitigate fishery impacts resulting from the operation of Pumping Plant No. 1. The program may include a fish screen at Rock Slough (just south of the Old River site), modified operations, or other measures to mitigate fishery impacts. Reclamation is required to develop a fish mitigation program (including the possible installation of a fish screen at the headworks) by December 31, 2008. Contra Costa Water District and Reclamation are in the process of seeking an extension of the December 31, 2008 requirement. Construction and operation of the 2-Gates Project would provide further justification for this extension.

Sacramento County Water Agency and East Bay Municipal Utilities District – Freeport Regional Water Project

The Freeport Regional Water Project is a cooperative effort of Sacramento County Water Agency and East Bay Municipal Utilities District to supply surface water from the Sacramento River to customers in central Sacramento County and in Alameda and Contra Costa counties. The project will provide SCWA with up to 85 million gallons of water per day which will in turn be supplied to customers in central Sacramento County to supplement groundwater use in the central part of the county. Sacramento will begin receiving water from this project in 2011 after construction of the Vineyard Surface Water Treatment Plant is completed. East Bay Municipal Utilities District will use up to 100 million gallons per day of water during dry years only, estimated to be three out of every 10 years, as a supplemental water source to complement existing conservation programs. East Bay Municipal Utilities District will be able to receive water from the Project by the end of 2009. An Environmental Impact Statement/Environmental Impact Report was completed for this project in July 2005. Significant, unavoidable impacts of the project were determined to be short-term increases in construction noise in the project area during the day, an exposure of noise-sensitive land uses to general construction noise at night, and an increase in ambient noise levels in the project area due to facility operations. The project was expected to be operational beginning December 2009.

Solano County – Fish Cleaning Stations

Solano County is developing fish cleaning stations at three parks for public convenience and to dispose of fish remains safety and sanitarily. The stations will be self contained units and will be located adjacent to existing restroom buildings and accessed by existing paved pathways. Each station will require water, electrical, and sewer hookups to existing utility lines in adjacent restroom buildings. Existing paved pathways will be leveled, repaved and extended for short distances to ensure full accessibility. A Notice of Exemption was submitted to the State Clearinghouse on April 1, 2010.

Other Potential Projects

Reclamation has considered constructing a barrier-gate near the head of Georgiana Slough to block highly turbid waters from entering the central Delta. If pursued and implemented, this could be tested as a complementary action to the 2-Gates Project at a future date.

While not currently a part of the proposed 2-Gate Project, and not evaluated in this study, the Old River gate could be operated in conjunction with potentially modified Delta Cross Channel gate operations or upstream reservoir releases to provide additional flow to the San Joaquin River, and help push conditions favorable to smelt in a seaward direction.

Other construction projects in Contra Costa County include Holland Tract Wetlands Project (Wildlands Inc.), construction expected to start in 2009; and Ironhouse Sanitary District Wastewater Expansion project Tertiary Treatment Plant, construction to begin in 2009.

c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

No impact.

Document Preparation

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