M&T CHICO RANCH/LLANO SECO RANCHO FISH SCREEN FACILITY SHORT-TERM PROTECTION PROJECT

(SCH NO. 2012092050)

DRAFT ENVIRONMENTAL ASSESSMENT/INITIAL STUDY

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DECEMBER 2013

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- 2011 M&T/Llano Seco Pumping Plant Riparian Vegetation Mitigation Monitoring Report
- 2010-2011 Bank Swallow Status Report
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M&T CHICO RANCH/LLANO SECO RANCHO FISH SCREEN FACILITY

SHORT-TERM PROTECTION PROJECT

DRAFT

ENVIRONMENTAL ASSESSMENT/INITIAL STUDY

1.0 INTRODUCTION

As part of an effort to reduce the risk of mortality to native anadromous salmonids, including special-status species within the Sacramento River Basin, the M&T Chico Ranch/Llano Seco Rancho fish screen and pumping facility (M&T/Llano Seco Pumps Facility) was redesigned, upgraded, and relocated from Big Chico Creek to the Sacramento River during 1997. Since its construction, unforeseen local geomorphic changes (including erosion and lateral migration of the west bank of the Sacramento River and related sediment deposition at the mouth of Big Chico Creek and in the vicinity of the fish screened intakes) have posed a threat to the normal operation and fish protection function of the M&T/Llano Seco Pumps Facility.

An upriver mid-channel gravel bar adjacent to the Bidwell-Sacramento River State Park is migrating not only toward the vicinity of the fish screened diversion, but also toward a former outfall location for the City of Chico (City) wastewater treatment plant (WWTP) and the City's current WWTP outfall location, which are located about 300 feet and 1,500 feet downstream, respectively, from the M&T/Llano Seco Pumps Facility. As a result of continued sediment deposition, the intake screens continue to experience sediment deposition, which could cause a reduction in sweeping velocities across (i.e., parallel to) the screens. A reduction in sweeping velocities would render the screens out of compliance with the National Oceanographic and Atmospheric Administration's National Marine Fisheries Service (NMFS) and the California Department of Fish and Wildlife (CDFW) fish screen criteria. Periodic maintenance is required to reduce the size of the gravel bar and prevent interference with the diversion facility. In 2001 and 2007, 200,000 tons and 100,000 tons of material, respectively, were excavated from the gravel bar as a short-term solution to limit sedimentation impacts. Additionally, 1,520 feet of short-term, rock-toe and tree bank protection was installed in 2007 on the west side of the Sacramento River on the U.S. Fish and Wildlife Service's (USFWS) Capay Unit of the Sacramento River National Wildlife Refuge (SRNWR) and the Stile property to prevent further channel migration and downstream movement of the gravel bar to protect the fish screens and pumping plant intake.

The lifespan for the 2007 temporary solution (dredging and revetment) was intended to be five years while planning for a long-term project that would permanently solve the problem. It was anticipated that dredging would occur only once during the five-year planning period and the bank revetment would be removed or incorporated into the long-term solution. A range of potential alternatives have been developed and are undergoing refinement for consideration in the long-term solution. A separate independent environmental compliance process will be initiated for the long-term project during the spring of 2013. While the process for analyzing and completing a long-term solution continues, additional interim measures are necessary to address the immediate concerns regarding fish screen/intake operability and maintain the viability of the range of alternatives under consideration for the long-term solution.

During the spring of 2007, USFWS, as the lead agency under the National Environmental Policy Act (NEPA), and CDFW[1], as the lead agency under the California Environmental Quality Act (CEQA), prepared a joint Environmental Assessment/Initial Study (EA/IS) to evaluate measures intended to maintain viability of the M&T/Llano Seco Pumps Facility, including removal of gravel bar material from the Sacramento River and placement of a rock-toe and tree revetment on the west side of the river. The Draft EA/IS for the M&T Chico Ranch/Llano Seco Rancho Pumping Plant Temporary Maintenance Project was made available for a 30-day public review period. Public and agency comments were reviewed and responses to comments were incorporated into the Final EA/IS (herein referred to as the 2007 Final EA/IS). USFWS approved the Finding of No Significant Effect (FONSI) and CDFW adopted the Mitigated Negative Declaration (MND) on October 16, 2007.

Construction associated with the M&T Chico Ranch/Llano Seco Rancho Pumping Plant Temporary Maintenance Project (CDFG and USFWS 2007), as approved and authorized, was initially carried out during the fall of 2007, with the rock-toe and tree revetment anticipated to remain in place for five years. This Draft EA/IS evaluates a time extension of the rock-toe and tree revetment portion of the project originally described in the 2007 Final EA/IS that would extend until a long-term solution is developed and completed, and includes an analysis of ongoing monitoring and maintenance of the revetment. It is also possible that the rock-toe revetment will become a part of the long-term solution. This Draft EA/IS also evaluates potential impacts due to implementation of up to two additional maintenance dredging operations intended to sustain viability of the M&T/Llano Seco Pumps Facility, including meeting existing fish screen criteria and water delivery obligations. The results of this Draft EA/IS will provide the basis for determining whether a NEPA FONSI and a CEQA MND can be issued or if additional environmental review such as an Environmental Impact Statement/Environmental Impact Report (EIS/EIR) is required.

[1] At the time, the California Department of Fish and Wildlife was still known as the California Department of Fish and Game. It became CDFW, rather than CDFG, on January 1, 2013, pursuant to legislation enacted in 2012.

1.1 PROJECT BACKGROUND

Constructed in the early 1900s, the original M&T/Llano Seco Pumps Facility was located on Big Chico Creek about 0.5 mile upstream from the confluence with the Sacramento River. The Big Chico Creek facility served as the sole diversion works for the M&T/Llano Seco Rancho Sacramento River water right entitlements. In the 1980s, the M&T Chico Ranch and Llano Seco Rancho pump station on Big Chico Creek was identified as impacting both resident and anadromous juvenile fish, particularly spring-run Chinook salmon, by entrainment (M&T Chico Ranch 2006).

M&T Chico Ranch/Llano Seco Rancho entered into an agreement dated April 22, 1991 (referred to herein as the M&T Agreement) concerning management, maintenance, operation, and expansion of certain water delivery facilities used by the ranches to deliver Butte Creek Waters and waters diverted by M&T Chico Ranch/Llano Seco Rancho from the Sacramento River to their respective properties.

On April 25, 1991, USFWS, CDFW, The Nature Conservancy (TNC), and Llano Seco Rancho entered into an agreement concerning the conveyance of land (fee title and easement), management, and water supply and conveyance through associated water delivery facilities. The fee title and easement interests held by USFWS and CDFW were acquired from Llano Seco Rancho, together with the nonexclusive right to use waters as specified in the agreement. The rights of use acquired by USFWS and CDFW were expressly subject to the terms of the 1991 M&T Agreement.

On May 20, 1996, USFWS, CDFW, M&T Chico Ranch, and Parrott Investment Company (Llano Seco Rancho) entered into an agreement (the “1996 Agreement”) for relocation of the M&T/Llano Seco Pumps Facility from Big Chico Creek to the Sacramento River to enhance instream conditions for Chinook salmon and steelhead in Big Chico Creek. The M&T/Llano Seco Pumps Facility is currently located on the east bank of the Sacramento River downstream of the confluence of Big Chico Creek and the Sacramento River, immediately south of the Bidwell-Sacramento River State Park at River Mile (RM) 193, approximately 6 miles southwest of the City of Chico.

The existing M&T/Llano Seco Pumps Facility was constructed as part of the 1997 M&T Pump Relocation and Fish Screen Project (Relocation Project). The relocated diversion, which supplies the ranches and other users, was designed with a total capacity of 150 cubic feet per second (cfs) and a state-of-the-art fish screen system. As part of the 1997 relocation, M&T Chico Ranch/Llano Seco Rancho agreed to implement a bypass at the Parrott-Phelan Dam on Butte Creek of up to 40 cfs of their Butte Creek water right entitlement for the period of October 1 through June 30. The water would provide instream flows in Butte Creek to support Butte Creek fisheries, as long as the new Sacramento River pumps meet their goals, and the replacement water for the amount of water bypassed in Butte Creek is made available to the Ranches from the Central Valley Project (CVP) at the new diversion located on the Sacramento River. The 1996

Agreement also stated that "*all parties* [M&T, PIC, CDFG and USFWS] *will diligently assist in obtaining any necessary permits for maintenance of the pumping facility*."

As originally designed and constructed, the 1997 Relocation Project provided major benefits to the fisheries resources in the Sacramento River Valley including:

- The removal of a major obstacle to the recovery of spring-run Chinook salmon on Big Chico Creek through the relocation of the pumping plant.
- Increased flows in lower Big Chico Creek.
- Elimination of reverse flows in Big Chico Creek from the Sacramento River, thereby improving conditions for migratory Chinook salmon and steelhead.
- Reduced potential of entrainment through the construction of a new fish screen facility.
- Dedication of 40 cfs in Butte Creek to enhance fisheries resources.
- Water for the maintenance of the Llano Seco Unit of the North Central Valley Wildlife Management Area and State Llano Seco Unit of the Upper Butte Basin Wildlife Area.

Since the 1997 relocation, the M&T/Llano Seco Pumps Facility has provided a reliable water supply to the M&T Chico Ranch and Llano Seco Rancho, as well as habitat acreage owned and managed by USFWS and CDFW.

1.1.1 PRIVATE PROPERTY RELYING ON THE PUMPING FACILITY

The M&T Chico Ranch is about 8,500 acres, of which approximately 6,000 acres is currently developed prime farmland and irrigable from the pumping facility. Llano Seco Rancho is approximately 15,000 acres, of which a minimum of approximately 3,500 acres is or may soon be developed into wetlands (this wetland acreage may be further increased in the future). In addition to the wetlands, Llano Seco Rancho includes 12,000 acres of prime farmland, most of which has been developed into orchards, row crops, rice and irrigated pasture. Both ranches rely heavily on the pumping facility to serve the irrigable acreage. M&T Chico Ranch has a contract with Bureau of Reclamation for 17,956 acre-feet, diverted via the pumping facility. Llano Seco Rancho has riparian rights and relies on the pumping facility for water supply. Additional habitat and/or prime farmland may be developed in the future and served pursuant to the riparian rights. In addition, the ranches are entitled to divert replacement water from the Sacramento River for water bypassed in Butte Creek, pursuant to the 1997 Agreement previously described.

The combined acreage of the M&T and Llano Seco Ranches which is potentially irrigable by the M&T/Llano Seco Pumps Facility is approximately 21,000 acres. Virtually all of the Llano Seco acreage is protected by conservation and agricultural easements to permanently preserve the Ranch's wildlife and its farming culture.

1.1.2 PUBLIC LANDS RELYING ON THE PUMPING FACILITY

In addition to serving the ranches, the pumping facility provides water to approximately 2,200 acres in fee title owned and managed by USFWS. Included in these fee title lands, approximately 933 acres has been developed in wetlands and associated habitat. In addition, CDFW owns approximately 1,500 acres in fee title that includes approximately 952 acres developed into wetlands and associated habitat. These habitat areas provide wetland habitat for waterfowl, shorebirds, and other wetland-dependent and special-status species.

All the above referenced areas rely on the pumping facility to supply water to maintain agricultural production and habitat conservation needs.

1.1.3 SUMMARY

Maintenance of the habitat areas and the prime farmland requires a dedicated water supply. This supply had originally been met by the unscreened facilities on Big Chico Creek, resulting in conditions adverse to the Big Chico Creek fishery resources. Accordingly, the agencies committed additional financial and managerial resources toward implementing and constructing the M&T/Llano Seco Pumps Facility, which now provide the sole reliable water supply to the habitat areas. A reduction or total curtailment of pumping would jeopardize or eliminate the water supply provided to these areas. Relocation of the diversion facility represents a significant investment made by various Federal, State and private parties, all of which have a vested interest in maintaining the viability of the M&T/Llano Seco Pumps Facility.

Unless additional measures are taken to address the effects of river meander and sedimentation, the potential exists for the M&T/Llano Seco Pumps Facility to become inoperable or out of compliance with CDFW and NMFS fish screening criteria if the encroachment of sedimentation is allowed to continue or if the rock-toe and tree revetment becomes damaged and is not maintained. In addition, the original objectives of the Relocation Project could be undermined because reductions in pumping at the M&T/Llano Seco Pumps Facility may also result in a diminution of flows in Butte Creek and Big Chico Creek under the No Action Alternative, if M&T Chico Ranch and Llano Seco Rancho revert to the diversion on Big Chico Creek. Hydrographic and topographic surveys of the M&T/Llano Seco reach of the Sacramento River between RM 192 and RM 193.5 have been used to monitor geomorphic and riverbed elevation changes in the reach, including aggradation of the riverbed, bank erosion and lateral migration of the river. The survey data provide a substantial part of the basis for determining whether dredging is necessary and if so, the volume of material to be removed. As briefly described below, the encroaching sediment is migrating toward the vicinity of the M&T/Llano Seco Pumps Facility and the City's WWTP outfall locations at an unpredictable rate.

A pre-excavation survey of the gravel bar was conducted prior to the fall 2007 removal of approximately 100,000 tons of material from the gravel bar from within a constructed in-river containment berm along the east side of the Sacramento River. The 2007 excavated material and the approximately 200,000 tons of material excavated in 2001 were stockpiled on 10 acres of the

M&T Ranch on the south side of Big Chico Creek between the creek and the Phelan Levee (Tetra Tech 2010). During mid-January 2010, another bathymetric survey of the M&T/Llano Seco reach of the Sacramento River (RM 190 – RM 194) was conducted, when the flows in the Sacramento River at the Hamilton City gage ranged from 7,000 to 13,500 cfs (Tetra Tech 2010). For reference purposes, the gravel bar is inundated at flows of about 35,000 cfs (Tetra Tech 2010). After the 2007 excavation and before the relatively high peak flows during late January 2010, the highest daily peak flow was approximately 56,000 cfs during January 2008. During this time period, little or no deposition on the gravel bar. By contrast, between 5 and 15 feet of aggradation was observed in a region downstream of the gravel bar in the center-left portion of the channel opposite the M&T/Llano Seco Pumps Facility. Some aggradation also occurred along the east side of the channel in the vicinity of the relocated City of Chico WWTP outfall (Tetra Tech 2010).

Flows peaked on the Sacramento River at 76,000 cfs and 73,000 cfs on January 21 and 26, 2010, respectively, the highest flows experienced since 2006. A survey conducted during June 2010 showed net removal of about 47,000 tons of material from the approximately 600-foot by 1,200 foot area of the river bed in the vicinity of the pump intake, primarily as a result of the January high flows.

The most recent hydrographic survey was conducted during June 2012. The survey showed that about 9,000 tons of material accumulated in the 600-foot by 1,200 foot area of the river bed in the vicinity of the pump intake, primarily due to the low peak flows during Spring 2012 (~44,000 cfs at the Hamilton City gage). Based on the patterns indicated by the repeat surveys, aggradation and degradation within the M&T/Llano Seco reach are directly linked to the peak flow hydrology, with a tendency for net degradation in response to flows in the range of bankfull and higher, and net aggradation during lower flows (Tetra Tech 2012). The differences in riverbed elevation between the 2012 and 2006 surveys demonstrate that the site continues to exhibit net aggradational conditions during low flow years. Until a long-term solution is developed and implemented, it is recommended that geomorphic changes in the reach continue to be monitored.

The two previously conducted gravel excavations in 2001 and 2007 were temporary, short-term protection solutions that were implemented to limit sedimentation impacts at the M&T/Llano Seco Pumps Facility (Tetra Tech 2010) as well as the City's WWTP outfall. Unlike the 2001 and 2007 gravel removal operations conducted using "dry-land" excavation methods (i.e., on a gravel bar above the river's water line), future dredging operations will likely require a below-water, barge-mounted dredging method due to current sedimentation patterns at this location in the river (Tetra Tech 2012).

Temporary bank protection consisting of 1,520 linear feet of rock-toe and tree revetment was placed on the west bank of the Sacramento River on the USFWS Capay Unit and the Stile property in October 2007 (Tetra Tech 2010). The primary objective of placing the revetment was to stabilize the site to protect the ability of the M&T/Llano Seco Pumps Facility to pump water

until such time as a long-term solution is developed and implemented. As described above, the lifespan for the revetment was intended to be five years while planning for the long-term project occurred. The potential impacts associated with both revetment construction and removal were evaluated in the 2007 Draft EA/IS, and additional analyses were provided in the 2007 Final EA/IS to clarify that potential impacts associated with revetment removal would be less than significant with mitigation incorporated (CDFG and USFWS 2007). It was anticipated that the bank revetment would be removed at the end of the five-year planning period unless it was incorporated into the long-term solution. Independent environmental review of the long-term project will address impacts associated with the long-term habitat removal (CDFG 2007).

In consideration of the continued gravel bar migration and sediment deposition upstream of the City's WWTP with no long-term solution yet determined, the City decided to move its wastewater outfall operations 1,200 feet downstream from its previous location. This move occurred during 2009 and is estimated to extend the project life by 15 to 20 years (Tamara Miller, City of Chico, personal communication, as cited in Technical Memorandum: Workshop #5 Summary). Because the downstream outfall location may be threatened with the similar sedimentation issues in the future, the City has expressed a desire to maintain the ability to utilize either the upstream location (i.e., 300 feet downstream of the M&T/Llano Seco Pumps Facility) or the downstream location (i.e., 1,500 feet downstream of the M&T/Llano Seco Pumps Facility) in the future if either one of them are clear of sedimentation.

Presently, westward migration of the Sacramento River channel is being controlled by the temporary rock-toe and tree revetment. Because the revetment was designed as an interim and temporary measure, some maintenance was anticipated. However, annual inspection indicates that maintenance has not been necessary to date, and the revetment continues to perform as designed (Tetra Tech 2010). Because river conditions are uncertain and vary on an annual basis, maintenance[2] of the temporary revetment may become necessary prior to completion of a long-term solution.

Although short-term protective solutions, including placement of a rock-toe and tree revetment and excavation of materials proximate to the M&T/Llano Seco Pumps Facility, have been implemented to address the problems of ongoing sediment deposition along the east bank of the Sacramento River and increasing river meander that has threatened the efficiency of the diversion facility fish screens and the City's WWTP outfall, these efforts were intended to provide temporary protections for the diversion facility until a long-term solution is developed and completed. Until a long-term solution is completed, these short-term actions have continued to: (1) secure the water supply to the ranches, a State wildlife area, and Federal wildlife management areas; (2) protect the fisheries resources of Big Chico Creek; (3) preserve the

[2] Specific maintenance-related activities, responsible parties and funding are described in Section 2.2 and in Appendix I – Draft Mitigation, Monitoring and Reporting Program.

enhancement of instream flows on Butte Creek for the protection of salmonids, including spring-run Chinook salmon (Federally and State threatened) and steelhead (Federally threatened); and (4) protect the significant investments made by Federal, State and private parties.

These past short-term protective solutions also have been necessary to maintain the viability of a range of potential alternatives for a long-term solution until the environmental review process for the long-term project can be completed. Because implementation of several of the proposed long-term alternatives would be limited by further erosion of the right river bank opposite the M&T/Llano Seco Pumps Facility, it is necessary to maintain the temporary revetment installed during 2007 to prevent further erosion, thereby preserving the existing bank line during the alternative development and environmental review process for the long-term protection project. Presently, several potential alternatives are being considered for evaluation as part of a long-term solution. These alternatives are currently being refined, and new alternatives may be identified through the public scoping process that will be conducted for the long-term protection project. A separate independent environmental compliance process for the long-term project will be initiated during 2014.

1.2 NEPA PURPOSE AND NEED

CDFW and USFWS, along with the M&T Chico Ranch and Llano Seco Rancho, propose to implement interim measures to protect and maintain the viability of the M&T/Llano Seco Pumps Facility to pump and deliver water to agricultural lands, USFWS wildlife management areas, a CDFW wildlife area and private wetlands, while meeting current fish screen criteria and complying with the ESA and CESA. A Federal action would be required to authorize the continued presence of the temporary revetment on the USFWS Capay Unit and the Stile property, as well as activities that may be required to maintain the revetment, until a long-term solution is developed and completed.

Sediment deposition has posed and continues to pose a threat to normal operation of the existing M&T/Llano Seco Pumps Facility and the City's WWTP outfall. The rate at which the sediment will continue to accumulate near the fish-screened intake is uncertain because it is highly dependent on flow conditions in the Sacramento River (i.e., with the interim revetment in place, the area around the intakes tends to be aggradational during low flow years, and in the absence of the interim revetment, growth and downstream migration of the in-river gravel bar is accelerated during wet years). As a result of gravel bar migration and continued sediment deposition in the vicinity of the intake screens on the M&T/Llano Seco Pumps Facility, there is an imminent threat of inundation by encroaching sediment and the ability to maintain sufficient sweeping velocities parallel to the screen, which would render the screens out of compliance with CDFW and NMFS fish screen criteria. Operation of the facility in this manner could result in impacts to anadromous salmonids in the Sacramento River, and/or would result in the need to curtail pumping and water delivery to farmland, refuge land and wildlife management areas, including over 5,300 acres of wetlands and associated habitats. Additionally, although river meander away

from the pumping facility, which could isolate the facilities from the Sacramento River, is being controlled by the temporary revetment that was installed during 2007, the continued presence of the revetment is necessary until further technical and environmental evaluations are completed to determine whether this short-term measure should be incorporated as part of the long-term solution. In consideration of future uncertainties associated with continued sediment deposition and river migration, and because the downstream outfall location may become threatened with sedimentation issues, the City has expressed a desire to maintain the ability to utilize either of its WWTP outfall locations (i.e., 300 feet and 1,500 feet downstream of the M&T/Llano Seco Pumps Facility) on the Sacramento River. Maintaining the functionality of the City's WWTP outfall locations would be an ancillary benefit provided by the proposed project.

Because meandering rivers provide natural ecosystem processes resulting in high habitat value for terrestrial and aquatic species, including anadromous salmonids, the current situation near the M&T/Llano Seco Pumps Facility and the City's WWTP outfall results in a potential conflict between beneficial uses of water from the Sacramento River. However, the Sacramento River Conservation Area Forum (SRCAF) realized that there were areas along the Sacramento River where meander would have to be limited to protect structural "hardpoints" including public and private infrastructure, the City of Chico's outfall and the M&T/Llano Seco Pumps Facility. Therefore, the Proposed Action/Project represents a compromise between agricultural, and fish and wildlife beneficial uses of the Sacramento River.

1.3 CEQA PROJECT OBJECTIVES

The overall underlying purpose and fundamental objective of the proposed project is to protect and maintain the viability of the M&T/Llano Seco Pumps Facility so that it will continue to provide a reliable water supply to M&T Chico Ranch, Llano Seco Rancho, USFWS wildlife management area lands, and CDFW wildlife areas, while meeting current fish screen criteria and complying with the ESA and CESA.

Specific objectives of the proposed project designed to protect fisheries, agricultural lands, and terrestrial biological resources include the following.

- Maintaining the viability of the M&T/Llano Seco Pumps Facility to pump and deliver water for agricultural and habitat-related purposes.
- Reducing entrainment mortality of juvenile fish species from water diversion by ensuring unimpeded upstream and downstream passage for Chinook salmon and steelhead, and by reducing or eliminating fish impingement and entrainment by insuring that encroaching sediment deposition does not render the existing fish screen facility on the Sacramento River out of compliance with NMFS and CDFW fish screen criteria.
- Preserving the enhancement of instream flows on Butte Creek for the protection of fisheries and wildlife purposes.
- Protecting instream flows on Big Chico Creek for anadromous salmonids.

- Maintaining the temporary revetment along the west bank of the Sacramento River until a long-term solution is developed and completed.

As described in Section 1.2 above, river meander is presently being controlled by the temporary revetment that was installed during 2007. An ancillary benefit of the proposed project would be the maintenance of the functionality of the City's WWTP outfall locations.

1.4 PROJECT SETTING AND LOCATION

The project setting for this Draft EA/IS includes areas that may be affected directly, indirectly, or cumulatively by the proposed project and is generally the same as that identified in the 2007 Final EA/IS (CDFG and USFWS 2007). The Action/Project Area for the proposed project encompasses an area that is slightly smaller than that which was affected by construction activities conducted during 2001 and 2007. The smaller footprint is primarily because it is no longer possible to use a "dry-land" gravel excavation method, and future sediment removal would require an in-river suction dredging technique due to the location of deposition in the river. Use of an in-river suction dredging technique eliminates the need for loading excavated material on to trucks for transport to the spoils storage site on the M&T Chico Ranch property – activities that occurred on lands administered by the Bidwell-Sacramento River State Park during 2001 and 2007.

As shown on the project vicinity map (**Figure 1-1**), the project setting is located in both Glenn and Butte counties, just west of the confluence of Big Chico Creek on the Sacramento River. The setting area is rural and surrounded by agricultural lands, a national wildlife refuge, a California State park, and undeveloped land.

The Action/Project Area (**Figure 1-2**) includes areas upstream, adjacent to, and immediately downstream of the M&T/Llano Seco Pumps Facility. The M&T/Llano Seco Pumps Facility is located immediately downstream of the confluence of Big Chico Creek and the Sacramento River, on the east bank of the Sacramento River just south of the Bidwell-Sacramento River State Park at RM 193, approximately six miles southwest of the City of Chico.

As previously discussed, the M&T/Llano Seco Pumps Facility provides a reliable water supply to approximately 25,000 acres of privately owned farmland and public lands, including over 5,300 acres of wetlands and associated habitats owned or managed by the USFWS, CDFW and Llano Seco Rancho, which provide habitat for waterfowl and other species.

Also, within the Action/Project Area, the City's WWTP has one operating outfall and diffuser located approximately 1,500 feet downstream (constructed in 2009) from the M&T/Llano Seco Pumps Facility and an older outfall and diffuser located approximately 300 feet downstream (constructed in 1961) from the M&T/Llano Seco Pumps Facility that has been capped and sealed. The need to increase the City's sewage outfall capacity, as well as the eminent threat of inundation by sedimentation - which posed a public safety threat to the City's WWTP continued operations, resulted in the new outfall and diffuser construction in 2009.

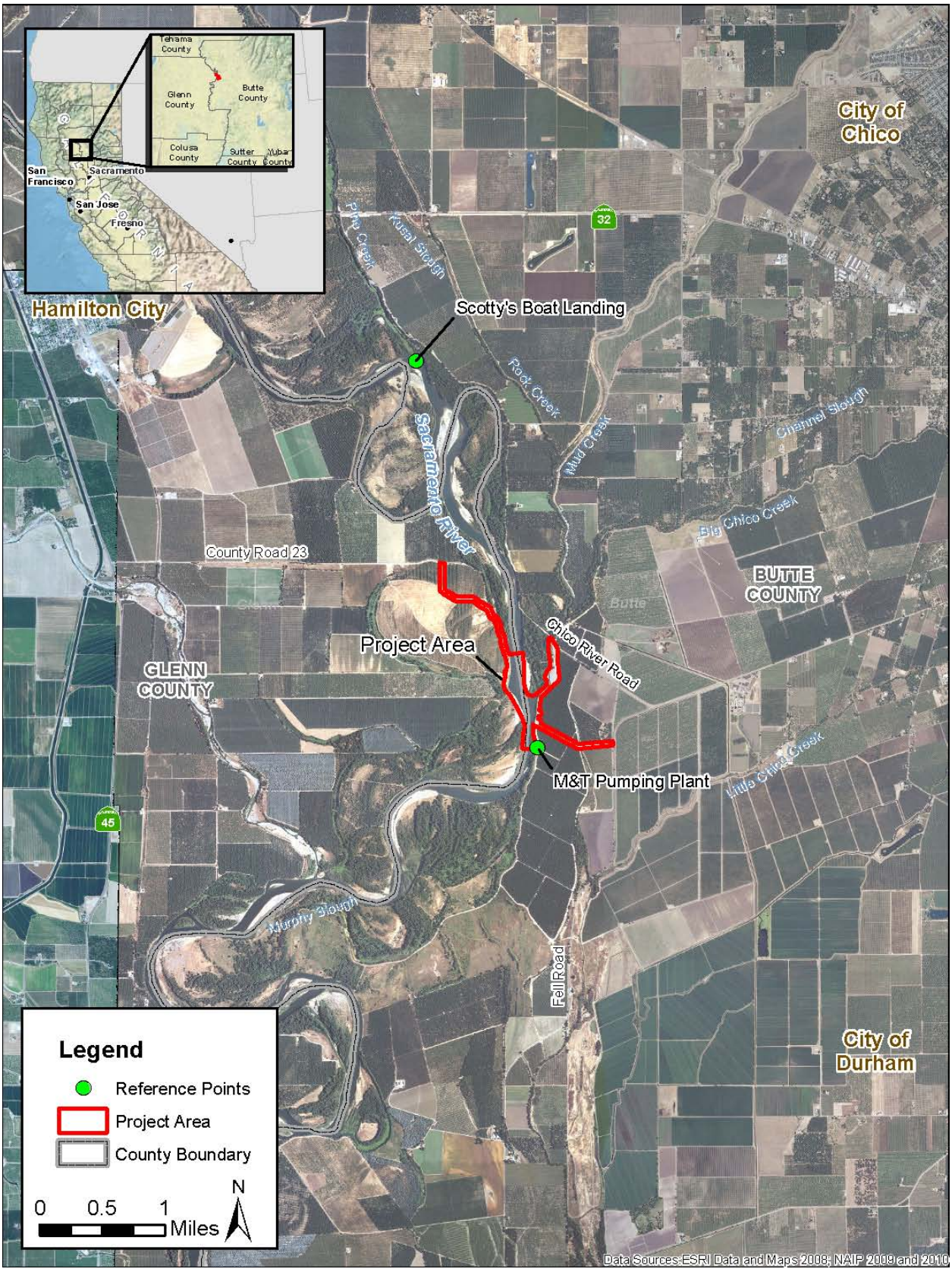

Figure 1-1. Project Vicinity.

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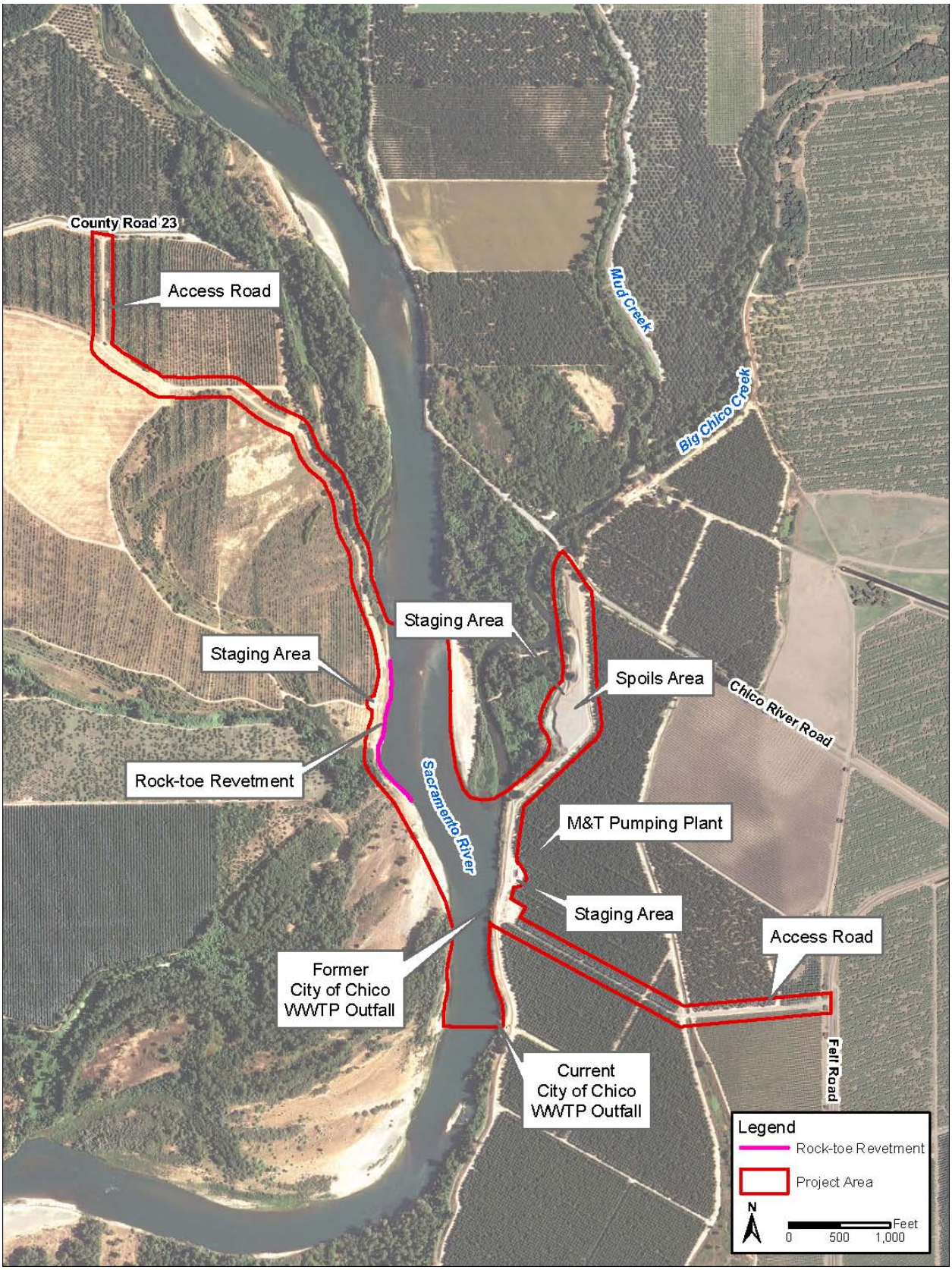

Figure 1-2. Action/Project Area.

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In addition, a portion of the Action/Project Area is also within the SRNWR, which is owned and operated by USFWS. The proposed project would involve the ongoing monitoring and maintenance of the rock-toe and tree revetment on the west bank of the Sacramento River at RM 192.5 that is located on the Capay Unit of the SRNWR, and what is now the TNC Stile property immediately south of the Capay Unit. This bank stabilization effort was implemented in 2007 to maintain river channel width until a long-term solution to protect the M&T/Llano Seco Pumps Facility from sedimentation was developed and implemented.

The rock-toe and tree revetment was constructed to halt the erosion process along the area of the west bank that continued to increase the effective width of the Sacramento River. Erosion of approximately 330 feet of the west bank of the river between 1996 and 2006 that increased the effective width of the river has in fact permitted the bar to migrate about 1,000 feet further downstream between 2006 and 2010, in spite of the fact that there have been few high flows in the river (Tetra Tech 2010). Interim stabilization of the toe of the west bank in the Fall 2007 has prevented further westward migration of the river, but has not prevented downstream bar migration to the point where the focus of deposition is now opposite the pump inlets (Tetra Tech 2010). If the current rate of migration continues, the functionality of the existing pumping plant and fish screen facility and eventually the City's outfall and diffuser could be rendered inoperable.

To understand the accumulation of sedimentation, hydrographic surveys have been and will continue to be conducted to provide the necessary information that would trigger a future sedimentation removal project in order to maintain operations, to provide a reliable water supply, and to meet regulatory compliance for the pumping plant and fish screens. These surveys have concluded that current sedimentation patterns in the river will require a floating hydraulic suction dredging to remove future sedimentation. This project intends to conduct up to two cycles of hydraulic suction dredging to remove accumulated sedimentation that will require dredge spoils to be deposited at the existing stockpile located on the M&T Chico Ranch property (Figure 1-2).

The Action/Project Area is also within a local planning area referred to the Sacramento River Conservation Area (SRCA) that was initiated in 1986 by California Senate Bill 1086, referred to as the SB1086 Riparian Habitat Management Program. The legislation called for a management plan to protect, restore and enhance the fisheries and riparian habitat along the Sacramento River from Keswick Dam down river to Verona.

The SRCA is administered by the SRCAF which is a non-profit organization that brings communities, individuals, organizations and agencies together within the management area to make resource management and restoration efforts more effective and sensitive to the needs of local communities and landowners along the river. The project area is located at the upstream end of the SRCA Reach 3 – Chico Landing to Colusa, and within the *inner river zone* or active meander of the reach.

The goal of the SRCA Program is to preserve remaining riparian habitat and reestablish a continuous riparian corridor along the Sacramento River. The objective of the SRCA "inner river

zone" management is to retain downstream movement of point bars and the natural river meander.

The SCRA recognizes there are places along the Sacramento River where bank stabilization would be necessary to limit meander in the inner river zone. This limitation takes into consideration the need to protect existing land uses, including agriculture, and structures such as buildings, bridges, pumping plants, and flood management structures from bank erosion (Resources Agency 2003).

1.5 LEGAL AUTHORITY, PERMITTING AND APPROVALS

1.5.1 ENVIRONMENTAL COMPLIANCE

The proposed project is expected to achieve a benefit to the environment by maintaining the integrity of the relocated M&T/Llano Seco Pumps Facility. Similar to the project that was approved and implemented during 2007, actions evaluated in this document would occur on Federal property and would require Federal permits and approvals, as well as environmental documentation under NEPA. Compliance with CEQA also is required because the proposed project is currently funded by the Ecosystem Restoration Program (ERP) and requires environmental review and permitting approval from several State agencies, including CDFW. The CEQA checklist is provided in **Appendix A**. Anticipating the need for a future dredge operation, a Draft Subsequent Initial Study/Subsequent Mitigated Negative Declaration (IS/SMND) was prepared and circulated by CDFW for public review during May 2011. On July 21, 2011, CDFW issued a letter to interested parties stating "*Based on new additional hydrological information, it has now been determined that the proposed short-term protection project will not be necessary this year. Therefore, CDFG has determined that the project environmental documents will not be executed at this time. We would like to thank all stakeholders and interested parties for your comments regarding this project*" (CDFG 2011c). A total of 15 comment letters from 10 commenters were received during the 30-day review period. Public comments received on the May 2011 environmental document are important, and were considered in the preparation of this Draft EA/IS.

This Draft EA/IS has been prepared to extend the period of the rock-toe revetment remaining in the Sacramento River, to evaluate potential activities associated with maintenance of the existing revetment, and to describe and evaluate a suction dredge operation prior to the long-term solution being in place. These project elements would be conducted consistent with Federal, State and local laws, and any permitting requirements. This document has been prepared using information from the 2007 Final EA/IS and the 2011 Draft Subsequent IS/SMND to form the basis of the environmental document, with appropriate updates, and therefore those documents are incorporated by reference into this Draft EA/IS. Both the 2007 and 2011 documents are available to the public at http://www.ducks.org/california/california-projects/m-t-llano-seco-fish-screen-project.

This Draft EA/IS is intended to serve several purposes. First, it has been prepared to satisfy the environmental review requirements of CEQA and CESA. Under CEQA, the primary focus is on the disclosure of impacts and establishment of detailed mitigation measures containing a verified timing component. CDFW is the CEQA lead agency and has prepared this Draft EA/IS.

Second, this document meets USFWS's impact assessment obligations under the NEPA of 1969 (42 U.S.C. 4321 et seq.). NEPA requires full disclosure regarding potential Federal actions, their alternatives, potential impacts, and possible mitigation for actions taken by Federal agencies. Unless significant impacts are identified, this document (consisting of an EA and a proposed FONSI) is intended to serve as the appropriate environmental review and approval document under NEPA. USFWS is the designated NEPA lead agency, and has published public notices and is providing for public and agency review, as required by NEPA.

Third, it provides documentation for USFWS's obligations and requirements under the Federal ESA of 1973, as amended (16 U.S.C. §§1531 et seq.) for the Proposed Action (i.e., extension of the period of the rock-toe revetment remains in the Sacramento River, and evaluation of potential activities related to maintenance of the existing revetment and dredging operations prior to the long-term solution being in place). With respect to USFWS's obligations under the Federal ESA, this document also serves as the Biological Assessment (BA), which must be prepared pursuant to section 7(c) of the Federal ESA (16 U.S.C. §1536(c)) and to 50 C.F.R. Part 402. The potential effects of the Proposed Action on Federally listed threatened and endangered species and on species proposed for Federal listing must be evaluated within the context of the Federal ESA. The Lead Agencies have been involved in coordination and informal consultations regarding the Proposed Action with both USFWS and NMFS, and will provide USFWS and NMFS with a review copy of the Draft EA/IS, which includes a chapter addressing ESA compliance issues. Following review of the Draft EA/IS, USFWS and NMFS each may prepare a letter of concurrence finding that the Proposed Action will not adversely affect protected species under USFWS and NMFS jurisdiction within the action area. Alternatively, USFWS and NMFS may issue Biological Opinions (BOs) pursuant to section 7(b) of the Federal ESA (16 U.S.C. §1536(b)), setting forth their respective opinions as to whether the action proposed by the Lead Agencies is likely to jeopardize the continued existence of any Federally listed or proposed listed species, or result in the destruction or adverse modification of designated critical habitat for such species, addressing those species over which each resource agency has jurisdiction under the Federal ESA. In addition, it is anticipated that NMFS will find that the Proposed Action is not likely to adversely affect Essential Fish Habitat (EFH) for Pacific salmon. (Please refer to Chapter 5, Endangered Species Act Compliance, for additional discussion regarding listed species and ESA consultation.)

The 2007 environmental documentation and construction was funded by a CALFED grant. Similarly, funding for the continuation of interim measures (e.g., the Proposed Project) is being provided by a CALFED Ecosystem Restoration Program grant. This Draft EA/IS and associated

permits and approvals are designed to comply with the provisions of the August 2000 CALFED Record of Decision.

Additionally, all necessary permits will be obtained or amended to address the suction dredging activities, and the continued presence and maintenance of the revetment until a long-term solution is developed and completed. Applicable laws and regulations related to the proposed project are presented in Chapter 6.0, Compliance with Environmental Laws and Regulations, and are similar to those identified in the 2007 Final EA/IS (CDFG and USFWS 2007).

1.5.2 PERMITTING REQUIREMENTS

In 2007, the following permits and authorizations were obtained prior to implementing the M&T Chico Ranch/Llano Seco Rancho Pumping Plant Temporary Maintenance Project.

- Clean Water Act Section 404 Permit
- Clean Water Act Section 401 Water Quality Certification
- National Pollution Discharge Elimination System (NPDES) Permit
- Rivers and Harbors Act Section 10 Permit
- USFWS and NMFS BOs for ESA Compliance
- CESA Compliance
- Fish and Game Code Section 1602 Streambed Alteration Agreement
- Section 106 of the National Historic Preservation Act Compliance
- USFWS Special Use Permit
- State Reclamation Board[3] Encroachment Permit

Where appropriate, existing permits and authorizations would be amended that would remain in effect during the life of the Proposed Action/Project. Section 106 compliance consultation remains in effect and would likely not require modifications.

However, it is likely that several existing documents will need to comply with changes that have occurred since the 2007 dredge operation, including preparation of a new National Pollutant Discharge Elimination System (NPDES) Permit for the Proposed Action/Project. It is anticipated that coverage would need to be obtained through the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Construction General Permit Order 2009-0009-DWQ), consistent with the terms of the NPDES Permit obtained for the 2007 Temporary Maintenance Project. The Construction General Permit requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP), which

[3] Presently referred to as the Central Valley Flood Protection Board.

must list Best Management Practices (BMPs) that will be used to protect stormwater runoff and the placement of those BMPs (SWRCB 2013).

To determine whether an amendment to existing permits is feasible or a new permit is required for continued short-term protection of the M&T/Llano Seco Pumps Facility, early coordination with USFWS and NMFS was conducted. Those discussions indicated that new ESA consultations will be required, and should address the changes in the methodology used for gravel extraction (suction dredge), continued revetment presence and maintenance, as well as updated information regarding potential changes in listing status of species that may have occurred within the Action/Project Area.

In 2001 and 2007, when gravel was excavated from the encroaching gravel bar using a "dry-land" excavation method that involved heavy equipment accessing the excavation site from the shore along the east bank of the Sacramento River, the CSLC (California State Lands Commission) granted an exemption for a dredging lease under Section 6327 of the Public Resources Code (PRC):

> *"The commission may, upon written application, grant a permit for the use and occupancy of state lands under the jurisdiction of the commission for the installation of facilities for procurement of fresh-water from and construction of drainage facilities into navigable rivers, streams, lakes and bays, except that if such applicant obtain the required permit for such use from the local reclamation district, the Reclamation Board, the Department of Water Resources, the California Debris Commission or the Corps of Engineers of the United States Army, then such application shall not be required by the State Lands Commission."*

In accordance with PRC Section 6327, an exemption was granted for both the 2001 and 2007 dry-land excavations because permits were obtained from the U.S. Army Corps of Engineers and the Central Valley Flood Protection Board (formerly the Reclamation Board).

Since the time of the previous dry-land excavation in 2007, the sedimentation patterns in the Sacramento River have changed, which has resulted in the expansion and downstream migration of the gravel bar. Because the portion of the bar that must be removed during the next proposed dredge to protect the functionality of the pump intakes is inundated at relatively low flows, the dry-land bar excavation method is not a viable option. A suction dredge is now required to effectively remove the encroaching in-river material in the vicinity of the M&T/Llano Seco Pumps Facility. Therefore, an exemption from a dredging lease will no longer be appropriate Because the bed of the Sacramento River is considered sovereign lands, the CSLC has jurisdiction and management control over those public lands of the State received by the State upon its admission to the United States in 1850 ("sovereign lands"). Please see California Public Resources Code Sections 6000 et seq. and Title 2, Division 3, Sections 1900 et seq. of the California Code of Regulations.

Generally, these sovereign lands include all ungranted tidelands and submerged lands, beds of navigable rivers, streams, lakes, bays, estuaries, inlets, and straits. The CSLC manages these sovereign lands for the benefit of all the people of the State, subject to the Public Trust for water-related commerce, navigation, fisheries, recreation, open space and other recognized Public Trust uses. In addition, the State manages lands received after Statehood including swamp and overflowed lands and school lands. The CSCL's Land Management Division in Sacramento administers the surface leasing of these lands, sand and gravel extraction from these lands, and dredging or disposal of dredged material on these lands. The CSLC also manages the development of all mineral resources contained on such lands and is granted authority to lease these sovereign lands to the littoral landowner pursuant to PRC Section 6301 (see Chapter 6).

The existing stockpile will continue to be used as a repository for materials removed from the Sacramento River to protect the existing M&T/Llano Seco Pumps Facility until a long-term solution is developed and implemented.

1.5.3 CALIFORNIA MORATORIUM ON SUCTION DREDGING

CDFW is the only California State agency with explicit statutory authority to regulate suction dredge mining (Fish & Game Code §5653 *et seq*.). CDFW's previous regulations governing suction dredge mining were promulgated after preparing and certifying an EIR under CEQA in 1994. In 2009, all California instream suction dredge mining was suspended following the Governor's signature on a new State law. Senate Bill (SB) 670 prohibited the use of vacuum or suction dredge equipment in any California river, stream or lake, regardless of whether the operator has an existing permit issued by CDFW. The moratorium on instream suction dredge mining established by SB 670 was to remain in effect until CDFW completed a court-ordered environmental review of its suction dredge permitting program and any necessary updates to the existing regulations take effect. In March 2012, CDFW released a Final Subsequent EIR and Proposed Regulations for its Suction Dredge Permitting Program (CDFG 2012a). On April 27, 2012 the Office of Administrative Law approved updated regulations governing suction dredge mining under Fish and Game Code Section 5653 *et seq*., CEQA and the Administrative Procedures Act (OAL 2012).

At this time, the moratorium does not apply to suction dredging operations performed for the regular maintenance of energy or water supply management infrastructure, flood control, or navigational purposes (e.g., cutterhead dredge) (CDFG 2011a; CDFG 2011b) and, consequently, would not affect the Lead Agencies' ability to implement the proposed project. However, in developing amendments to the previous regulations, a considerable amount of effort was undertaken during CDFW's environmental review to advance the scientific understanding of suction dredging impacts on a broad spectrum of environmental resources, and the new regulations provide greater protections to fisheries resources than the 1994 regulations (CDFG

2012b). In developing the proposed amendments to the 1994 regulations, CDFW considered the types of impacts and circumstances in which suction dredging activities may be deleterious to fish[4], as that term is defined in the Fish and Game Code. According to CDFG (2012b), the Suction Dredge Permitting Program EIR represents the most comprehensive scientific analysis of suction dredging impacts prepared in California to date. Therefore, to the extent that information available in the Suction Dredge Permitting Program EIR (CDFG 2012b) is applicable, it was used to support the impact analysis conducted in this Draft EA/IS, particularly with respect to the evaluation of potential dredging-related impacts to fisheries and aquatic resources.

1.6 CONSULTATION AND COORDINATION

1.6.1 CEQA NOTICE OF PREPARATION AND NEPA/CEQA PUBLIC SCOPING

The Lead Agencies are interested in the views of Federal, State and local public agencies, non-governmental organizations (NGOs) and the general public as to the scope and content of environmental information that should be included in the Draft EA/IS. As the CEQA lead agency, CDFW elected to issue a Notice of Preparation (NOP) to inform responsible agencies and members of the public of the preparation of the environmental document for the Proposed Project. Although not required for an Initial Study, the purpose of the NOP was to provide information describing the Proposed Project and its potential environmental impacts, and to seek input from responsible agencies as defined by CEQA (California Public Resources Code 21069) and members of the public. The 30-day public comment period ended on October 25, 2012.

Additionally, two public scoping meetings were held at the Chico Masonic Family Center in Chico, California on September 27, 2012 to solicit input for the Draft EA/IS. Public notices of the scoping meetings were published in the Chico Enterprise-Record on September 14, 2012, the Willows Journal/Orland Press Register on September 15, 2012, and on the Appeal-Democrat website on September 15, 2012.

A total of 10 agencies and other interested parties provided verbal and/or written comments during the public scoping process for the Draft EA/IS. The NOP and scoping comments are included in **Appendix B** of this Draft EA/IS.

1.6.1.1 SUMMARY OF ISSUES AND CONCERNS

A brief summary of the types of issues and concerns raised by interested parties is presented below.

[4] Section 45 of the Fish and Game Code defines "fish" to mean wild fish, mollusks, crustaceans, invertebrates, or amphibians, including any part, spawn, or ova thereof.

- Long-term maintenance of the rock-toe and tree revetment
- Characterization of the Project Area
- Characterization of the No Action Alternative
- Potential for diversion-related impacts to fisheries resources in Big Chico and Butte creeks and the need for additional ESA consultation
- River hydrology, sediment transport, and flood-related issues
- Potential for flood-related impacts near Big Chico Creek
- Potential for underwater noise and vibration impacts to fisheries and aquatic resources
- Potential for impacts associated with the existing gravel stockpile, and feasibility of temporarily storing spoils material at other locations along the Sacramento River
- Describe notification procedures and signage to minimize potential impacts to recreation and navigational safety
- Potential for water quality impacts (e.g., sediment and turbidity, mercury/methylmercury release into the water column)
- Potential for air quality and greenhouse gas emission impacts

Additional information regarding why some issues will not be analyzed in detail is presented in Section 2.3 – Alternatives Considered but Not Carried Forward.

1.6.2 DOCUMENT REVIEW AND AVAILABILITY

The Draft EA/IS is submitted to the State Clearinghouse and is available for a 45-day public review period at the following locations:

- California Department of Fish and Wildlife, 1701 Nimbus Road, Suite A, Rancho Cordova, CA 95670
- United States Fish and Wildlife Service, Sacramento National Wildlife Refuge Complex, 752 County Road 99W Willows, California 95988, and online at http://www.fws.gov/refuge/Sacramento_River/
- Butte County Library, Chico Branch, 1108 Sherman Avenue, Chico, California 95926
- Willows Library, 201 N Lassen Street, Willows, California 95988
- Sacramento River Conservation Area Forum Website: http://www.sacramentoriver.org/srcaf

In addition, the Notice of Availability of the Draft EA/IS has been distributed to the SRCAF Technical Advisory Committee, which consists of approximately 300 individuals and organizations with interests in the region, and is being published in the following newspapers:

- Willows Journal
- Chico Enterprise-Record

This Draft EA/IS is being provided to the public for review, comment, and participation in the planning process. Following the public review and comment period, comments received from agencies, organizations, and individuals will be considered, and a Final EA/IS will be prepared. Under NEPA, the EA/FONSI will serve as the basis for decision-making by USFWS and other Federal permitting and regulatory agencies. Under CEQA, the IS/MND will serve as the basis for decision-making by CDFW and other State permitting and regulatory agencies.

1.7 DOCUMENT ORGANIZATION

This Draft EA/IS is organized into the following sections:

- **Chapter 1.0** – Introduction, introduces the proposed project, provides background information, describes the purpose of and need for the proposed project, discusses the purpose of this Draft EA/IS, describes the project setting and location, discusses legal authorities and permits/approvals, and describes the document organization.
- **Chapter 2.0** – Description of the Alternatives, characterizes the Proposed Action/Project and the No Action Alternative analyzed in this Draft EA/IS. This chapter also discusses other alternatives that were considered but not carried forward.
- **Chapter 3.0** – Affected Environment and Environmental Consequences, describes the affected environment and setting, the impact analysis methodology, and the analytical results for this Draft EA/IS.
- **Chapter 4.0** – Other Impact Considerations, discusses potential cumulative impacts and growth inducement considerations.
- **Chapter 5.0 –** Endangered Species Act Compliance, presents additional information pertaining to listed species and critical habitat, and analyzes the Proposed Action within the context of listed species protected by the Federal and State ESA and EFH considerations for managed species under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).
- **Chapter 6.0** – Compliance with Environmental Laws and Regulations, presents information about the environmental laws and regulations related to the proposed project.
- **Chapter 7.0** – List of Preparers, presents agency staff and consultants directly responsible for preparing or reviewing this document.
- **Chapter 8.0** – Literature Cited, lists references cited in this Draft EA/IS.

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2.0 DESCRIPTION OF THE ALTERNATIVES

This document serves as a joint NEPA and CEQA compliance document. Much of the documentation and processing requirements for both acts are similar. Under CEQA, the primary focus is on the disclosure of impacts and establishment of detailed mitigation measures containing a verified timing component. Under NEPA, the emphasis is on full disclosure of impacts, with parallel analysis of alternatives.

The Lead Agencies have identified an immediate need to address issues associated with gravel deposition and river meander to ensure that the M&T Chico Ranch/Llano Seco Rancho pumping facility operates in conformity with the NMFS and CDFW fish screen criteria. Similar to the project evaluated in the 2007 EA/IS, the Proposed Action/Project is identified as a temporary solution to the gravel deposition and river meander occurring in the Action/Project Area until a permanent solution can be identified and implemented. Specifically, up to two dredge cycles could occur and the existing rock-toe and tree revetment would remain in the Sacramento River and be maintained, until a long-term solution is developed and completed. Although work is progressing, a long-term solution has not yet been identified, and therefore cannot be analyzed in this document, but will undergo a separate and independent environmental compliance process.

The following sections describe the basic characteristics of the alternatives considered, including location, technical and environmental characteristics, and project size, construction, and design. All phases of project planning, implementation, and operation are included in the descriptions below.

2.1 NO ACTION ALTERNATIVE

In addition to impacts of action-oriented alternatives, a lead agency is required under NEPA to consider environmental impacts of the No Action Alternative. The No Action Alternative was developed to meet the requirements of NEPA and to serve as a baseline for assessing the impacts of proposed actions. The No Action Alternative is defined as the alternative where current conditions and trends are projected into the future without another proposed action (40 CFR 1502.14(d)), as cited in USFWS 1999a)). Under the No Action Alternative, alternate sources of funding would be necessary before M&T Chico Ranch/Llano Seco Rancho could implement the maintenance activities required to ensure that fish screening criteria are met. Under the No Action Alternative, the existing temporary rock-toe and tree revetment also would be removed and erosion of the right (west) bank and growth of the in-channel gravel bar upstream of the diversion would continue (CDFG and USFWS 2007).

Maintenance of the existing pumping facility would be restricted to generally accepted standards[1] for similar facilities, as described in the 1996 Agreement (see Chapter 1 and text below). "Normal maintenance", as defined in the 1996 Agreement, is considered insufficient to maintain the pumping capabilities in consideration of the increased sediment deposition that is occurring immediately upstream of the M&T/Llano Seco Pumps Facility.

The No Action Alternative would adversely affect the ability of the pumping facility to deliver adequate, or any, water supplies to the ranches, Federal wildlife management areas, and a State wildlife area that depend on the pumps for their water supply while meeting existing fish screening criteria. In accordance with the agreement to provide flows for fisheries and wildlife purposes associated with the relocation of the M&T/Llano Seco Pumps Facility (1996 Agreement), if M&T Chico Ranch/Llano Seco Rancho's ability to pump water from the Sacramento River is lost, flows in Butte Creek dedicated to instream uses under the 1996 Agreement likely would be reduced or eliminated, which could potentially impact listed species such as spring-run Chinook salmon and steelhead that use Butte Creek.

Compared to the total amount of Sacramento River water presently diverted at the M&T/Llano Seco Pumps Facility, diversion of the previously dedicated water for environmental enhancement purposes of up to 40 cfs from Butte Creek under the No Action Alternative would be sufficient to irrigate only a small portion of farmland, which would result in economic damage to the ranch. The available Butte Creek water supply would also not be sufficient to maintain the existing managed wetlands. A low rainfall year in the Butte Creek Watershed would be especially critical to both farmland and managed wetlands.

Additionally, continued in-river sedimentation and gravel bar migration downstream on the east (left) bank of the river, could compromise the operation of the City's WWTP outfall. Based on observed bank erosion rates at the site between 1996 and 2006 (annual erosion rates have ranged from about 20 to 60-ft/year, with up to 100-feet per year during wet winters), additional erosion of 100-feet and 500-feet could occur over a subsequent five-year period (CDFG and USFWS 2007).

In summary, the No Action Alternative has the potential to affect in-river critical habitat and special-status fish species.

[1] As described in the 1996 Agreement, general accepted maintenance standards include, but are not limited to, regular removal of normal sediment and debris from the intake structure, regular repair and maintenance to ensure functionality of all structure components of the M&T/Llano Seco Pumps Facility, and compliance with all manufacturer's service requirements for maintenance of the pumps, motors and associated equipment. For the purpose of this evaluation, the No Action Alternative is considered the worst-case alternative with no funding provided to maintain the M&T Chico Ranch/Llano Seco Rancho pumping capabilities.

2.1.1 DREDGING WOULD NOT OCCUR

Under the No Action Alternative, if the encroaching in-river sedimentation renders the M&T/Llano Seco Pumps Facility non-functional prior to implementation of a long-term solution, the M&T Chico Ranch/Llano Seco Rancho would divert the entirety of their Butte Creek and Sacramento River water right entitlements from the Parrott-Phelan Dam on Butte Creek and from the pumping facility on Big Chico Creek. The consequences of shifting pumping from the M&T/Llano Seco Pumps Facility to the unscreened Big Chico Creek pump and the Parrott-Phelan Dam are described below.

2.1.1.1 BUTTE CREEK FLOWS UNDER THE NO ACTION ALTERNATIVE

Under the No Action Alternative, Butte Creek instream flow would be reduced as M&T Chico Ranch and Llano Seco Rancho could not continue to bypass 40 cfs of their Butte Creek entitlement as provided for in the 1996 Agreement.

According to the 1996 Agreement, M&T Chico Ranch and Llano Seco Rancho agreed to not exercise their total diversion rights to Butte Creek Waters and provide "Bypass Waters"[2] past their existing point of diversion at the Parrott-Phelan Dam on Butte Creek in the total amount of the flow of Butte Creek Waters or 40 cfs, whichever is less, for the October 1 through June 30 bypass period. Bypass Waters remain in Butte Creek to its confluence with the Sacramento River for the enhancement of instream flows. According to the 1996 Agreement, M&T Chico Ranch and Llano Seco Rancho may divert that portion of the Bypass Waters in excess of 25 cfs that is available to M&T Chico Ranch and Llano Seco Rancho during the October 1 through November 15 period during any year where the water is required for seasonal waterfowl habitat on the Llano Seco Rancho and M&T Chico Ranch lands and withholding of the water from Bypass Waters will not harm Chinook salmon and steelhead resources in Butte Creek, as determined in advance by USFWS and CDFW.

For each cfs of Bypass Waters in Butte Creek, the 1996 Agreement states that M&T Chico Ranch and Llano Seco Rancho are allowed, in exchange therefor, to divert an equivalent quantity ("Exchange Water") from the Sacramento River at the M&T/Llano Seco Pumps Facility. Provision of the Exchange Water is in accordance to the terms in the M&T Agreement and the 1991 Agreement regarding water management. Additionally, the 1996 Agreement states that the quantities of Exchange Water are in addition to any other water rights, quantities, or entitlement available to M&T Chico Ranch and Llano Seco Rancho at the M&T/Llano Seco Pumps Facility

[2] As used in the 1996 Agreement, the term "Bypass Waters" refers to the amount of Butte Creek Waters otherwise available to M&T Chico Ranch and Llano Seco Rancho for diversion that will not be diverted during the October 1 through June 30 bypass period.

and in Butte Creek, and do not limit or reduce the amount of water that may be taken by the ranches in accordance with their other water rights from these facilities.

Exchange of the portion of the "Butte Creek Waters" (i.e., up to 40 cfs) to be bypassed by M&T Chico Ranch/Llano Seco Rancho for equivalent flow of water to be available at the M&T/Llano Seco Pumps Facility in the Sacramento River allow for a fixed flow to remain in Butte Creek to its eventual confluence with the Sacramento River for the improvement of conditions beneficial to Chinook salmon and steelhead in Butte Creek. The 1996 Agreement further states that USFWS and CDFW shall diligently cooperate with the ranches to "…*finalize the exchange or otherwise obtain additional water from the Sacramento River to replace any portion of Butte Creek Waters bypassed for enhancement of instream flows so that M&T and PIC* [Llano Seco Rancho] *(and USFWS and CDFG, as successors to PIC with respect to the properties and interests that they hold) shall suffer no net loss in water available to them from all sources*."

As further described in the 1996 Agreement, "*Whenever Exchange Water or other water to be delivered at the pumping plant is not available or otherwise non-deliverable due to failure of supply or delivery capacity, and said failure of supply or delivery capacity is not the result of failure on the part of M&T and/or PIC to maintain and operate the pumping plant in accordance with generally accepted maintenance standards for comparable facilities, then Butte Creek Waters, up to the full quantity of PIC's and M&T's rights thereto, in excess of 25 cfs during a Bypass Period, shall be available to M&T and PIC at the Parrott-Phelan Dam on Butte Creek upon demand of M&T and PIC. Not less than seven (7) days prior to such demand, M&T and PIC shall notify FWS and CDFG of such requirement for water, unless a shorter time is agreed to by all parties in writing. It shall be the goal of all parties to protect critical crop, fishery, and wildlife and balance these needs in periods of shortage."*

Furthermore, the 1996 water bypass agreement states *"the M&T and PIC will operate and maintain the new pumping plant in accordance with generally accepted standards for similar facilities. All parties will diligently assist in obtaining any necessary permits for maintenance of the facilities."*

In 2005, M&T Chico Ranch and the Parrott Investment Company (Llano Seco Rancho) filed petitions for change of place and purpose of use to dedicate water for enhancement of fish and wildlife resources pursuant to Water Code §1707. Up to 40 cfs of water that would otherwise have been diverted from Butte Creek would remain instream, and be dedicated to fishery and habitat enhancement in Butte Creek between the Parrott-Phelan Dam and the confluence of Butte Creek with the Sacramento River. In exchange for the water not being diverted from Butte Creek, the ranches would enter into a water delivery contract with the Bureau of Reclamation (Reclamation) to divert a like amount of water from the Sacramento River (SWRCB 2005).

Pursuant to Sections 12003 and 12004 of the California Water Code, M&T Chico Ranch and Reclamation entered into a second 40-year (2005-2045) water delivery contract (or Settlement Contract) on March 4, 2005. The first 40-year Sacramento River Water Settlement contract covered the years from 1964 to 2004. According to Section 9(d) of the Settlement Contract

between Reclamation and M&T Chico Ranch, "*In the event this Settlement Contract terminates, the rights of the parties to thereafter divert and use water shall exist as if this Settlement Contract had not been entered into…*". Presumably, if the encroaching in-river sedimentation rendered the M&T/Llano Seco Pumps Facility non-functional prior to implementation of a long-term solution and water diversions from the Sacramento River ceased to occur, these conditions could affect the terms of the Settlement Contract and M&T Chico Ranch/Llano Seco Rancho could exercise their right to divert their entire entitlement of water from Butte Creek at the Parrott-Phelan Dam under the No Action Alternative.

Under the No Action Alternative, diversions on Butte Creek would resemble those that occurred prior to construction of the M&T Chico Ranch/Llano Seco Rancho pumping plant.

A summary of peak and annual water demand estimates associated with water diverted at the Parrott-Phelan Dam prior to 1997 is presented in **Table 2-1**.

Table 2-1. Summary of Peak and Annual Water Demand Estimates Associated with Water Diverted at the Butte Creek Parrott-Phelan Dam Prior to 1997 (Reclamation 1995). The Diversions in this Table Only Present Information for the Months of April Through October when Reclamation Records Monthly Diversion. Values Presented in the Table do not Include Monthly Diversions from November through March when a Large Amount of Water is Used from the Sacramento River (and Butte Creek when Winter Rainfall Replenishes the Butte Creek Water Supply) to Flood Both Public and Private Wetlands.

Water User	Estimated Peak Demand (cfs)	Estimated Annual Demand (acre-feet per year)
Llano Seco Rancho	49[A]	8,400[A]
CDFW/Llano Seco Unit	35	4,800
USFWS Sanctuary 1	16	2,800
USFWS Sanctuary 2	10	1,600
M&T Chico Ranch	71/75[B]	10,900/11,900[B]

[A] Exclusive of CDFW and USFWS lands.

[B] Peak demand of 75 cfs includes areas served by the M&T/Llano Seco Pumps Facility and/or by gravity from Butte Creek via Edgar Slough; 71 cfs peak demand rate excludes areas not served by Butte Creek.

In accordance with the 1996 Agreement to provide flows for fisheries and wildlife purposes, if the ranches' ability to pump water from the Sacramento River is lost, flows in Butte Creek dedicated under the 1996 Agreement likely would be reduced, which could potentially impact listed species, such as spring-run Chinook salmon, that use Butte Creek.

In the event that increased water diversions from Butte Creek were to occur under the No Action Alternative, it is reasonable to assume that reductions in Butte Creek flows of up to 40 cfs could occur downstream of the Parrott-Phelan Dam from April 1 through June 30 and October 1 through March 31 of the succeeding year due to additional diversion, as described in the 1996

Agreement. During dry years, Butte Creek flows from October through January can be less than 100 cfs, and these additional diversions could represent more than 30 percent of the mean monthly flow. Generally, large quantities of water are needed to flood rice fields and irrigate orchards during April, May and June (Jones and Stokes 1996). Before the M&T/Llano Seco Pumps Facility was relocated to the Sacramento River in 1997, water deliveries, in plentiful water years, during the months of April, May and June were primarily diverted from Butte Creek. Under the No Action Alternative, M&T Chico Ranch would continue to take delivery of their water rights for crop irrigation purposes.

The No Action Alternative would not affect diversions from Butte Creek during July, August, and September and, thus, flows in Butte Creek and in smaller tributaries that comprise the local water conveyance system would not be affected by project operations during these three months, which correspond to the summer low flow period.

2.1.1.2 BIG CHICO CREEK FLOWS UNDER THE NO ACTION ALTERNATIVE

Under the No Action Alternative, Big Chico Creek instream flow would be reduced and fishery resources potentially affected as M&T Chico Ranch and Llano Seco Rancho could not continue to divert from the M&T/Llano Seco Pumps Facility as provided for in the 1996 Agreement, but would divert instead from the existing facility on Big Chico Creek.

As described in Chapter 1 of this Draft EA/IS, USFWS, CDFW, M&T Chico Ranch, and Llano Seco Rancho entered into the 1996 Agreement for relocation of the M&T/Llano Seco Pumps Facility from Big Chico Creek to the Sacramento River to enhance instream conditions for Chinook salmon and steelhead in Big Chico Creek. The pump station relocation resulted in the following:

- Increased flows in lower Big Chico Creek.
- Elimination of reverse flows in Big Chico Creek from the Sacramento River, thereby improving conditions for migratory Chinook salmon and steelhead.
- Reduced potential of entrainment through the construction of a new fish screen facility.
- Water for the maintenance of the Llano Seco Unit of the SRNWR and State Llano Seco Unit of the Upper Butte Basin Wildlife Area.

Under the No Action Alternative, it also may be necessary to return to the existing diversion facility on Big Chico Creek, approximately 0.75 miles upstream from the confluence with the Sacramento River. The original M&T Chico Ranch/Llano Seco Rancho pumping plant on Big Chico Creek is still operational and Reclamation continues to identify this location as a point of diversion. In the event of a water cut-off emergency at the M&T/Llano Seco Pumps Facility on the Sacramento River, the pumping plant on Big Chico Creek would be used to divert water until the ranches were able to resume diverting water from the M&T/Llano Seco Pumps Facility on the Sacramento River. Because alternative sources of water supply have not been identified for USFWS and CDFW wetland management and restoration purposes, it is expected that USFWS

and CDFW will limit delivery of Llano Seco's available supplies, as was the practice prior to relocation of the M&T/Llano Seco Pumps Facility in 1997 (Jones and Stokes 1996). Additional evaluation would be required to identify the average volume of water which would be available to Llano Seco to support the wetland habitat areas on an annual basis, should pumping shift to the Big Chico Creek pumping facility.

As described above, the No Action Alternative has the potential to affect aquatic and fishery resources in Big Chico Creek.

2.1.2 REMOVAL OF THE TEMPORARY ROCK-TOE AND TREE BANK REVETMENT INSTALLED IN 2007

The 1,520-foot long rock-toe and tree revetment was originally anticipated to be a temporary structure. Under the No Action Alternative, the revetment would be removed once available funding was secured and appropriate regulatory compliance activities completed. In the meantime, annual inspection and monitoring of the revetment would cease to occur, and near-term maintenance would not be conducted if the revetment were to become damaged and in need of repairs due to high flows in the Sacramento River or other reasons. Following revetment removal, it is anticipated that erosion of the west bank would continue to occur and the Sacramento River would continue to migrate to the west. Because dredging would also not be conducted under the No Action Alternative, it is anticipated that deposition would continue to occur on the east bank near the pump intake, potentially rendering the City's WWTP outfall and the M&T/Llano Seco Pumps Facility inoperable, reducing the amount of water supplied to private, State and Federal wetland habitat areas – some of which are used by ESA-listed species.

2.1.2.1 REVETMENT REMOVAL ANTICIPATED CONSTRUCTION SCHEDULE AND CHARACTERISTICS

The interim revetment was designed to provide toe protection only to the eroding bank and there was a general expectation that the upper, nearly vertical and unprotected portion of the bank, would continue to erode until a lower bank angle developed that would be colonized by plants and, thereby, be stabilized (Tetra Tech 2010a). The original revetment design called for five tons of rock per linear foot of bank, for a total of 9,120 tons (5,482 cubic yards), including four intermediate tiebacks and the up- and downstream tie-ins. The median size of the rock was 0.75 feet, the 30th percentile was 0.63 feet and the 100th percentile was 0.94 feet (Tetra Tech 2010a).

The top of the revetment was set an elevation of about 119 feet, which corresponds to the water surface elevation at a discharge of approximately 15,000 cfs. Based on the mean daily flow-duration curve at the Hamilton City gage, located about 7 miles upstream, the revetment would be overtopped about 40 percent of the time over the course of a typical year. For environmental mitigation purposes, woody debris was added to the structure at two elevations: (1) approximately elevation 118 feet, which corresponds to a discharge of about 12,000 cfs (50-percent exceedence on the mean daily flow-duration curve); and (2) on the top of the structure. The top of the rock was sloped towards the Sacramento River at a grade of 10H:1V and the area

between the top of the rock and the bank was backfilled with spoils from the tie-back excavations to prevent entrapment of fish (Tetra Tech 2010a).

The rock covers the lower approximately half of the bank height to an elevation of approximately 119 feet and the base of the revetment is approximately 30 feet wide. The top of the bench averaged approximately 10 feet wide. Tiebacks were spaced at about 10 to 15 times the bank height, including the upstream and downstream ends of the revetment to prevent flanking and unraveling. Sufficient stone was incorporated to account for toe scour, and incorporation of brush into the revetment required anchoring with cables and large boulders to prevent loss during overtopping flows.

The brush portion of the revetment consists of multiple, alternating clusters of trees spaced approximately 10 to 15 feet apart at two elevations. One layer was installed on the top of the rock toe and the second layer was installed at an intermediate elevation to provide instream cover over a range of flows. Each tree cluster consists of 10 to 16 trees, depending on the size of each tree, and extends for approximately 40 to 50 feet in length. Trees forming clusters on the top of the rock toe are oriented in varying directions and layered to create a dense mix of branches and roots, and anchored to partially sunken large boulders (minimum of three feet in diameter) using steel cable. Intermediate clusters are buried in the rock toe and oriented with either the root wad or branches extending from the rock toe. Approximately 390 almond trees were obtained from the M&T Chico Ranch/Llano Seco Rancho for use in the brush revetment.

Revetment removal activities would utilize access and staging areas, equipment and materials, personnel, and project commitments, as generally described for the rock placement in 2007. To support the analysis presented in this Draft EA/IS, a more thorough discussion of specific revetment removal activities is discussed below.

SCHEDULE

The construction period for rock-toe and tree revetment removal activities is estimated to take five weeks. The revetment would be removed during a five week period between July 1 and October 15, which is the in-river work period that has been identified as being protective of fisheries resources in the Sacramento River.

ACCESS AND STAGING

As described in the 2007 EA/IS, trucks and other construction equipment required for removal of the rock-toe and tree revetment would access the project site from CR23, which can be accessed from SR45. A staging area would be established west of the revetment site, which was previously used for the 2007 project and could potentially impact approximately one acre of grassland and woodland habitat.

Since installation of the revetment 2007, The Nature Conservancy (TNC) has acquired ownership, in fee title, of the property immediately south of the USFWS Capay Unit (referred to as the Stile property). According to the Glenn County Assessor's Parcel Map, approximately 245

feet along the southern portion of the revetment is presently located on TNC property. Revetment removal under the No Action Alternative would require access to the southernmost 245 feet of the revetment. Landowner permission was obtained during July 2013 when TNC and the ranches finalized an access agreement to continue to have and maintain the portion of the revetment on TNC property until a long-term solution is developed and completed. Access would be limited to the fee title Stile property only.

EQUIPMENT AND MATERIALS

It is anticipated that removal of the rock would occur from the top of the bank. No equipment would work directly from the water, although the bucket of a dragline would enter the water column to remove materials. Because removal of the bank revetment can be accomplished from the landward side with appropriate equipment, and because no bank grading is anticipated at the site, minimal temporary increases in turbidity would be expected.

Rock and vegetation would be removed from the Sacramento River using a dragline with a 120-foot reach, working along the top of the nearly vertical 15-foot high bank. Excavation activities for removing the buried rock tiebacks would also be conducted with a dragline. Removed material would be dumped on a 20-foot wide working area, and then loaded onto trucks for removal from the site.

Heavy equipment to be used to remove the revetment will include:

- Front End Loader
- End Dump Trucks
- Dragline
- Water Truck
- Grader

PERSONNEL

A base project crew of seven persons would be required throughout most of the construction period. Crew size would peak at about ten persons.

ENVIRONMENTAL COMMITMENTS AND MITIGATION MEASURES

With respect to revetment removal mitigation commitments, the 2007 Final EA/IS for the Temporary Maintenance Project (CDFG and USFWS 2007, page 1-7) stated that *"Additional analyses were provided throughout the document to clarify that potential impacts associated with revetment removal would be less than significant with mitigation incorporated. Specifically, removal of the rock revetment after the five-year planning period would result in impacts similar to those associated with construction of the revetment. Additionally, these impacts would be mitigated in a similar manner to those mitigation measures implemented for construction of the revetment."* Therefore, it is anticipated that standard construction-related impact avoidance and

minimization measures that could be implemented during revetment removal would be similar to those that were described for installation of the revetment in the 2007 Final EA/IS for the Temporary Maintenance Project (CDFG and USFWS 2007).

Recognizing that it is not typically a standard practice to identify mitigation measures for a No Action Alternative, the environmental commitments to implement standard construction-related impact avoidance and minimization measures as part of revetment removal were agreed to and approved by the Lead Agencies in 2007. Therefore, for analytical purposes in this Draft EA/IS, it is assumed that the standard construction-related impact avoidance and minimization measures presented in Section 2.2.3 would apply, if the No Action Alternative described in this Draft EA/IS was selected for implementation by the Lead Agencies. As described above in Section 2.1.2, the revetment would be removed once available funding was secured and appropriate permitting approvals were obtained. Because permitting approvals may require mitigation measures that differ from those identified in the 2007 Temporary Maintenance Project Final EA/IS and those preliminarily considered in this Draft EA/IS, it is assumed that specific mitigation measures needed for revetment removal would be refined as part of the permitting approval process that would occur after funding for revetment removal was secured.

2.2 PROPOSED ACTION/PROJECT

2.2.1 IN-RIVER DREDGING AND SPOILS DISPOSAL OPERATIONS

Dredging of the gravel bar in 2001 and 2007, as described in the 2007 Final EA/IS (CDFG and USFWS 2007), was used as a short-term solution to the sedimentation problems at the M&T/Llano Seco Pumps Facility and the City of Chico's WWTP outfall. Between 1995 and 2001, the gravel bar, which is located on the east bank of the river upstream of the pumping plant migrated about 1,700 feet downstream (Tetra Tech 2010a). Additionally, erosion of approximately 330 feet of the west bank of the Sacramento River occurred between 1996 and 2006, increasing the effective width of the river and permitting the gravel bar to subsequently migrate about 1,000 feet farther downstream between 2006 and 2010. Interim stabilization of the toe of the west bank during the fall of 2007 has prevented further westward migration of the river, but has not prevented downstream bar migration to the point where the focus of deposition is now opposite the pump inlets (Tetra Tech 2010a).

The current sedimentation patterns in the river have resulted in the expansion and downstream migration of the gravel bar. Because the portion of the bar that must be removed during the next dredge cycle to protect the functionality of the pump intakes is inundated at relatively low flows, the "dryland" bar excavation method that included crossing Big Chico Creek in the previous 2001 and 2007 short-term dredging operations are not a viable option. The Proposed Action/Project, therefore, consists of a modified approach to dredging and disposal of spoils material from those presented in the 2007 Final EA/IS (CDFG and USFWS 2007). The

proposed approach for the suction dredging and spoils disposal, which also would likely be utilized for any future dredging operations should they be necessary, is described below.

Dredging would entail removing in-river sedimentation from the Sacramento River to allow parallel sweeping flows at the pumping site in order to maintain the functionality of the pumping facility while continuing to meet NMFS and CDFW fish screen criteria. It is anticipated that up to two dredge cycles (during separate years) could occur, potentially removing up to 100,000 cubic yards of material per dredge cycle, in the area immediately upstream, adjacent to, and downstream of the M&T/Llano Seco Pumps Facility via suction dredge. Due to production capacity constraints associated with suction dredging, the actual amount of material removed may be less than 100,000 cubic yards per dredge cycle. The first dredge cycle is currently proposed for 2014. Specific features associated with the Proposed Action/Project, including locations for dredging, staging and spoils disposal, and rock-toe revetment are included in **Figure 2-1** to show the relative locations of these components.

The removal, transport, and placement of dredged sediments are the primary components of the dredging process (BCDC 1998). It is anticipated that most aspects of the proposed dredging operation would be the same as those described in the 2011 Draft Subsequent IS/MND, with the following exceptions: (1) there would be no anchoring cables extending across the Sacramento River from the dredge barge to D-6 dozers on the shore; and (2) the dredging process would be slower due to reduced production capacity associated with using a smaller dredge.

A cutterhead suction dredge is a commonly used dredging vessel that is equipped with a rotating cutter apparatus surrounding the intake end of a suction pipe. With conventional dredging, the cutterhead and ladder are locked in a fixed position relative to the dredge barge, and dredging is accomplished by anchoring the rear of the barge and moving the front of the barge side to side with swinging cables that are anchored to front-end loader construction equipment on both banks of the river. For the Proposed Action/Project, a swinging ladder suction dredge technique would be used to avoid the need for the typical barge-to-land steel anchor cables. The swinging ladder suction dredge (**Figure 2-2**) is a more recent version of the cutterhead dredge. Similar to a conventional cutterhead, a swinging ladder suction dredge utilizes a rotating cutterhead at the end of the ladder to dislodge sediment for capture by the suction pipe; but instead of using anchors and cables to pivot the suction dredge on spuds, the ladder itself swings on a pivot located on the dredge at the top of the ladder (Palermo et al. 2008). With the proposed swinging ladder suction dredge, the dredge barge is locked in a fixed position with one rear anchor and two front anchors. During active dredging, the ladder and cutterhead are self-propelled and "swing" side to side independent of the barge position.

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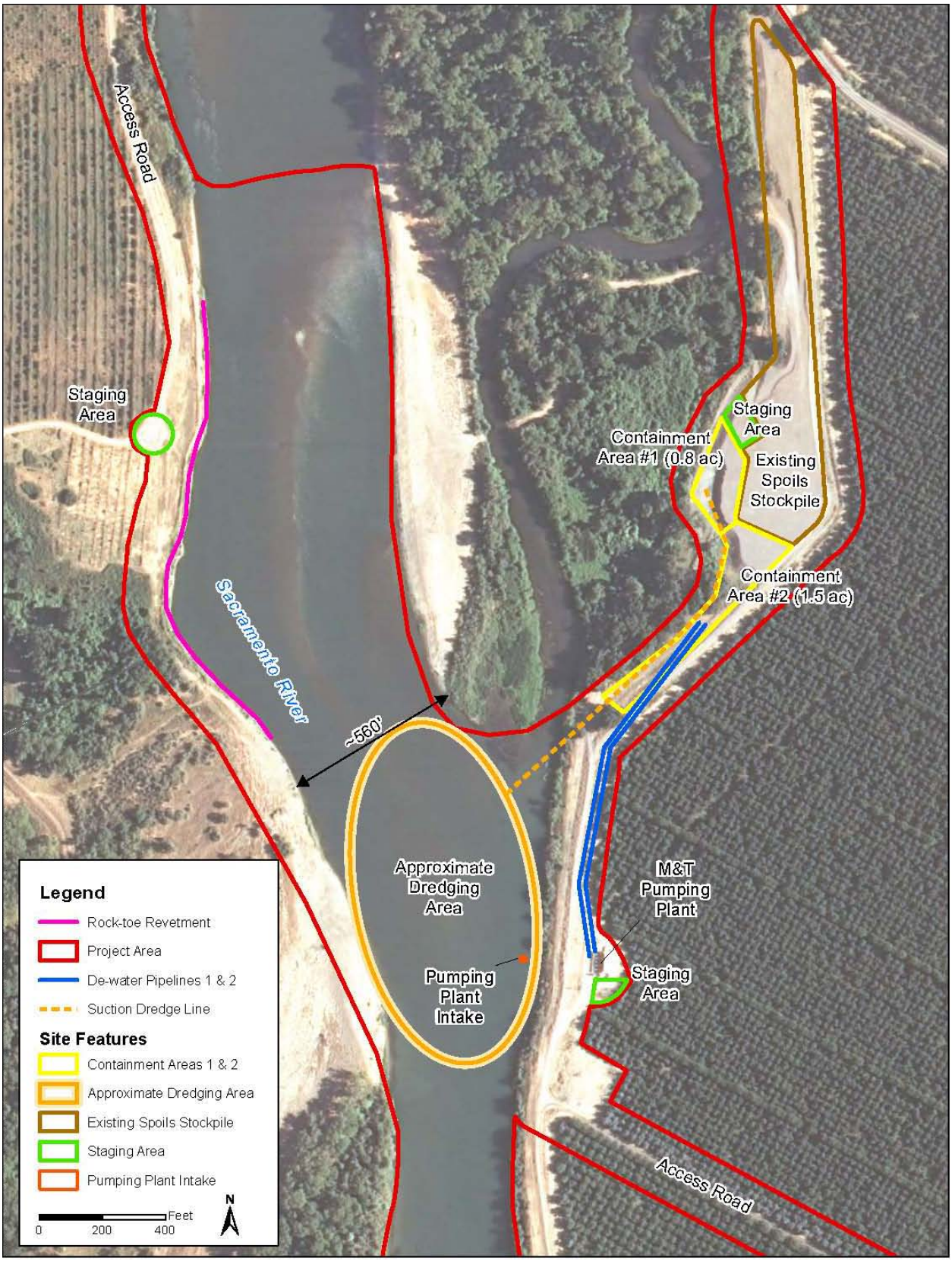

Figure 2-1. Proposed Action/Project Features.

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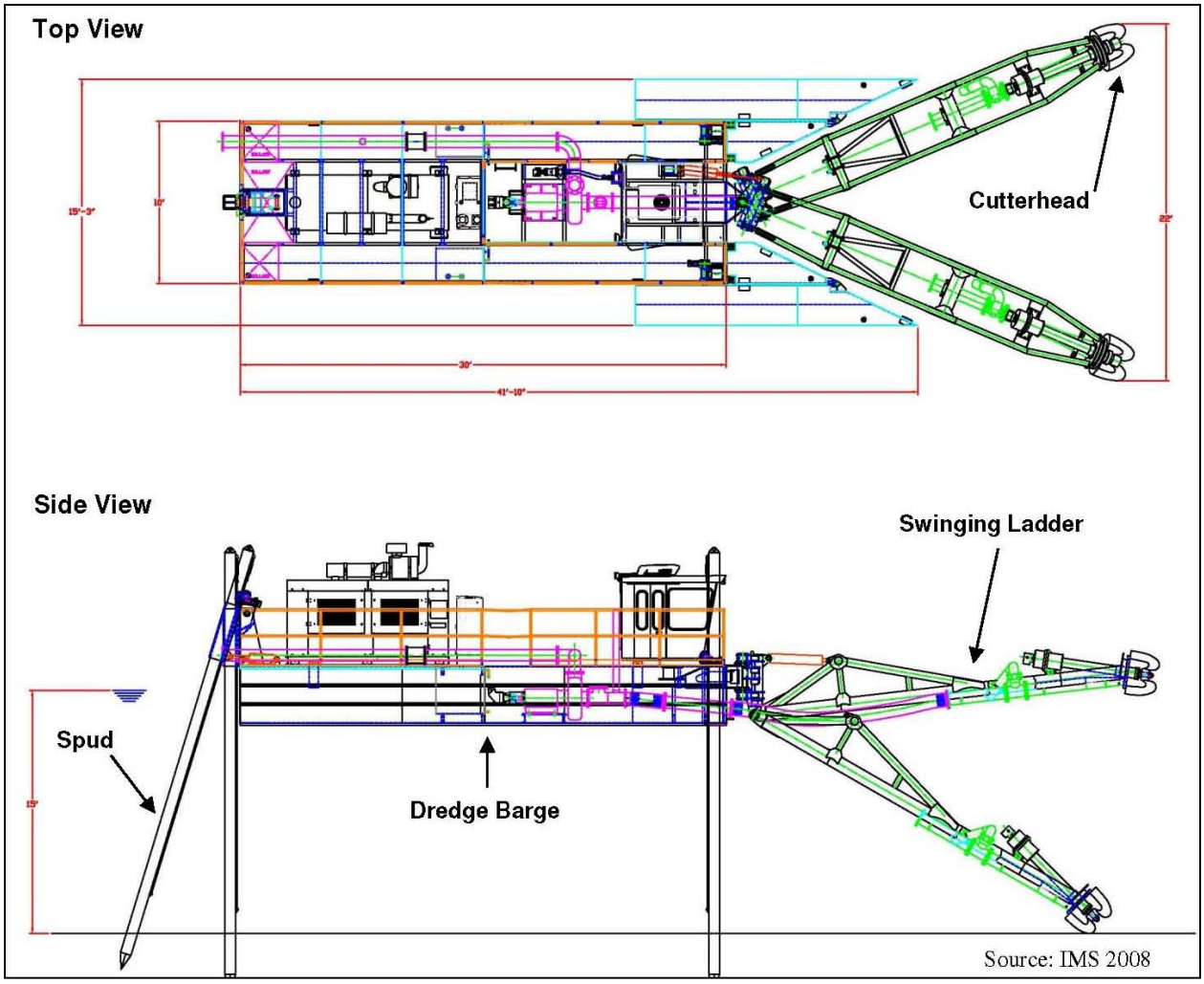

Figure 2-2. Example of a Swinging Ladder Cutterhead Suction Dredge.

Because of its improved ability to work around large debris, more uniform pattern of sediment removal (reduction of zigzag pattern of arcs and windrowing of sediment), and ability to work in confined areas and near navigation, the swinging ladder cutterhead dredge is better matched for environmental dredging than larger conventional cutterhead dredges (Palermo et al. 2008). In addition, some swinging ladder suction dredges have incorporated an articulated ladder that allows the cutterhead to be positioned parallel to the bottom, resulting in closer proximity of the suction head to the cut, which reduces the fallback contribution to generated residuals (Palermo et al. 2008). The cutterhead dredge also operates on an almost continuous cycle while dredging, resulting in maximum economy and efficiency (GlobalSecurity Website, March 25, 2011).

A cutterhead suction dredge has the capability of digging compacted deposits and pumping dredged material long distances to upland disposal areas. A pump produces a vacuum on its intake side, which forces water and sediments (in liquid slurry form) through the suction pipe, and the slurry is transported by pipeline to a disposal area. Slurry concentrations are a function of the suction pipeline inlet velocity, the physical characteristics of the in-situ sediment, and

effective operational controls (Palermo et al. 2008). Slurries of 10 to 20 percent solids (by dry weight) are typical, depending upon the material being dredged, dredging depth, horsepower of dredge pumps, and pumping distance to disposal area (GlobalSecurity Website, March 25, 2011). The dredge pump and dredgehead (e.g., cutterhead) should work in tandem so that the entire volume of sediment comes into the system, while maintaining a slurry concentration that the dredge pump is capable of handling. For hydraulic dredging, resuspension of sediment is generally minimized at the same point that production is optimized. If the rate of operation is slowed or accelerated, the resuspension and release may be increased (Francingues and Thompson 2006 in Palermo et al. 2008).

The pump must impart enough energy to the slurry so that the velocities in the pipeline prevent the solids from settling out in the line prior to reaching the discharge point. A properly designed and operated dredgehead, suction intake and pipe, pump, and discharge pipeline system can reduce sediment resuspension while significantly reducing system maintenance and the likelihood of pump failure (Palermo et al. 2008).

A wide load semi-truck or 18-wheeler will transport the dredge boat to the launch site. The barge will be placed in the river by a crane, either at Scotty's Landing boat ramp located on the east side of the Sacramento River approximately 2 miles upstream of the dredge site, or near the sediment field just upstream of the M&T/Llano Seco Pumps Facility, wherever the water is deepest. The barge is not self-powered and will be directed by two skiff boats to the excavation site. A new, freshly painted barge will be used for the proposed dredging operations, which will avoid the potential transport and spread of aquatic invasive species into the Sacramento River.

The dredge boat is an anchored barge with a basket cutterhead mounted to a ladder positioned at the front of the boat. A suction pipe located within the cutterhead runs from the apparatus, along the ladder, and through the length of the barge. The suction dredge pipeline will extend from the rear of the barge and will float in the river such that it will be visible above the waterline from the barge to the shore on the east bank of the Sacramento River. The portion of the pipeline reaching from the swinging ladder cutterhead to the riverbank will be a flexible flanged system. To support the floating pipeline and increase its visibility, two round orange buoys will be attached to every 40 to 50 feet of pipe. Additionally, it may be necessary for cables (or ropes) to be used to attach the floating pipeline to a stationary anchor, which will be adjacent to the dredge pipe and should not create a separate obstruction in the river. The anchor would rest on the riverbed and would be used to prevent the floating pipeline from moving in front of the dredge barge or downstream with the river current. Additional piping would be added to this portion of the pipeline system as the barge advances. Polyethylene pipe connected to the floating pipe would be placed on the riverbank and would remain stationary, extending from the riverbank to a containment area. Placement of the polyethylene pipe would contain a minimum number of bends to ensure adequate flow of materials, and would be placed to avoid sensitive environmental resources and receptors.

Table 2-2 provides an overview of the approximate dimensions of a swinging ladder cutterhead dredge, barge, and associated equipment. Although slight variations in dredging equipment are possible due to differences in contractor specifications, the information provided in these sections represent the types of equipment that will likely be utilized based upon early consultations with local dredge contractors.

Table 2-2. Swinging Ladder Cutterhead Dredge and Barge Equipment Summary.

Dredge Boat Components	Dimensions
Barge	40 feet long x 20 feet wide x 5 feet deep (main hull)
Cutterhead size (diameter)	36 inch basket
Cutterhead speed	38 – 40 revolutions per minute
Ladder	36 feet long
Suction pipeline	12-inch diameter
Pipeline length	Up to 2,500 feet – 1,500 feet flexible flanged pipeline (from barge to riverbank); 1,000 feet polyethylene pipe (from riverbank to containment area)

The in-river anchoring technique for a swinging ladder cutterhead dredge uses three spuds - two spuds are located on the bow, and one spud on the stern of the dredge barge, all of which are placed into the bottom sediment to hold the dredge in working position and to advance the dredge into the excavation area. During operation, the cutterhead dredge swings from side to side alternately using the port and starboard spuds as a pivot. Once the dredge is set in place, the swinging ladder sweeps an arc in front of the dredge removing sediment through the action of the cutterhead and suction pipe.

Each sweeping arc would result in approximately 9 feet of material removed on either side of the centerline, or approximately 18 feet total width. The material will be excavated to a depth of approximately 20 feet, with about 15 to 16 feet of material removed in 4 to 5 feet of moving water. The swinging ladder cutterhead dredge can work in water as shallow as 3 feet. These conditions should not be problematic in the Sacramento River. If, however, there is not sufficient depth available at the site, then the contractor will need to cut a trench to initiate dredging. Once a sweep is completed, the dredge moves itself ahead a few feet by pushing off its spuds (traveling spud or kicker spud). The dredge then resets its spuds and completes another dredging sweep (Palermo et al. 2008).

Although the swinging ladder cutterhead dredge technique removes boating and navigation hazards associated with anchor cables across the river, it does have limitations associated with production capacity. A conventional cutterhead dredge is larger and would allow a 30-foot sweeping arc on each side of centerline, or a width of about 60 feet per dredging pass. The

swinging ladder cutterhead dredge allows about a 9-foot arc on each side of centerline, or a width of about 18 feet per pass. Consequently, production capacity will be reduced to a third because the width of the area dredged on each pass will be reduced (narrowed) from about 60 feet to 18 feet. The cutterhead dredge is restricted to the length of the ladder, and can move in the river channel about 4 to 5 feet before the anchoring spuds need to be raised and lowered to move the barge for the next dredging segment. The reduction in production capacity is primarily due to the increased amount of time required to move the dredge for each new pass, rather than lost yardage from individual cuts.

Before dredging is initiated, bathymetric data will be used to prioritize the location where the greatest benefit can be achieved (e.g., areas with the greatest volumetric amount of material along the east bank of the river in front of the M&T/Llano Seco Pumps Facility), and dredging operations would then move westward from this location, as time allows within the authorized in-river work window. After completion of the initial pass, the dredge barge will be maneuvered by the skiff boats back to the top of the sediment field of the preceding pass, and the process will be repeated as necessary to cover the width of the gravel deposit. Due to the size of the sedimentation field, it is anticipated that the barge and suction dredge will make more than one pass (likely 10 passes), with each pass beginning at the upstream end of the sediment field and dredging in the downstream direction.

The production rate of in situ sediments dredged during a given period is anticipated to be about 90 cubic yards per hour using a 550 horsepower motor. The 550-horsepower motor will pump approximately 7,000 gallons of water per minute (420,000 gallons per hour) with enough force to mobilize and pump coarse material through 12-inch polyethylene pipeline with a minimum number of bends to a containment area located approximately 1,600 to 2,500 feet away (note that the distance to the containment area varies based upon where in the sediment field the measurement is taken [i.e., upstream end or downstream end]).

In-river operations would involve two motorized work boats. One skiff boat would advance the non-motorized dredge barge to the next section in the river, and one work boat would be used to support general operations. Refueling the dredge equipment will occur once per day using a skiff boat to transfer approximately 120 gallons of fuel to the barge. Appropriate spill prevention measures will be applied (e.g., use of absorbent pads, etc) to minimize and reduce any potential accidental fuel discharges into the river. As a precautionary measure to avoid the potential transport and spread of aquatic invasive species, each of the two work boats will be high-pressure washed and steam-cleaned prior to entering the Sacramento River, and will be re-washed and steam-cleaned when the boats are removed from the river after dredging operations are completed.

To support a safe dredge operation, signage and warning buoys would be placed both upriver and downriver from the active dredge area notifying boaters, fishermen and other water users of the dredge operation. The barge, flexible pipe, and auxiliary boats would be anchored and sufficiently illuminated (via solar or battery power) during non-daylight hours to maintain high

visibility for boaters and other water users. A light plant with a self-contained generator also would be on shore, focusing light on the dredge barge. In addition, a night watchman would remain at the project site during non-working hours to respond to any unanticipated issues. Dredging operations (e.g., set-up, in-river dredging, moving equipment, dewatering and conveying spoils material to the stockpile) would be conducted about 12 hours per day, seven days per week.

In addition to the dredging site within the Sacramento River, equipment staging and access areas will be necessary. Two areas will be utilized for material staging and assembly of the dredge pipeline system on the east bank of the river, including a gravel parking lot at the M&T/Llano Seco Pumps Facility and an area within the vicinity of the existing spoils location. These staging areas are shown in Figure 2-1.

The excavated material will be pumped to confined containment areas located upland from the dredge site and approximately 1,500 feet to the east on the M&T Ranch property. Two previous gravel bar extractions from the Sacramento River have occurred, one in 2001 and the other in 2007, resulting in approximately 300,000 tons of materials being stockpiled at this existing spoils area. Although the spoils disposal areas are located within the floodplain of the river, the storage site is not anticipated to significantly alter floodplain capacity, as described in Section 3.6 – Hydrology and Water Quality.

Two containment areas, bounded by a 6-foot high berm along the west side of the existing stockpile, will be established within the area of the spoils disposal, just outside of the drip line of the existing trees (see Figure 2-1). Containment Area #1 is approximately 0.80 acre with a berm length of 75 feet. A Briggs Box Weir, or broad crested weir, will be placed in an embankment at the downstream end of Containment Area #1 for overflow into Containment Area #2. Containment Area #2 is approximately 1.5 acres with a berm length of 720 feet. Containment Area #1 will receive the dredge spoils pumped directly from the river and Containment Area #2 will be available for overflow and serve as a siltation and settling pond area. Both containment areas will be fully enclosed so that no water discharged from the dredge spoils will re-enter the river.

Once the spoils have been pumped into Containment Area #1, a bulldozer will push the materials into a trap belt loader. The spoils will be transported by conveyor belt to the top of the existing stockpile. The bulldozer will alternate between uses and will also be utilized to spread the gravel material at the top of the stockpile. The bulldozer and trap belt loader will operate throughout the duration of the project. Although dependent upon the amount and rate of material extracted from the river and transferred to Containment Area #1, the trap belt loader and bulldozer are anticipated to operate approximately 4 to 6 hours per day due to the larger capacity of the moving and spreading equipment. It is anticipated that the majority of the gravel materials will be added to the existing stockpile at the end of the project, with some portion of the dredged material remaining in Containment Area #1.

In the event that the water in Containment Area #2 exceeds the rate of absorption into the ground, two suction/pressure pumps (commonly used for irrigation) will be used to pump the excess water from Containment Area #2 through approximately 1,100 feet of aluminum pipeline along an access road on the M&T Ranch property to a stilling well at the M&T/Llano Seco Pumps Facility. The pumping plant will deliver the excess water to M&T Chico Ranch rice fields for decomposition and to the existing wetland system on the Llano Seco Rancho and the Llano Seco Unit of the SRNWR. Water routed from Containment Area #2 to the M&T/Llano Seco Pumps Facility will not cause the pumping plant diversions to increase above permitted capacities.

The existing stockpile located on the M&T Chico Ranch property was created as the result of two previous Sacramento River gravel excavations, which were conducted in 2001 and 2007 as a short-term solution to limit sedimentation impacts. There is currently insufficient room to expand the existing stockpile. As a result, it would be necessary to elevate any new spoils material with a conveyor and spread it on top of the existing stockpile.

According to Tetra Tech (2010), the area of the existing stockpile is about 10 acres. As an upper bookend for impact assessment purposes, it is assumed that if the upper maximum volume of material (i.e., up to 200,000 cubic yards) were uniformly distributed over an 8-acre area, the height of the stockpile could be increased by up to 15 feet. However, because some areas near the center and the north end of the stockpile are lower than others, a more reasonable estimate assumes that the height of the area could be increased between 10 to 15 feet.

Recognizing the uncertainties regarding the amount and location of material in the Sacramento River, as well as production capacity limitations associated with the swinging ladder dredging technique, the actual quantity of material to be removed from the river and placed on the stockpile will most likely be less than the values indicated. Nevertheless, the information presented herein is provided to demonstrate that sufficient capacity exists at the stockpile to support the dredging component of the Proposed Action/Project.

A summary of the regulatory approvals received for the 2001 and 2007 projects is provided below to demonstrate that the two previously conducted gravel excavations that contributed to the presence of the existing stockpile were conducted in a legal manner and complied with all necessary federal, state and local regulatory compliance requirements.

In 2001, the M&T Ranch/Llano Seco Ranch/City of Chico Sacramento River Water Intake Stream Channel Maintenance Project was implemented following completion of the CEQA public review and approval process (IS/MND, SCH#2001092072) and various permitting approvals, including but not limited to: (1) August 22, 2001 Butte County letter stating that no County permits were required for the removal of the gravel from the Sacramento River; (2) September 27, 2001 Reclamation Board letter of approval; (3) October 16, 2001 USFWS Biological Opinion; (4) October 22, 2001 CSLC letter stating the project does not need to obtain a dredging lease provided that permits are obtained from the local reclamation district, State Reclamation Board, USACE, or DWR.; (5) USACE Section 404 letter of permission; (6) State

Historical Preservation Office Section 106 compliance; (7) RWQCB Section 401 Water Quality Certification, NPDES Permit; (8) CDFG Agreement Regarding Proposed Stream Alteration; and (9) NMFS Section 7 ESA Consultation and Magnuson-Stevens Act Consultation.

In 2007, the M&T Ranch/Llano Seco Rancho Pumping Plant Maintenance of Channel Alignment River Mile 192.5 Project was implemented following the completion of the NEPA and CEQA public review and approval processes (EA/IS and FONSI/MND, SCH#200782036) and various permitting approvals, including but not limited to: (1) September 7, 2007 CSLC letter stating the project does not need to obtain a lease provided that permits are obtained from the local reclamation district, State Reclamation Board, USACE, or DWR; (2) September 27, 2007 USFWS cultural resource compliance letter; (3) RWQCB Section 401 Water Quality Certification dated October 19, 2007; (4) Reclamation Board Permit No. 18285GM dated October 22, 2007; (5) USFWS Special Use Permit dated October 22, 2007; (6) California Department of Parks and Recreation Right of Entry Permit dated October 22, 2007; (7) CDFG Agreement Regarding Proposed Stream Alteration dated October 18, 2007; (8) USACE Section 404 letter of permission dated October 18, 2007; (9) USFWS Section 7 ESA Consultation letter of concurrence dated July 19, 2007; and (10) NMFS Biological Opinion dated October 2, 2007.

Since the previous dry-land excavations (that involved heavy equipment accessing the excavation site from the shore) in 2001 and 2007, the sedimentation patterns in the river have changed and future removal of the material is no longer feasible as a dry-land excavation. A hydraulic suction dredge would be required to effectively remove the encroaching subsurface material from the bed of the Sacramento River, which is considered sovereign lands of the State of California.

In 1850, the State of California acquired sovereign ownership of all tidelands and submerged lands and beds of navigable waterways upon its admission to the United States. The State holds these lands for the benefit of all people of the State for statewide Public Trust purposes, which include waterborne commerce, navigation, fisheries, water-related recreation, habitat preservation and open space. On navigable non-tidal waterways, the State holds fee ownership of the bed landward to the ordinary low water mark and a Public Trust easement landward to the ordinary high water mark, as they last naturally existed. The State's sovereign interests are under the jurisdiction of the CSLC. For the Proposed Project, it is anticipated that a State dredging lease would be issued by the CSLC.

2.2.1.1 DREDGING CONSTRUCTION SCHEDULE AND CHARACTERISTICS

SCHEDULE

The entire dredging operation is anticipated to occur over a 137-day work period. It is anticipated that approximately 17 days would be necessary to mobilize, set up, and prepare the staging and containment areas. Additionally, approximately 13 days would be necessary to demobilize, remove equipment and materials, and grade the containment areas. Based upon equipment

capacity, it is anticipated that the in-river work period would require about 107 days of dredging, occurring for 10 hours per day, 7 days per week. Equipment maintenance and non-dredging work would be performed about 2 hours each day, such that crews will be working 12-hour days. Although not anticipated, it is possible that unforeseen adverse conditions (e.g., high or low flows, weather) or equipment failures could occur. Therefore, the in-river work period for the suction dredging would be 107 days, extending from July 1 through October 15. The entire dredging component (i.e., equipment mobilization and site set up, dredging, spoils disposal, and demobilization) of the Proposed Action/Project would be implemented during the 137-day period between June 14 and October 28.

ACCESS AND STAGING

The construction footprint for dredging-related activities is anticipated to include: (1) the area of the existing stockpile; (2) access and staging areas (pullout areas, loading and unloading areas, equipment storage); (3) areas along the Sacramento River from the point of dredge (and skiff boat) launching and navigation to the dredging location; (4) the in-river area upstream of the M&T/Llano Seco Pumps Facility where the dredging would occur; and (5) the in-river area immediately downstream of the dredging area, which would be subject to short-term disturbance effects associated with dredging operations.

Roadway access to the dredging and spoils stockpile area would occur via River Road, near the River Road crossing over Big Chico Creek.

Construction locations for the project elements are shown above in Figure 2-1.

EQUIPMENT AND MATERIALS

Reconnaissance level surveys were conducted by Robertson-Bryan, Inc. (RBI) to identify sensitive terrestrial species including nesting raptors, vegetation habitat communities, and potential habitat for giant garter snake during June of 2012. A Valley Elderberry Longhorn Beetle (VELB) habitat survey also was conducted by RBI during June of 2012 (see Section 3.4). To determine whether botanical species identified from the California Natural Diversity Database (CNDDB) and the California Native Plant Society (CNPS) as having the potential to occur in the area are present in the Action/Project Area, a pre-construction floristic survey is planned during the spring of 2014[3]. Bathymetric surveys will be conducted prior to in-river work to confirm the estimates of the location and amount of material to be dredged.

Heavy equipment to be used during construction for the dredging and spoils removal components of the project will include:

[3] Because the current funding mechanism for the proposed project does not include provisions for a 2014 pre-construction floristic survey, it is anticipated that additional funding would need to be secured as part of the bid contract that is prepared to address project implementation activities, subject to Lead Agency approval of the project.

- Crane
- Swinging Ladder Cutterhead Dredge Barge
- Skiff Boats (two)
- Bulldozer
- Trap Belt Loader
- Irrigation Pump (two)
- Light Plant with Self-Contained Generator
- Electrical Powered Plastic Pipe Welder

Other equipment may include standard construction materials, polyethylene and aluminum piping, work pickup trucks, and crew vehicles.

PERSONNEL

The dredging crew would be composed of four workers:

- Two full-time deckhands manning the suction dredge (one leverman and one deckhand), including coordinating with boat traffic
- One supervisor/operator and one operator running the bulldozer, excavator, and trap belt loader at the spoils disposal site

All other activities (placing pipeline as the dredge moves downstream and removing pipeline at the end of each pass through the sediment field, welding pipeline together, etc) would be managed by the four crew members described above.

2.2.2 ROCK-TOE AND TREE REVETMENT MONITORING AND MAINTENANCE

During October 2007, a temporary bank protection consisting of approximately 1,520 linear feet of rock-toe and tree/brush revetment was constructed on the west bank of the Sacramento River on the USFWS Capay Unit of the SRNWR system and the Stile Property. The purpose of the revetment was to prevent further bank erosion and river migration, thereby preserving options for long-term solutions to the ongoing gravel deposition and river meander affecting the M&T/Llano Seco Pumps Facility.

The top of the revetment was set an elevation of about 119 feet, corresponding to the water surface elevation at a discharge of approximately 15,000 cfs, which has a 42-percent exceedence on the mean daily flow-duration curve at the Hamilton City gage, located about 7 miles upstream (Tetra Tech 2010a). The entire structure, including the trees and brush, was designed to be inundated at the 25 percent exceedance flow (24,840 cfs and an elevation of 123 feet msl) that has average winter duration of 23 days (pers. comm., Harvey 2006). Based on its design, it was expected that the intermediate tree clusters would be completely inundated more than 42 percent of the time, and would be partially inundated substantially more frequently, thus providing

velocity refuges and rearing habitat at flows that would occur during most anadromous salmonid outmigration periods. The stone toe was designed to have a 1:10 cross grade, which places the outboard portion of the toe at a slightly lower elevation than the inboard elevation. Advantages of this design included the creation of Shaded Riverine Aquatic (SRA) habitat at some flows and decreased likelihood of stranding fish when high flows recede. The addition of woody material to the top and within the revetment also provided an element of self-mitigation for loss of Essential Fish Habitat (EFH) and SRA habitat.

The lifespan of the temporary solution was intended to be five years while planning for the long-term project occurred. It was anticipated that the bank revetment would be removed after the five-year planning period or incorporated into the long-term solution. While the process for developing and analyzing a long-term solution to address the ongoing gravel deposition and river meander affecting the M&T/Llano Seco Pumps Facility is ongoing, continued interim measures are necessary to address the immediate concerns regarding fish screen operability as well as to maintain the viability of a range of alternatives under consideration for the long-term solution.

The Proposed Action/Project includes thecontinued presence of the revetment installed during the fall of 2007, as well as any required maintenance activities while the revetment is in place until the long-term solution is completed.

Because the revetment was designed as an interim and temporary measure, there was an expectation that some maintenance would be required. This component of the Proposed Action/Project would extend monitoring and maintenance activities[4] until a long-term solution is developed and completed. Specifically, the types of maintenance would include: (1) inspecting for movement of revetment due to slippage of the underlying bank, and making repairs to stabilize the area; (2) repairing areas of localized scour and erosion, particularly in the toe zone, by adding rock and other materials; (3) dispersing large build-ups of debris to eliminate eddy currents; and (4) re-anchoring or replacing woody material and brush structures if they become rotted, disintegrated, or washed out due to high flow events. If flanking or some other catastrophic failure were to occur, the revetment would not be reconstructed as part of the commitments under the Proposed Action/Project. If a mass failure occurred during the interim period while a long-term solution is being developed, no immediate action would be taken and reconstruction of the revetment would be considered as part of the long-term solution, or would require preparation of separate, independent environmental documentation (including compliance with all relevant legal requirements, such as NEPA, CEQA and ESA, among others).

[4] To ensure that adequate funding is available to implement measures required to minimize and fully mitigate potential project-related impacts to CESA-listed species, including funding for compliance and effectiveness monitoring, it is anticipated that funding for continued monitoring and revetment maintenance activities would need to be secured as part of the bid contract for project implementation activities, which are subject to project approval.

If the future long-term project incorporates the revetment, then the potential effects of a permanent revetment and associated mitigation measures will be included in the separate environmental review conducted for the long-term project.

Replacement of the rock or brush, as needed, on the revetment would utilize access and staging areas, equipment and materials, personnel, and project commitments consistent with the activities and actions described in the 2007 Final EA/IS (CDFG and USFWS 2007).

Prior to implementing any construction-related maintenance activities, biological pre-construction surveys will be conducted to determine if sensitive species are present in the project area. Additional surveys or monitoring may be conducted if special-status species are found prior to construction.

A description of the potential effects associated with the rock-toe and tree revetment remaining in place until a long-term solution is completed is provided in the resource discussions in Chapter 3.0. The anticipated maintenance activities and approaches for implementing those activities are described below.

2.2.2.1 REVETMENT MONITORING AND MAINTENANCE SCHEDULE

The rock-toe and tree revetment is anticipated to remain in the river until evaluation of a long-term solution to the ongoing sedimentation and retreat of the west bank of the Sacramento River affecting the M&T/Llano Seco Pumps Facility can be completed. When the long-term solution is completed, the revetment will either be removed or incorporated as part of the long-term solution.

Monitoring conducted, to date, indicates that the revetment is performing as designed. Since construction, the revetment has experienced peak flows of 56,000 cfs (January 26, 2008), 43,000 cfs (February 17, 2009) and 64,000 cfs (January 26, 2010) (Tetra Tech 2010a). In response to the revetment being subject to peak flows of up to 64,000 cfs in the Sacramento River, a survey was conducted during April of 2010 to evaluate the condition of the revetment and to determine whether maintenance activities would be required. Based on surveyor observations, it was determined that no immediate maintenance was required, although additional surveys following the 2010/2011 winter high flow period were recommended. An inspection during November 2011 following a range of peak flows up to 102,500 cfs, the highest discharge experienced since construction determined that there were no immediate requirements for maintenance of the site (Tetra Tech 2012a). Based on this inspection, there was no evidence of either accelerated erosion of the upper bank or damage to the revetment itself, and both the upstream and downstream transitions into and from the revetment show no signs of substantial erosion (Tetra Tech 2012). Considerable numbers of volunteer riparian plants have established onto both the top of the rock-toe revetment and the reduced-angle lower bank slope above the contact with the revetment, and there does not appear to have been any loss of large woody debris from the structure. Based on the field observations, it appears that the toe rock revetment is performing well and continues to

maintain the current river alignment (Tetra Tech 2012a). Based on these inspections, maintenance activities associated with the revetment are not anticipated to occur frequently.

Future inspection of the site should be done when flows are in the range of 6,000 to 8,000 cfs so that the outboard side of the revetment can be observed (Tetra Tech 2010a). If maintenance repairs become necessary, it is estimated that construction work would be completed within one week. In-river work activities associated with revetment maintenance would be conducted between July 1 through October 15.

ACCESS AND STAGING

Access to the revetment site for maintenance activities would occur via an unnamed road, on USFWS property, that begins at the terminus of County Road 23, south of Hamilton City in Glenn County, California. Placement of material to maintain the revetment would utilize access and staging areas presented in Figure 2-1.

As previously discussed, approximately 245 feet along the southern portion of the revetment is presently located on TNC property. Landowner permission was obtained during July 2013 when TNC and the ranches finalized an access agreement to continue to have and maintain the portion of the revetment on TNC property until a long-term solution is developed and completed. Access would be limited to the fee title Stile property only.

EQUIPMENT AND MATERIALS

If maintenance-related repairs are required, work would be conducted in a manner that would return the rock-toe and tree revetment to the condition in which it was originally designed and constructed. Therefore, it is anticipated that equipment and materials that would be needed to conduct maintenance-related repairs would be similar to those that were described for revetment installation in the 2007 EA/IS (CDFG and USFWS 2007). If necessary for maintenance purposes, rock for the toe protection would be placed with large construction equipment such as dragline or other appropriate machinery. Trees and brush would be placed in the revetment area utilizing appropriate machinery. For additional details regarding implementation, mitigation and monitoring responsibilities associated with maintenance-related repairs, and funding commitments, please see Appendix I – Draft Mitigation, Monitoring and Reporting Program. Additional sources of funding and specific identification of parties responsible for carrying out these commitments may occur at the time a construction bid contract is circulated. Funding will be secured and a contractor selected prior to implementation of any on the ground actions.

Heavy equipment to be used during construction associated with revetment maintenance will include:

- Front End Loader
- End Dump Truck
- Dragline

- Water Truck
- Grader

PERSONNEL

A base project crew of four persons would be required throughout most of the construction period. Although the number of personnel would depend on the magnitude and extent of maintenance that would be required, for planning purposes, it is anticipated that crew size would peak at up to six persons.

2.2.3 ENVIRONMENTAL COMMITMENTS AND MITIGATION MEASURES

The environmental commitments (e.g., Best Management Practices [BMPs]) and mitigation measures that would avoid or minimize potential resource-specific impacts associated with the Proposed Action/Project are described below and are presented in the Mitigation, Monitoring, and Reporting Plan (MMRP) (**Appendix I**). These measures have been incorporated into the Proposed Action/Project to reduce impacts of the project to a less than significant level.

The following actions (organized by resource topic) would be implemented as part of the Proposed Action/Project to minimize and avoid the potential for adverse environmental impacts.

Air Quality and Greenhouse Gas Emissions

To the extent feasible, standard mitigation measures and best available mitigation and management practices described in the Butte County Air Quality Management District's *CEQA Air Quality Handbook Guidelines for Assessing Air Quality Impacts for Projects Subject to CEQA Review* (BCAQMD 2008) would be implemented by the construction contractor to minimize carbon emissions and reduce impacts to air quality and GHG emissions to a less than significant level. Minimization measures may include the following.

Environmental Commitment AQ-1*: Reduce potential air quality impacts by implementing standard minimization and mitigation measures, and best available construction management practices.*

The following standard mitigation measures would be implemented as part of the project to ensure minimization of impacts on air quality.

- Maintain all construction equipment in proper tune according to manufacturer's specifications.
- Maximize to the extent feasible, the use of diesel construction equipment meeting the CARB's 1996 or newer certification standard for off-road heavy-duty diesel engines.
- Use electric equipment where feasible.
- Substitute gasoline-powered for diesel-powered equipment, where feasible.

- Require that emissions from all off-road diesel-powered equipment used on the project site not exceed 40 percent opacity for more than 3 minutes in any one hour.
- Minimize the amount of disturbed area and the amount of materials actively worked.

Additional review of BCAQMD guidelines regarding BAMMs identified one additional measure that the Proposed Action/Project is capable of implementing.

- A Vehicle Idling Policy will be implement to restrict unnecessary vehicle idling to 5 minutes.

Environmental Commitment AQ-2*: Prepare and implement a dust control plan.*

A dust control plan identifies the fugitive dust sources at the construction site and describes the dust control measures to be implemented before, during, and after any dust generating activity for the duration of the Proposed Project. The following environmental commitments would be implemented to minimize ozone precursor impacts on air quality.

- Haul vehicles transporting rock into or out of the area will be covered.
- A water truck will be present on site at all times to water non-paved roadways in order to minimize dust and other particulate matter. Active construction areas will be watered at least twice daily. The frequency of watering should be based on the type of operation, soil, and wind exposure.
- Water will be applied as needed prior to any land clearing or earth movement to minimize dust emission. All visibly dry disturbed soil surface areas of operation shall be watered to minimize dust emission. Water shall be applied to disturbed areas a minimum of 2 times per day or more, as necessary.
- Vehicles entering or exiting a construction area shall travel at a speed that minimizes dust emissions.
- Limit the speed of on-site vehicles to 15 mph on unpaved roads.
- Suspend grading, earth moving, or excavation activities when winds exceed 20 mph.
- Construction workers shall park in designated parking areas(s) to help reduce dust emissions.
- Post a publicly visible sign with the telephone number and person to contact regarding dust complaints. This person shall respond and take corrective action within 24 hours. The telephone number of the BCAQMD also will be visible to ensure compliance with BCAQMD Rule 200 and 205 (*Nuisance and Fugitive Dust Emissions*).

Mitigation Measure AQ-1*: Prepare an Air Quality Control Plan to reduce NO_x emissions.*

Because potentially significant air quality impacts related to NO_x emissions have been identified, mitigation measures will be implemented to reduce NO_x emissions when GCAPCD and

BCAQMD thresholds are exceeded. Projects that exceed a BCAQMD Level B threshold (i.e., > 25 lbs per day of NO_x) should be submitted to the BCAQMD for review (BCAQMD 2008). Therefore, the contractor will provide a plan for review and approval by GCAPCD and BCAPCD and the Lead Agencies demonstrating that construction activities will not exceed 25 lbs/day of NO_x. The plan also will demonstrate that the heavy-duty (equal to or greater than 50 horsepower) off-road equipment to be used during construction, including owned, leased and subcontractor vehicles, will achieve a project-wide fleet-average 20 percent NO_x reduction compared to the most recent CARB fleet average at time of construction. To reduce NO_x emissions for the Proposed Action/Project, the contractor may employ one or more of the following measures:

- Require injection timing retard of 2 degrees on all diesel vehicles, where applicable.
- Install high-pressure injectors on all vehicles, where feasible.
- Encourage the use of reformulated diesel fuel.
- Electrify equipment, where feasible.
- Maintain equipment in tune with manufacturer's specifications.
- Install catalytic converters on gasoline-powered equipment.
- Substitute gasoline-powered for diesel-powered equipment where feasible.
- Use compressed natural gas or on-site propane mobile equipment instead of diesel-powered equipment, where feasible.

The contractor will submit to the Lead Agencies and all relevant air quality management districts a comprehensive inventory of all off-road construction equipment equal to or greater than 50 horsepower that will be used an aggregate of 40 or more hours during any portion of the construction project. The inventory shall include the horsepower rating, engine production year, and projected hours of use or fuel throughput for each piece of equipment. At least 48 hours prior to the use of subject heavy-duty off-road equipment, the contractor shall provide the relevant air quality management districts with the anticipated construction timeline, including start date and the name and phone number of the project manager and on-site foreman.

Acceptable options for reducing emissions also may include use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, aftertreatment products, provide funds for air district offsite mitigation projects, and/or other options as they become available. The GCAPCD and GCAQMD will be contacted to discuss plan details and potential alternative measures, if necessary.

Environmental Commitment GHG-1*: Reduce potential GHG impacts by implementing standard BMPs for reducing GHG emissions.*

Although BCAQMD (2008) does not identify specific measures for reducing GHG emissions, the measures below are considered BMPs that provide options for reducing GHG emissions from construction projects (SMAQMD 2010).

- ❑ Improve fuel efficiency from construction equipment:
  - Minimize idling time either by shutting equipment off when not in use or reducing the time of idling to no more than 3 minutes (5 minute limit is required by the State airborne toxics control measure [Title 13, sections 2449(d)(3) and 2485 of the California Code of Regulations]). Provide clear signage that posts this requirement for workers at the entrances to the site.
  - Maintain all construction equipment in proper working condition according to manufacturer's specifications. The equipment must be checked by a certified mechanic and determined to be running in proper condition before it is operated.
  - Train equipment operators in proper use of equipment.
  - Use the proper size of equipment for the job.
  - Use equipment with new technologies (repowered engines, electric drive trains).
- ❑ Perform on-site material hauling with trucks equipped with on-road engines (if determined to be less emissive than the off-road engines).
- ❑ Use alternative fuels for generators at construction sites such as propane or solar, or use electrical power.
- ❑ Use a CARB approved low carbon fuel for construction equipment (NOx emissions from the use of low carbon fuel must be reviewed and increases mitigated.)
- ❑ Use locally sourced materials for construction materials (goal of at least 20% based on costs for building materials)
- ❑ Develop a plan to efficiently use water for adequate dust control.
- ❑ Encourage and provide carpools or shuttle vans for construction worker commutes.

Hydrology and Water Quality

The BMPs and the environmental commitments identified to address potential project effects on hydrology and water quality will be based on the measures described below. Standard water pollution prevention measures, including erosion and sediment control measures, proper maintenance of equipment and storage of materials, proper control of non-stormwater discharges, and hazardous spill prevention and response measures would be implemented as part of the Proposed Action/Project. The measures below, together with BMPs and other protective

measures incorporated into the project description, are adequate to avoid potentially significant effects under both NEPA and CEQA.

To the extent that they would apply to alternative-specific actions, the measures identified below would be implemented for both the Proposed Action/Project and the No Action Alternative. By implementing best management practices and the environmental commitments described below, potential impacts to hydrology and water quality would be less than significant.

Environmental Commitment WQ-1: *(1) Obtain appropriate NPDES Permit and Water Quality Certification; and (2) comply with the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities by Preparing and Implementing a Stormwater Pollution Prevention Plan.*

The Construction General Permit requires that all stormwater discharges associated with construction activity, where clearing, grading, and excavation results in soil disturbance of at least 1 acre of total land area, by law must comply with the provisions of an NPDES Permit and develop and implement and effective SWPPP (Caltrans 2003). Because both the Proposed Action/Project and the No Action Alternative would involve construction activities affecting more than one acre, it is anticipated that coverage would be obtained through the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Construction General Permit Order 2009-0009-DWQ), consistent with the terms of the NPDES Permit obtained for the 2007 project. The Construction General Permit requires the development and implementation of a SWPPP, which must list BMPs and the placement of those BMPs, that will be used to protect stormwater runoff (SWRCB 2013).

BMPs will include but are not limited to:

- Implementing the terms and conditions of the CWA Section 401 Water Quality Certification, including a ECP, PCSWMP, SWPPP, and a Hazardous Materials Control, Spill Prevention, and Response Plan (HMCSPRP) to prevent any substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses, as well as to minimize turbidity levels and suspension of sediments;
- Establishing and implementing a HMCSPRP before project construction that includes strict on-site handling rules to keep construction and maintenance materials out of drainage and waterways;
- Training all construction personnel in the proper use and cleanup of potentially hazardous materials;
- Notifying CDFW and the Central Valley RWQCB immediately of spills and cleanup procedures, and cleaning up all spills immediately according to the HMCSPRP, and
- Providing staging and storage areas for equipment, materials, fuels, lubricants, solvents, and other possible contaminants away from watercourses and their watersheds.

The SWPPP will be provided prior to the onset of construction activities, and will be implemented as required by the conditions of a NPDES permit.

Environmental Commitment WQ-2: *Prepare and Implement an Erosion Control Plan and a Post-Construction Stormwater Management Plan.*

Implementing an Erosion Control Plan (ECP) and Post-construction Stormwater Management Plan (PCSWMP) will help to prevent any substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses, as well as to minimize turbidity levels and suspension of sediments. Consistent with mitigation requirements for the 2007 Temporary Maintenance Project, it is anticipated that an ECP and PCSWMP will be prepared and implemented for the Proposed Project.

According to Butte County (2005) requirements for preparing an ECP, the plan must be prepared by a qualified professional with experience in the field of erosion and sediment control that has the ability to certify based on a professional license or registration issued in the State of California that the erosion control plan is suitable for proposed construction and that when completed, the construction was in accordance with the erosion and sediment control plans (Butte County 2005).

The ECP shall include both temporary (first year) and permanent erosion control protection measures that prevent sediment and other pollutant discharges from reaching watershed drainages and streams. In the event that the ECP fails to adequately prevent sediment from leaving the site, the qualified professional will be contacted to immediately correct and/or repair the deficiencies (Butte County 2005).

Erosion and sediment control requirements may include, but are not limited to, the following.

- Hydroseeding mixtures shall conform to the Federal Seed Act, the Federal Noxious Weed Act, and applicable state and local seed and noxious weed laws. Seed mixtures will be determined by CDFW and USFWS biologists, using appropriate native species collected from local ecotypes.
- Use hydroseeding in conjunction with straw mulch, and state the application rate per seed mixture in the ECP. Supplemental irrigation may be required during dry periods.
- Hydroseeding can be applied prior to straw mulch or in a mixture of fiber, seed, etc. Application prior to straw mulch ensures maximum direct contact of the seeds to the soil. If seed is applied in a mixture, increase the seed rate to compensate for all seeds not having direct contact with the soil.
- Roughen embankments and fill rills before placing straw mulch by rolling with a crimping or punching type roller or by track walking. Apply straw at a minimum rate of 4,000 lb/acre, either by machine or by hand distribution, and evenly distribute straw mulch on the soil surface.

- Avoid use of hydroseeding in areas where it would be incompatible with future earthwork activities and would have to be removed.
- Follow up application shall be made as needed to cover weak spots and to maintain adequate soil protection.
- Avoid over spray onto roads, sidewalks, drainage channels and existing vegetation.
- Use fiber rolls that are a minimum of 8 inches in diameter, and locate them on level contours according to appropriate slope inclination requirements.
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll. If more than one fiber roll is placed in a row, the rolls shall be abutted securely to one another to provide a tight joint.
- Fiber rolls typically remain in place. If fiber rolls are removed, the contractor should collect and dispose of sediment accumulation, and fill and compact holes, trenches, depressions or any other ground disturbance to blend with adjacent ground.

With respect to revetment maintenance, the specific combination of erosion control measures to be implemented will be dependent on the location, type and extent of maintenance that may be required. Post-construction inspection and maintenance requirements include, but are not limited to the following.

- Inspect erosion control applications prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Areas where erosion is evident shall be repaired, and straw mulch and hydroseed shall be re-applied as soon as possible. Reapplication of straw mulch and tackifier may be required to maintain effective soil stabilization over disturbed areas and slopes. A tackifier is typically applied at a rate of 125 lb per acre. In windy conditions, the rates are typically 180 lb per acre.
- Where seeds fail to germinate, or they germinate and die, the area must be re-seededand mulched within the planting season, using not less than half the original application rates.
- Sediment shall be removed from fiber rolls when sediment accumulation reaches one-half the designed sediment storage depth, usually one-half the distance between the top of the fiber roll and the adjacent ground surface. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.

The primary objective of a Post-Construction Stormwater Management Plan is to ensure that pollutant discharges are reduced to the maximum extent practicable and to prevent stormwater discharges from causing or contributing to a violation of receiving water quality standards (RWQCB 2012). Post-construction stormwater management primarily consists of non-structural and structural BMPs (RWQCB 2011). Non-structural BMPs include the preservation of riparian

zones, minimization of disturbance and imperviousness, and maximization of open space. Structural BMPs include treatment devices designed to reduce pollutants through sedimentation, adsorption, decomposition, filtration and infiltration (RWQCB 2011).

Development of stormwater management controls and practices is an effective and economical way of meeting the requirements of the NPDES General Permit and the stormwater management objectives (RWQCB 2011). The minimum requirements for a Post-Construction Stormwater Management Plan, as described in the General Permit, are as follows:

- Develop a regulatory mechanism (to the maximum extent allowable by State, tribal, and local law) requiring the implementation of post-construction runoff BMPs at new development and redevelopment projects covering at least one acre of land.
- Continue to implement and evaluate structural and non-structural BMPs for the control of post-construction runoff from new development and redevelopment projects.
- Ensure adequate long-term operation, maintenance and success of BMPs.
- Identify, develop and implement the appropriate BMPs and measurable goals to meet these minimum requirements.

A discharger must certify that all State and local requirements have been met in accordance with the General Permit. For construction to be found complete, post-construction stormwater management measures must be installed, and a long-term maintenance plan established (SWRCB 2013). This requirement is intended to ensure that the post-construction conditions at the project site do not cause or contribute to direct or indirect water quality impacts (i.e., pollution and/or hydromodification) upstream and downstream. Specifically, the discharger must demonstrate compliance with the post-construction standards set forth in Section XIII of the General Permit (SWRCB 2013).

Environmental Commitment WQ-3: *Minimize the potential for increased sediment and turbidity by reducing the cutterhead dredge speed and/or the ladder swing speed, as conditions warrant.*

The Proposed Action/Project would adhere to RWQCB water quality objectives for the Sacramento River Basin. These objectives require that project discharge cannot exceed 1 Nephelometric Turbidity Unit (NTU) when natural turbidity is between 0 and 5 NTUs, 20 percent of natural turbidity levels when natural turbidity is between 5 and 50 NTUs, 10 NTUs when natural turbidity is between 50 and 100 NTUs, or 10 percent when natural turbidity is greater than 100 NTUs. A biological monitor will oversee construction activities within the channel of the Sacramento River, and if water quality objectives are exceeded, in-water work will stop until these objectives can be achieved (for additional detail on monitoring activities, see Appendix I).

Silt curtains are not recommended for operations around cutterhead dredges where frequent curtain movement would be necessary (Herbich and Brahme 1991). Operating parameters used to determine the turbidity generation from the cutterhead typically include the cutter rotational

velocity, the suction flow rate, the thickness of cut, the ladder angle, and the translational ladder speed (Henriksen 2009). In addition to the other environmental commitments to minimize and avoid potential water quality impacts described in this chapter, the following BMPs for dredging will be applied to further reduce the potential for mobilization of sedimentation in the water column.

- ***Reduce cutterhead rotation speed.*** Submerge the cutterhead within the substrate to the maximum extent practicable when the dredge pumps are engaged, and utilize a slow rotational speed, where feasible given onsite in-river conditions. Reducing cutterhead rotation speed reduces the potential for side casting excavated sediment away form the suction entrance and re-suspending sediment. This measure is typically effective only on maintenance of relatively loose, fine grain sediment (LTMS 2001). Pipeline clearing will be kept to the minimum amount necessary.
- ***Reduce ladder swing speed.*** Reducing the swing speed ensures that the dredgehead does not move through the cut faster than it can hydraulically pump the sediment. Reducing swing speed reduces the volume of re-suspended sediment. When feasible given onsite in-river conditions, the goal is to swing the dredgehead at a speed that allows as much of the disturbed sediment as possible to be removed with the hydraulic flow. Typical swing speeds are 5-30 feet per minute (LTMS 2001).

Fisheries and Aquatic Resources

Fisheries and aquatic resources in and proximately downstream of the Action/Project Area would have the potential to be affected by water pollution associated with construction-related activities, both for the Proposed Action/Project and the No Action Alternative. However, implementation of BMPs and other protective measures incorporated into the project description, developed for water quality resources and further described in Section 3.6.4 of this EA/IS, also would serve as impact avoidance and minimization measures for fisheries and aquatic resources.

Standard water pollution prevention measures, including erosion and sediment control measures, proper maintenance of equipment and storage of materials, proper control of non-stormwater discharges, and hazardous spill prevention and response measures would be implemented as part of the Proposed Action/Project, and for construction-related activities under the No Action Alternative. These measures, together with other water quality protective measures incorporated into the project description, are adequate to avoid water quality-related potentially significant effects under both NEPA and CEQA for fisheries and aquatic resources.

In addition to avoiding, minimizing, and/or mitigating water quality potential effects on fisheries and aquatic resources, one of the water quality measures (***Environmental Commitment* WQ-3**) also contributes to the avoidance/minimization of the potential for entrainment of juvenile fishes into the suction dredge. That measure includes submerging the cutterhead within the substrate to the maximum extent practicable when the dredge pumps are engaged, and reducing the dredge

ladder swing speed to the extent practicable – both of which additionally serve to minimize the potential for fishes to encounter the cutterhead and suction dredge and, thereby, the potential for entrainment.

In addition to the previously described water quality-related measures, additional measures specifically developed to avoid, minimize, or mitigate potential impacts to fisheries and aquatic resources are described below.

Environmental Commitment FAR-1: *Implement measures to minimize the injury or mortality of fish in the immediate work area associated with rock-toe and tree revetment maintenance activities.*

The construction contractor conducting rock-toe and tree revetment maintenance activities, including rock or brush replacement, will be required to implement measures to scare fish and other aquatic wildlife (e.g., western pond turtles) away from the immediate work area. Before submerging a dragline bucket or placing rock below the water surface, the dragline will be splash-cast into the water, and a person will wade ahead of the equipment to scare fish away from the immediate work area.

Environmental Commitment FAR-2: *Prepare and implement an environmental awareness training program for project personnel.*

Project personnel will participate in an environmental awareness training program provided by a qualified biologist (see Appendix I). Construction workers will be informed by a qualified biologist about any sensitive fisheries and aquatic biological resources associated with the project and that disturbance of sensitive habitat or special-status species is a violation of the Federal ESA and Section 404 of the CWA.

Workers will be informed of the potential nearshore presence of juvenile listed fish species, including anadromous salmonids, and that actions causing injury or death to these fish could result in civil or criminal penalties to the individuals who commit such actions.

Environmental Commitment FAR-3: *Decontaminate field gear and dredging equipment to avoid introduction of invasive species.*

The construction contractor will be required to read and implement procedures identified for decontaminating field gear and in-river dredging equipment contained in the CDFG (2008) Field Gear Decontamination Protocols. Procedures for decontaminating field gear (i.e., waders, wading boots, boot insoles, nets, wading sticks, or anything else that comes into contact with the water), as well as in-river equipment, developed by CDFG (2008) will be followed prior to entering the Sacramento River in the Action/Project Area.

Environmental Commitment FAR-4: *Conduct entrainment monitoring if construction crews identify fish in dredge slurry.*

Although entrainment associated with suction dredging is not anticipated, if construction personnel observe fish in dredge slurry entering the containment areas, work would be halted and CDFW, NMFS, and USWFS would be contacted, and a formal entrainment monitoring plan would be developed and implemented prior to the re-initiation of dredging activities.

Terrestrial Resources

Environmental Commitment TR-1: *Avoid and minimize potential adverse effects to Valley Elderberry Longhorn Beetle and its habitat.*

If suitable habitat for VELB occurs on a project site, or within close proximity where beetles will be affected by the project, these areas must be designated as avoidance areas and must be protected from disturbance during the construction and operation of the project. Protective measures are identified in USFWS's 1999 guidelines to avoid and minimize potential project effects on VELB. Complete avoidance (i.e., no adverse effects) may be assumed when a 100-foot (or wider) buffer is established and maintained around elderberry plants containing stems measuring 1.0 inch or greater in diameter at ground level (USFWS 1999). In buffer areas, construction-related disturbance should be minimized and any damaged area should be promptly restored following construction. The USFWS must be consulted before any disturbances within the buffer area are considered. In addition, the Service must be provided with a map identifying the avoidance area and written details describing avoidance measures (USFWS 1999).

Any VELB habitat that cannot be avoided should be considered impacted and appropriate minimization measures should be implemented (USFWS 1999). The Proposed Project will avoid and minimize impacts to VELB by implementing the protective measures that are prescribed in the USFWS Biological Opinion that will be prepared for this project, as well as those described below.

- The project engineer will stake the limits of the construction footprint that is in proximity to potential VELB habitat (i.e., elderberry shrubs) at the project site. Elderberry shrubs located within 100 feet from the edge of access roads and containment areas in the Action/Project Area will be protected. Temporary construction netting (e.g., high-visibility plastic fencing) will be placed around nearby vegetation by the contractor to provide protection from construction activities.
- A biological monitor (see Appendix I for additional detail) will be on site during mobilization to assist the project engineer with identifying suitable locations for placement of construction equipment, staging, and containment areas that avoid elderberry shrubs. The biologist will direct activities to occur away from the drip line of all elderberry shrubs and to avoid shrubs at a distance of 100 feet if possible.

Protective measures identified in USFWS 1999 Conservation Guidelines for the Valley Elderberry Longhorn Beetle include:

- ❑ Fence and flag all areas to be avoided during construction activities. In areas where encroachment on the 100-foot buffer has been approved by the USFWS, provide a minimum setback of at least 20 feet from the drip line of each elderberry plant.
- ❑ Brief contractors on the need to avoid damaging the elderberry plants and the possible penalties for not complying with these requirements.
- ❑ Erect 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 should be clearly readable from a distance of 20 feet, and must be maintained for the duration of construction.
- ❑ Instruct work crews about the status of the beetle and the need to protect its elderberry host plant.

Restoration and maintenance measures identified in USFWS 1999 Conservation Guidelines for the Valley Elderberry Longhorn Beetle include:

- ❑ Restore any damage done to the buffer area (area within 100 feet of elderberry plants) during construction. Provide erosion control and re-vegetate with appropriate native plants.
- ❑ Buffer areas must continue to be protected after construction from adverse effects of the project. Measures such as fencing, signs, weeding, and trash removal are usually appropriate.
- ❑ No insecticides, herbicides, fertilizers, or other chemicals that might harm the beetle or its host plant should 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.
- ❑ The applicant must provide a written description of how the buffer areas are to be restored, protected, and maintained after construction is completed.
- ❑ Mowing of grasses/ground cover may occur from July through April to reduce fire hazard. No mowing should occur within five feet of elderberry plant stems. Mowing must be done in a manner that avoids damaging plants (e.g., stripping away bark through careless use of mowing/trimming equipment).
    - Additionally, if new elderberry shrubs are identified or any shrubs cannot be avoided during implementation of the Proposed Action/Project, the appropriate resource agency (i.e., CDFW and/or USFWS) will be contacted for additional review and consultation to determine the potential significance of any anticipated impact, and

whether additional impact avoidance measures exceeding those described in USFWS (1999) are necessary.

- In addition to the protective measures described above, minimization measures (e.g., planting replacement habitat, or conservation planting), may be needed (USFWS 1999). Elderberry plants must be transplanted if they can not be avoided by the Proposed Project. All elderberry plants with one or more stems measuring 1.0 inch or greater in diameter at ground level must be transplanted to a conservation area (USFWS 1999). At USFWS discretion, a plant that is unlikely to survive transplantation because of poor condition or location, or a plant that would be extremely difficult to move because of access problems, may be exempted from transplantation. In cases where transplantation is not possible, the minimization ratios in Table 1 of USFWS (1999) may be increased to offset the additional habitat loss. The numbers of elderberry seedlings/cuttings and associated riparian native trees/shrubs to be planted as replacement habitat are determined by stem size class of affected elderberry shrubs, presence or absence of exit holes, and whether a project lies in a riparian or non-riparian area (USFWS 1999).

On October 2, 2012, the USFWS issued a proposed rule to remove VELB from the Federal list of endangered and threatened wildlife and to remove the designation of critical habitat (77 FR 60237). Generally, the protective measures described above would be implemented as part of the Proposed Action/Project until such time that the USFWS issues a Final Rule removing VELB from the Federal list of threatened and endangered species. However, because the Capay Unit of the SRNWR was established, in part, for VELB habitat restoration purposes, these protective measures would likely remain in place on the Capay Unit regardless of a Final Ruling to remove VELB from listing under the ESA (K. Moroney, USFWS, 2013, pers. comm.).

Environmental Commitment TR-2: *Prepare and implement an environmental awareness training program for project personnel.*

Concurrent with ***Environmental Commitment FAR-2***, project personnel will participate in an environmental awareness training program provided by a qualified biologist (see Appendix I) prior to initiation of construction activities at the project site. Construction workers will be informed by a qualified biologist about any sensitive terrestrial biological resources associated with the project and that disturbance of sensitive habitat or special status species is a violation of the Federal ESA and Section 404 of the CWA. The training also will instruct workers about what to do if a special status species is encountered during construction activities, and how to contact the monitoring biologist overseeing construction activities.

Environmental Commitment TR-3: *Maintain existing project conditions to the extent feasible.*

- ❑ Materials placed in natural areas and all temporary structures will be removed in their entirety and the affected areas returned to pre-construction elevations.

- These affected areas will be revegetated, as appropriate, to stabilize the environment and to prevent erosion and will be detailed in a restoration plan approved by CDFW.

Environmental Commitment TR-4: *Avoid and minimize potential adverse effects to terrestrial resources.*

- Conduct a pre-construction floristic plant survey according to CDFW Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities (CDFG 2009) during the spring of 2014 to investigate whether botanical species identified as having the potential to occur in the Action/Project Area are present. If special status botanical species (see Chapter 3) are identified, then CDFW and USFWS will be notified, survey results will be provided to CDFW and USFWS, the locations of individual plants or populations will be identified, and these locations will be clearly identified as avoidance areas (e.g., exclusionary fencing and signage) prior to initiation of construction.
- To avoid take of birds and/or their nests, if construction is to occur during the nesting season (February 1 – August 31), conduct pre-construction surveys within 15 days prior to initial mobilization. Surveys for raptors will be conducted within 500 feet of the project area, other nesting bird surveys will be conducted within the project footprint.

  The results of the survey shall be emailed to Tracy.McReynolds@wildlife.ca.gov.

  If no active nests are detected during these surveys, no additional measures are required.

  If active nests are found in the survey area, avoidance measures will be developed in coordination with CDFW (and USFWS).
- If a lapse in project-related work of 15 days or longer occurs, another focused survey shall be required before project work can be reinitiated. Concurrent with ***Environmental Commitment TR-1***, a pre-construction survey for WPT shall be conducted by a qualified biologist the morning of initiation of construction activities. If a western pond turtle is observed in the project area during construction activities, the contractor will temporarily halt construction until the turtle has moved itself to a safe location outside of the construction limits. If construction is to occur during the nesting season (late June–July), a pre-construction survey will be conducted by a qualified biologist to locate any western pond turtles or their nests. This survey will be conducted within suitable habitat within the project footprint no more than two days prior to the start of construction activities in suitable habitat. If a pond turtle nest is found, the biologist will flag the site and determine whether construction activities can avoid affecting the nest. If the nest cannot be avoided, in consultation with CDFW, a no-disturbance buffer zone may be established around the nest until the young have left the nest.

  The monitoring biologist shall be contacted immediately in the event that a turtle or eggs are encountered during the work period. Any dead or injured turtles shall be immediately

reported to the CDFW. The treatment of any injured or dead turtles shall be coordinated with the CDFW.

- Coordinate with CDFW (and USFWS as appropriate) if the aforementioned pre-construction surveys identify other special status species (see Chapter 3) in the Action/Project Area prior to the onset of construction activities.

  As previously discussed, the results of site assessments and biological surveys are often considered valid by the USFWS and/or CDFW for a period of two years, unless determined otherwise on a case-by-case basis by the appropriate USFWS or CDFW office. Depending on the timing of when revetment maintenance and a second dredge cycle may become necessary, additional terrestrial resource pre-construction surveys (e.g., nesting raptors, WPT, VELB habitat) may need to be conducted if these activities occur two or more years in the future.

Environmental Commitment TR-5: *Avoid and minimize potential adverse effects to terrestrial resources resulting from the spread of non-native weeds.*

Construction equipment will be pressure washed prior to entering the project site to help control the spread of non-native weeds. Additionally, reseeding with native grasses may be required if mowing of grasslands is required during revetment maintenance to ensure adequate construction vehicle clearance to minimize the potential fire risk.

Environmental Commitment TR-6: *Avoid and minimize potential adverse effects to bank swallow habitat.*

Impacts to potential bank swallow habitat will be minimized during construction activities through the implementation of construction BMPs and avoidance, to the extent feasible, of potential bank swallow habitat areas.

Recreation

Environmental Commitment REC-1: *Post notices at area public boat launch facilities.*

Notices alerting recreationalists to the dredge activities will be posted at local boat launch facilities. Beginning two weeks prior to the proposed dredging and throughout the duration of the activity (i.e., June 15 through October 15), notices will be posted at boat launch facilities along the Sacramento River within Glenn and Butte counties. Facilities with motor boat access (e.g., boat launches) where notices will be posted are provided in **Table 2-3.**

Table 2-3. Public Motor Boat Access Points in Glenn and Butte Counties.

Facility	Location	County
Irvine Finch River Access	RM 200	Glenn
Gianella Landing	RM 199	Glenn
Pine Creek Day Use Area (Landing)	RM 196.5	Butte
Scotty's Boat Landing	RM 196	Butte
Bidwell-Sacramento River State Park	RM 193	Glenn/Butte
Ord Bend Park	RM 184	Glenn
Butte City Launch Facility	RM 169	Glenn
Capay Unit Parking Lots, SRNWR	RM 194	Glenn

Each notice will state that, while in the river, the suction dredge boat will represent a potential hazard to navigation and boaters, and other recreationalists should exercise caution while passing through the affected portion of the Sacramento River. The notices also will state that in-river operations are anticipated to occur between 7 am and 7 pm from July 1 through October 15.

Environmental Commitment REC-2: *Publish notice for planned dredge activities in local newspapers.*

An informative notice advising the public of the proposed dredge activities will be published in local newspapers. Newspaper notices will be published approximately one week prior to commencement of in-river activities.

Environmental Commitment REC-3: *Utilize U.S. Coast Guard standard lighting elements on suction dredge boat and associated in-river equipment.*

Consistent with U.S. Coast Guard Inland Navigation Rules (e.g., Rule 27) and Federal Navigation Regulations (33 CFR 83), lights will be used to illuminate the location of the dredge boat and the portion of the pipeline in the river between dusk and dawn. The barge, flexible pipe, and auxiliary boats will be anchored and sufficiently illuminated during non-daylight hours to maintain high visibility for boaters and other water users. The dredge boat will be anchored as close to shore as practicable at night to allow traffic to pass freely. In addition, a night watchman would remain on the project site during non-working hours to respond to any unforeseen issues. It is anticipated that active dredge operations would be conducted about 12 hours per day, seven days per week.

Vessels engaged in dredging or underwater operations also must utilize the following lighting elements when an obstruction exists and when at anchor:

- Two all-round red lights or two balls in a vertical line to indicate the side on which the obstruction exists.
- Two all-round green lights or two diamonds in a vertical line to indicate the side on which another vessel may pass.

Environmental Commitment REC-4: *Install warning signs upstream and downstream of dredging construction site on the Sacramento River, and along public access trails on the Capay Unit.*

The contractor will install warning signs consistent with both U.S. Coast Guard and California Department of Boating and Waterways marking systems. Two special marked buoys will be utilized to alert boaters and other recreationalists of the general location of the dredge boat and the dredging activities. The buoys will be yellow, and will be placed upstream and downstream of the affected area two days prior to and throughout the duration of dredging operations to caution local water craft of the potential in-river hazard. Although special marked buoys are not required to be lit, a lighted warning buoy would be utilized in order to increase visibility of the dredge boat (California Department of Boating and Waterways 2012).

Construction activities would result in the short-term loss of recreational opportunities available at the Capay Unit. Although revetment maintenance (or removal) activities could result in temporary disruptions to recreational opportunities, trail management, timing of maintenance (or removal) activities and safety precautions (e.g., signage on the refuge) would minimize potential disturbances.

Cultural Resources

In the event of an unanticipated discovery of a historic property, a cultural resource or a unique archeological resource, the following measures would be implemented.

Environmental Commitment CULT-1*: Reduce potential historic and cultural resources impacts if buried resources are discovered during construction.*

If buried historic, cultural or archeological resources are discovered during construction, the contractor will cease work in that area and within 100 feet of the find until a qualified archaeologist can assess the significance of the find and, if necessary, develop appropriate treatment measures in consultation with the State Historic Preservation Officer (SHPO). In accordance with Section 15064.5(f) of the CEQA Guidelines, if the find is determined to be an historical or unique archaeological resource, contingency funding and a time allotment sufficient to allow for implementation of avoidance measures or appropriate mitigation should be available. Work could continue on other parts of the project site while historical or unique archaeological resource mitigation takes place. The contractor also would contact the lead agencies.

Environmental Commitment CULT-2*: Reduce potential historic and cultural resources impacts if human remains are discovered during construction.*

If human remains are unearthed during construction, the contractor would contact the County Coroner to make the necessary findings of origin and disposition in accordance with Public Resources Code Section 5097.98. If the remains are determined to be Native American, guidelines of the Native American Heritage Commission (NAHC) shall be adhered to in the treatment and disposition of the remains. The contractor also would contact the lead agencies.

Environmental Commitment CULT-3*: Reduce potential historic and cultural resources impacts if submerged archaeological or historic resources are discovered in the Sacramento River.*

Title to abandoned shipwrecks, archaeological sites, and historic or cultural resources on or in the tide and submerged lands of California is vested in the State and under the jurisdiction of the California State Lands Commission (CSLC). Any submerged archaeological site or submerged historic resource that has remained in State waters for more than 50 years is presumed to be significant. Therefore, in the even that any buried cultural materials are unearthed on lands under CSLC jurisdiction, the CSLC will be consulted and notified. The contractor also would contact the lead agencies.

Hazards and Hazardous Materials

Environmental Commitment HAZ-1: *Prepare and Implement a Hazardous Materials Control, Spill Prevention and Response Plan*

Before construction begins, a Hazardous Materials Control, Spill Prevention, and Response Plan (HMCSPRP) will be prepared to reduce the potential effects of hazardous materials and spills. The plan will identify staging areas where hazardous materials would be stored during construction and include an accidental spill prevention and response plan. The plan also will identify potential hazardous materials that would be used during construction activities and include appropriate practices to reduce the likelihood of a spill of toxic chemicals and other hazardous materials during construction, which may include the following.

- Protocols for proper handling and disposal of materials will be established prior to construction.
- Spill prevention measures will include stockpiling absorbent booms, staging hazardous materials at least 25 feet away from the river, and maintaining and checking construction equipment to prevent fuel and lubrication leaks. Additional spill prevention measures will include specific actions regarding the containers, handling, and transport of fuel to the barge, and refueling practices.
- Any spill within the floodplain and active channel of the Sacramento River will be reported to NMFS, CDFW, and other appropriate resource agencies within 48 hours.

- The contractor will have absorbent boom available within 250 feet of the live channel during all in channel work to be further prepared for quick containment of any spills within or adjacent to the Sacramento River.
- All measures from the 1602 Streambed Alteration Agreement, 404 and 401 water quality certifications and permits will be adhered to.

Environmental Commitment HAZ-2: *Implement fire risk reduction measures.*

To minimize the potential for wildland fires during construction, the lead agencies would ensure (through enforcement of contractual obligations) that staging areas, welding areas, or other areas identified for construction work using spark-producing or intense heat-producing equipment would be cleared of dried vegetation or other materials that could serve as fire fuel. The contractor would keep these areas clear of combustible materials in order to maintain a firebreak.

Traffic and Circulation

Environmental Commitment TRAF-1: *Prepare and Implement a Traffic Control Plan*

To avoid any potential delays or safety issues on SR45, County Rd. 23, River Road or other haul routes, a traffic control plan would be developed and implemented. M&T Chico Ranch/Llano Seco Rancho would work with the construction contractor and coordinate with Caltrans and/or county public works or planning departments and develop a traffic control plan prior to initiating work. The traffic control plan would include specific measures to manage traffic in the Action/Project Area and along haul routes, which would be submitted to the appropriate transportation agency for review and approval prior to the start of construction. The traffic control plan would include measures to address the following.

- Reduce, to the extent practicable, the number of vehicles (construction-related and other) on the roadways adjacent to the Action/Project Area.
- Reduce, to the extent practicable, the interaction between construction equipment and other vehicles.
- Promote public safety through actions aimed at driver and road safety.
- Prior to implementation of construction activities, the contractor will verify that all roads, bridges, culverts, and other infrastructure along the access routes can support expected vehicle loads.
- Identify intended haul routes, locations of signage, locations of flaggers, approved permits, documentation of coordination with local and State agencies, and locations of potential delays to vehicle and pedestrian traffic. Construction vehicles will follow established truck routes to the greatest extent practicable.

Environmental Commitment TRAF-2: *Implement Measures to Address Potential Traffic Flow and Access Issues*

The following environmental commitments would be implemented as part of the project to ensure minimization of impacts on traffic and circulation.

- The construction contractor will maintain travel traffic on all roads adjacent to the site and on all affected public roads during the construction period. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, will be as required by State and local authorities having jurisdiction.
- The traveling public shall be protected from construction and work damage to person and property. The contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic.
- Traffic controls on major roads and collectors would include flag persons wearing bright orange or red vests and using “stop/slow” paddles to direct drivers.
- Access to public transit would be maintained, and movement of public transit vehicles would not be impeded as a result of construction activities.
- Through access for emergency vehicles would be provided at all times.
- Access would be maintained for driveways and private roads.

Environmental Commitment TRAF-3: *Construction-related Traffic Measures*

The following environmental commitments would be implemented as part of the project to ensure minimization of impacts on traffic and circulation.

- Construction parking will be restricted to the designated staging areas.
- During peak periods, construction-generated traffic will avoid roadway segments or intersections that are at, or approaching, a level of service (LOS) that exceeds local standards, either by traveling different routes or by traveling at non-peak times.
- Construction warning signs would be posted in accordance with local standards or those set forth in the Manual on Uniform Traffic Control Devices (Federal Highway Administration 2000) in advance of the construction area and at any intersection that provides access to the construction area.
- Rock, dirt, and/or other fill materials will be prevented from being accidently dropped from trucks traveling on highways to and from the project site.
- Written notification would be provided to appropriate contractors regarding appropriate routes to and from construction sites, and weight and speed limits for local roads used to access construction sites.

- Water trucks will be utilized to prevent excess dust caused by equipment traffic on dirt and gravel roads.

2.3 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

Consideration was given to several potential alternative approaches to addressing gravel storage and removal of the existing stockpile. Provided below is a brief summary of the history, issues and constraints associated with previous attempts to remove gravel from the existing stockpile, which also support explanation as to why these alternatives were dismissed from detailed consideration.

As previously discussed, "dry-land" excavation construction methods were utilized in 2001 and 2007 to reduce the size of the gravel bar located upstream of the M&T/Llano Seco Pumps Facility. Spoils material from each excavation were stored on a 10-acre stockpile area on the M&T Chico Ranch property located along the south side of Big Chico Creek between the creek and the Phelan Levee (Tetra Tech 2010a).

2.3.1 DREDGING WITH GRAVEL STOCKPILED ON PRIVATE PROPERTY (WITH A NATURE CONSERVANCY CONSERVATION EASEMENT)

One potential gravel disposal alternative that was considered consisted of placing up to 100,000 cubic yards of extracted gravel materials on private property along the west bank of the Sacramento River across from the M&T/Llano Seco Pumps Facility. The private property is under a TNC conservation easement (herein referred to as the Shaw property). The objective of this alternative was to place the dredged gravel material such that it would be remobilized and recruited back into the Sacramento River.

An analysis was conducted to determine the mobility of the gravel in the stockpile that would be located on the floodplain of the Shaw property, on the right bank of the Sacramento River slightly downstream of and opposite to the M&T/Llano Seco Pumps Facility. A model was developed to conduct this analysis, referred to as the Phase III Stockpile Model. This model was developed by raising the overbank elevations of the Phase III Setback Levee Model to represent the stockpile (Tetra Tech 2011).

The proposed stockpile area was represented in the model by a 1,000 feet long by 300 feet wide by 9 feet high area, which was rounded on the upstream side to deflect flow. To determine the mobility of the gravel in the stockpile (in particular, the mobility of the gravel located around the base of the stockpile), an incipient motion analysis was conducted using the hydraulic output from the 2-D model at the 50-year peak flow event (Q=237,829 cfs). According to Tetra Tech (2011), the incipient-motion analysis was performed by evaluating the effective shear stress on the stockpile material in relation to the amount of shear stress that is required to move the material. A representative bed material gradation (D_{50}=39 mm) was used in the analysis, based on three pebble counts that were conducted on the gravel bar in December 2005 (MEI 2006 as

cited in Tetra Tech 2011). The bank attached bar was excavated in 2001 and 2007 and it was assumed that the stockpile would contain the same sized material.

The results of the incipient motion analysis indicated that the stockpile material would not be mobilized at the 50-year peak flow event, with maximum shear stress values around the base of the pile less than 30 percent of those required for mobilization. Because the hydrodynamic conditions associated with the 50-year peak flow event would not be sufficient to mobilize the stockpile material, modeling evaluations at lower flows were not conducted.

However, during the course of the modeling, it was observed that the highest NGS values in the vicinity of the stockpile would occur approximately 350 feet due east of the upstream end of the stockpile along the west bank of the channel. At this location, the shear stresses along the right bank and towards the center of the channel are sufficiently high to cause significant sediment transport in this area. Consequently, a "Bank-edge Stockpile Scenario" was developed to determine if mobilization could be achieved by locating the stockpile located in the area predicted to have high sediment transport.

The bank-edge stockpile consisted of a 1,200-foot long bank-edge stockpile extending from the downstream end of the longitudinal stone toe to just upstream of the thick stand of established trees. The bank-edge stockpile, as well as the previously described Shaw property floodplain stockpile, is depicted in **Figure 2-3**.

To maximize the potential sediment-transport rates, the toe of the bank-edge stockpile was located at the water's edge at a discharge of 5,000 cfs (this discharge corresponds to the lowest discharge modeled and it is exceeded 94 percent of the time based on the flow duration curve discussed in Chapter 2 of Tetra Tech 2011). The size of the simulated stockpile had a total volume of 101,500 tons (compared to original stockpile of 100,000 tons), with sideslopes set at the angle of repose (37 degrees), and the elevation of the top of the bank-edge stockpile was set at the same elevation as the original Shaw property floodplain stockpile.

The Bank-edge Stockpile Scenario was modeled at the representative bankfull discharge of 90,000 cfs (2-year return interval, or Q_2) to evaluate the sediment transport conditions during relatively frequent flow events, and at 145,000 cfs which corresponds to approximately the 10-year peak flow event (Q_{10} = 145,800 cfs). Discharges greater than the 10-year peak flow event were not modeled, because these events were considered to occur too infrequently to transport significant amounts of material from the bank-edge stockpile over the long-term. The model results generally indicated that, while some mobilization of the toe of the pile would occur near the downstream end, this mobilization would not be sufficient to entrain a sufficient quantity of the stockpiled material back into the river to make this option viable.

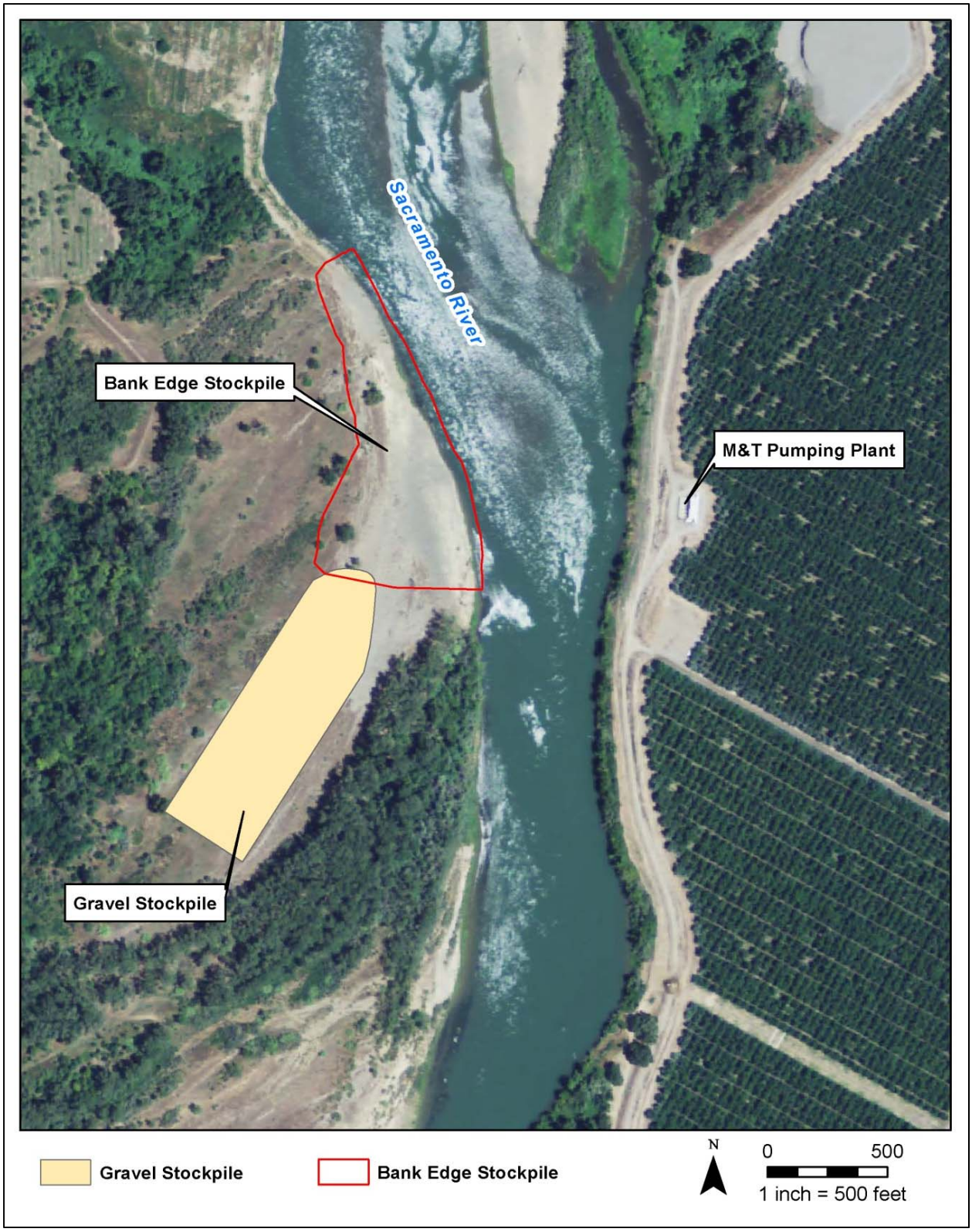

Figure 2-3. Location of the Shaw Property Floodplain Stockpile and the Bank-Edge Stockpile (Modified from Tetra Tech 2011).

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In summary, the incipient motion analysis indicated that the Shaw property floodplain stockpile was stable at the 50-year peak flow event, and that the stockpile material would not be mobilized. Because the hydrodynamic conditions associated with the 50-year peak flow event in the vicinity of the Shaw property floodplain stockpile would not be sufficient to mobilize the stockpile material, modeling evaluations at lower flows were not conducted. Consequently, the stockpile material would not be mobilized at lower flow recurrence intervals, and therefore gravel would not be recruited back into the Sacramento River with a sufficient frequency to result in the perceived fisheries benefits.

Significant sediment-transport rates (NGS ≥1.5) existed along 140 feet of the toe at 90,000 cfs and along 410 feet at 145,000 cfs under the Bank-edge Stockpile Scenario. Under the Eroded Bank-edge Stockpile Condition Scenario, significant sediment transport rates occurred along 40 feet of the toe at 90,000 cfs and along 180 feet at 145,000 cfs. The reduction in length of sediment-transport rate from 410 feet under the Bank-edge Stockpile Scenario to 180 feet under the Eroded Bank-edge Stockpile Condition Scenario indicated that relatively little sediment would be eroded from the stockpile compared to the total volume of the stockpile during a significant flood event, and that significant erosion would only take place during relatively infrequent flood events.

Additionally, discussions with TNC regarding amendment to the conservation easement raised the following concerns: (1) easement conditions would not allow for the use of the private property for gravel stockpiling; (2) about seven acres of the property would have been covered to a depth of ten feet with material, which would not be expected to recruit back to the Sacramento River for the foreseeable future; and (3) placement of the material would have eliminated existing riparian habitat that is important to wildlife, including native bees and a number of avian species (TNC 2011).

In addition to the above, the distance to move the material from the dredge site to the Shaw property stockpile site would have been considerable, the dredge production capacity was too small to complete dredging within the authorized in-river work period, and the costs associated with moving the spoils material would have been prohibitive. Concerns associated with this alternative also were expressed regarding downstream impacts associated with such a large quantity of gravel recruitment back into the Sacramento River. For example, shoreline placement and subsequent disposal of gravel into the Sacramento River at this location would have potential fill impacts to waters of the United States, as well as potential impacts under Section 10 of the Rivers and Harbors Act. Navigation blockage or redirected impacts downstream were identified as potential issues of concern. Moreover, Chinook salmon and steelhead spawning habitat in the Sacramento River is located much farther upstream than the Action/Project Area. Thus, placement of gravel at the Shaw property location would not be advantageous for the purposes of fisheries habitat enhancement at and downstream of this location because this reach of the Sacramento River primarily serves as a migration corridor.

This alternative also would have included maintenance of the existing rock-toe and tree revetment to prevent further westward migration of the Sacramento River until a long-term solution is developed and completed.

2.3.2 DREDGING WITH GRAVEL STOCKPILING ON THE USFWS PHELAN ISLAND UNIT OF THE SACRAMENTO RIVER NATIONAL WILDLIFE REFUGE

A second potential gravel disposal alternative that was considered consisted of placing up to 100,000 cubic yards of the gravel material further south on USFWS Phelan Island property (between about RM 191 and RM 192). The objective of this alternative, similar to the above gravel disposal alternative, was to place the dredged gravel material such that it would be remobilized and recruited back into the Sacramento River.

Similar to the discussion above, placement of gravel material on the USFWS Phelan Island property would not be advantageous to Chinook salmon and steelhead spawning because the Sacramento River at this location, and in the reaches downstream, are primarily used as a migration corridor for anadromous fish. Additionally, shoreline placement, mobilization and subsequent disposal of gravel into the Sacramento River at this location could have potential fill-related impacts to waters of the United States, as well as potential impacts under Section 10 of the Rivers and Harbors Act.

This alternative also would have included maintenance of the existing rock-toe and tree revetment to prevent further westward migration of the Sacramento River until a long-term solution is developed and completed.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

Chapter 3 of the Draft EA/IS discusses the environmental resources that could potentially be affected by implementation of the Proposed Action for NEPA compliance purposes, and by implementation of the Proposed Project for CEQA compliance purposes. The NEPA Proposed Action and the CEQA Proposed Project are the same, and are referred to as the "Proposed Action/Project" in this chapter. For CEQA purposes, existing conditions serve as the basis of comparison against which the Proposed Project is evaluated. Under NEPA, the No Action Alternative should not be considered identical to the existing conditions of the affected environment because future actions may occur regardless of whether the Proposed Action is selected. If other actions are likely to occur and the effects are reasonably foreseeable, these also are discussed under the No Action Alternative. The potential environmental impacts of the Proposed Action/Project are discussed and compared to the No Action Alternative in the environmental consequences section of this chapter.

This chapter evaluates the potential for significant adverse effects that may occur on these resources as a result of implementing the Proposed Action/Project and, when necessary, proposes measures to avoid, reduce, minimize, or compensate for potentially significant effects. Where it can be shown that the Proposed Action/Project would not, or could not, affect a particular resource, a concluding statement to that effect is provided and there is no additional discussion for these resources.

A CEQA Environmental Checklist (Appendix G to the CEQA Guidelines [14 CCR Sections 15000-15387]) for the Proposed Project (i.e., proposed maintenance dredging activities and maintenance of the existing rock-toe and tree revetment) is included as Appendix A to this Draft EA/IS. The CEQA Checklist responses are based on the discussions in the following sections.

3.2 RESOURCES NOT EVALUATED IN DETAIL

During preparation of this EA/IS, it became evident that the project would not impact several resource categories because they are not present in the project study area. Therefore, the following resources are not included for detailed analysis:

- Population and Housing
- Mineral Resources
- Depletable Resources
- Indian Trust Assets

Other environmental resources are present in the project study area, but no impact is anticipated to potentially occur as a result of the Proposed Action/Project. These resources include the following.

- Agriculture and Forest Resources
- Land Use and Planning
- Public Services
- Utilities and Service Systems
- Socioeconomics and Environmental Justice

Each of the resource categories listed above are dismissed from further detailed analysis, as described below.

3.2.1 AGRICULTURE AND FORESTRY RESOURCES

The lands adjacent to the project area are classified as Prime Farmland, Farmland of Local Potential, Water, and Other Land by the California Department of Conservation, Farmland Mapping and Monitoring Program (FMMP) as shown in **Figure 3.2-1**. Prime Farmland is irrigated land that has the best combination of physical and chemical characteristics for the long-term production of crops. It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops when treated and managed, including adequate drainage, according to current farming methods. Farmland of Local Potential is defined as land having similar soils as Prime Farmland or Farmland of Statewide Importance, although the land is not irrigated. As shown in Figure 3.2-1, the lands directly adjacent to the study area within the Capay Unit of the USFWS SRNWR, which serve as habitat for fish and wildlife with hunting, fishing, photography, wildlife observation and environmental education uses, are delineated as Farmland of Local Potential. Other Land is areas that do not meet the criteria for any other FMMP category.

Construction activities associated with the Proposed Action/Project would not occur directly in land currently under agricultural production or cause conversion of agricultural lands. The Proposed Action/Project would be implemented, in part, to maintain water reliability for the M&T Chico Ranch and Llano Seco Rancho agricultural operations and wetlands. No changes to water distribution would occur that would change the pattern of irrigation for agricultural uses and restored wetland areas. Although the Proposed Action/Project would not physically change these agricultural uses or wetland areas, the project could be understood to benefit them by helping to preserve the existing water supply that serves them. The Proposed Action/Project would not directly or indirectly result in the conversion of land areas classified as important farmland, zoned for agricultural use, or under a Williamson Act contract, to non-agricultural use. Thus, there would be no impact to agricultural resources as a result of the Proposed Action/Project.

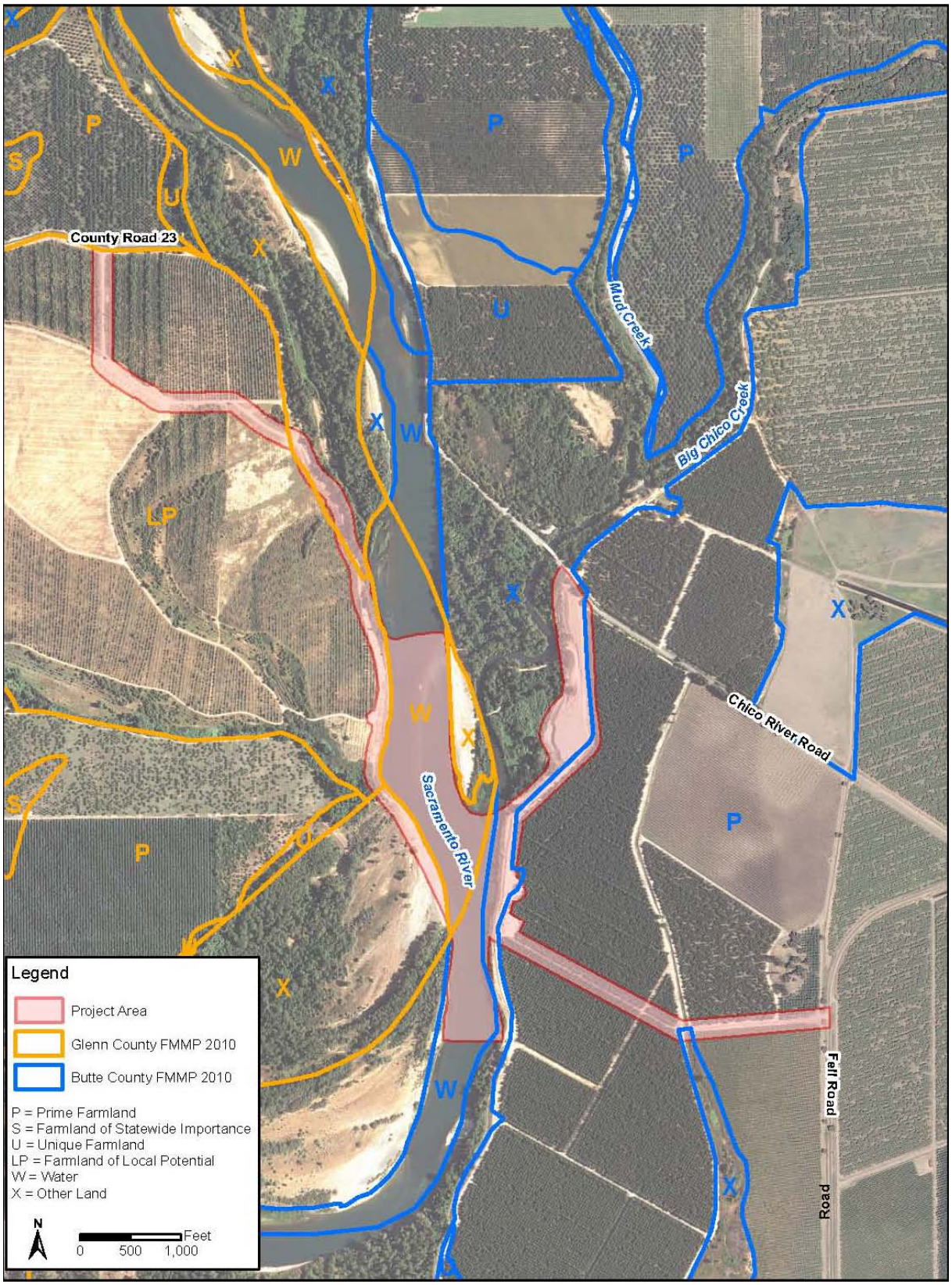

Figure 3.2-1. Important Farmland in Proximity to the Action/Project Area Located in Glenn and Butte Counties.

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3.2.2 LAND USE AND PLANNING

Implementation of the Proposed Action/Project would occur on either private property or USFWS property that has been restored as part of separate, independent restoration activities to natural floodplain habitat TNC property (southern portion of the rock-toe revetment) and in the Sacramento River channel. No modifications to existing land uses are proposed in any of the alternatives. Therefore, implementation of the Proposed Action/Project would have no impact on land use.

3.2.3 PUBLIC SERVICES

Public services, including police, fire, and ambulance services in the vicinity of the Proposed Project are provided by Butte and Glenn counties. Additionally, numerous private and public schools and public parks exist throughout the two counties.

Implementation of the Proposed Action/Project would occur on M&T Chico Ranch property, USFWS property, TNC property and in the Sacramento River channel in the general area between RM 194 and RM 192. The Proposed Action/Project would not result in the provision of new or physically altered government facilities and therefore, would not impact the service ratios, response times, or other performance objectives for public services. The Proposed Action/Project also would not result in the need for any additional fire protection, police protection, schools, parks, or other public facilities. Therefore, implementation of the Proposed Action/Project would have no impact on public services.

3.2.4 UTILITIES AND SERVICE SYSTEMS

Construction of the Proposed Action/Project would occur in a small, localized area that currently does not provide and is not serviced by utilities (e.g., electricity or natural gas). No utilities would be required or altered during or after construction. In fact, implementation of the Proposed Action/Project would maintain functionality of the City's WWTP outfall.

Water included with the dredged material removed from Sacramento River would be anticipated to percolate back into the system (Sacramento River or groundwater aquifer), or would be utilized on M&T Chico Ranch rice fields for decomposition or within the existing wetland system on the Llano Seco property. Return water from the project that is pumped from Containment Area #2 to the M&T/Llano Seco Pumps Facility and conveyed within the ranch's distribution system would be within existing water rights and entitlements, and would not cause the pumping plant diversions to increase above permitted capacities (see Chapter 3).

Therefore implementation of the Proposed Action/Project would have no impact on utilities and service systems.

3.2.5 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

Because land use would not change with implementation of the Proposed Action/Project, the socioeconomics of the project area would not change. There also would be no substantial loss or addition of jobs or revenue as a result of implementation of the Proposed Action/Project. In addition, there would be no effect on environmental justice because there are no environmental justice communities in the project area. Therefore, implementation of the Proposed Action/Project would have no impact on socioeconomics or environmental justice.

3.3 FISHERIES AND AQUATIC RESOURCES

3.3.1 AFFECTED ENVIRONMENT/ENVIRONMENTAL SETTING

3.3.1.1 ACTION/PROJECT AREA

The Proposed Action/Project Area is located downstream of the confluence of Big Chico Creek and the Sacramento River, just south of the Bidwell-Sacramento River State Park at RM 193. In the Proposed Action/Project Area, aquatic habitat is characterized by a constrained channel (flood control levees) on the east side of the Sacramento River, with active portions of the channel on the west side with a sand/mud/gravel bottom, interspersed with submerged aquatic or emergent vegetation, and intermittent adjacent riparian trees. This area of the Sacramento River is dynamic, and experiences variable annual patterns of sediment deposition and erosion. Interim stabilization consisting of a 1,520-foot long rock-toe and tree revetment of the west bank of the Sacramento River constructed during the fall of 2007 has prevented further westward migration of the river, but has not prevented continued sediment deposition in the Proposed Action/Project Area and downstream migration of the gravel bar downstream so that the focus of deposition is now opposite the M&T/Llano Seco Pumps Facility intake (Tetra Tech 2010).

Anadromous salmonid (winter-run, spring-run, fall and late fall-run Chinook salmon and steelhead) and green sturgeon spawning is reported to occur in the mainstem Sacramento River, primarily upstream of the Proposed Action/Project Area. Thus, the Proposed Action/Project Area generally does not support spawning for these fishes (see additional discussion, below), although it does serve as a migration corridor (both adult upstream and juvenile downstream) for anadromous fish, and potentially as a transient rearing area for salmonid and non-salmonid species.

3.3.1.2 FISHERIES AND AQUATIC RESOURCES IN THE ACTION/PROJECT AREA

Over 30 species of fish are known to use the Sacramento River. Of these, a number of both native and introduced species are anadromous. Anadromous species include Chinook salmon (winter-run, spring-run, fall- and late fall-run), steelhead, green and white sturgeon, Pacific lamprey, river lamprey, American shad and striped bass.

Special-status fish species considered in this section are those that are State or Federally listed as threatened or endangered, proposed for State or Federal listing as threatened or endangered, species classified as candidates for future Federal or State listing, Federal species of concern, and State species of special concern. Searches for special-status fish species potentially occurring in the Action/Project Area were conducted during 2007, 2010, and most recently during October 2012 using USFWS species lists based on individual USGS topographic quadrangles including Ord Ferry, Butte County and Glenn County, and using California Natural Diversity Database (CNDDB) species lists based on USGS topographical quadrangles including Chico, Foster-Island, Glenn, Hamilton City, Llano Seco, Nelson, Nord, and Richardson Springs. In addition, because the Sacramento USFWS office no longer maintains a list of Federal species of concern, recent environmental documents or planning processes (e.g., the Bay Delta Conservation Plan planning efforts), other environmental documents for projects proximate to the Action/Project Area, and other USFWS office (i.e., the Oregon USFWS Office) species lists were evaluated to identify potential additional species of concern.

Some fish species were identified as potentially occurring in the Action/Project Area through these efforts that were not carried forward for impact assessment determination in this EA/IS, including delta smelt, coho salmon, Sacramento perch, and California roach. In addition to the Delta, delta smelt (Federally threatened) have been found in the Sacramento River as far upstream as the confluence with the American River (Moyle 2002; USFWS 1994) at approximately Sacramento RM 60. The delta smelt is excluded from further evaluation in this document because the Action/Project Area is located far upstream at about RM 192.

In the Sacramento River drainage, coho salmon (Federally endangered[1]) were never common, but a small population probably once spawned in the McCloud and Upper Sacramento rivers (Moyle 2002). Coho salmon rarely, if at all, utilize the Sacramento River and, therefore, are not further evaluated in this document.

Historically, Sacramento perch (designated by CDFW as a Species of Special Concern) were found throughout the Central Valley, the Pajaro and Salinas rivers, and Clear Lake (Moyle 2002). The only populations that represent continuous habitation within their native range are those in Clear Lake and Alameda Creek (Moyle 2002). Most populations today are established in warm, turbid, moderately alkaline reservoirs or farm ponds. Therefore, Sacramento perch are not further evaluated in this EA/IS.

The California roach (designated by CDFW as a Species of Special Concern), a native freshwater minnow, is found throughout the Sacramento-San Joaquin drainage system (Moyle 2002). California roach, of which the Pit and San Joaquin roaches are a subspecies, are generally

[1] There is not a coho salmon ESU within the Central Valley. The most proximate coho salmon ESU is the Central California Coast ESU, which is Federally endangered.

found in small, warm intermittent streams, and dense populations are frequently found in isolated pools (Moyle et al. 1982; Moyle 2002). They are most abundant in mid-elevation streams in the Sierra foothills and in the lower reaches of some coastal streams (Moyle 2002). Although California roach are abundant in Butte and Big Chico creeks (BCCWA 2013), this species is not found in large numbers in the mainstem Sacramento River and it is unlikely that roach would be present in the Action/Project Area. Therefore, California roach is not further evaluated in this document.

Table 3.3-1 presents the special-status fish species that are evaluated in this EA/IS. Special emphasis is placed on these species to facilitate compliance with applicable laws, particularly the State and Federal ESAs, and to be consistent with State and Federal restoration/recovery plans and NMFS and USFWS biological opinions (BOs). This focus is consistent with: (1) CALFED's 2000 Ecosystem Restoration Program Plan and Multi-Species Conservation Strategy; (2) the programmatic determinations for the CALFED program, which include CDFW's Natural Community Conservation Planning Act (NCCPA) approval and the programmatic BOs issued by NMFS and USFWS; (3) USFWS's 1997 Draft Anadromous Fish Restoration Program (AFRP), which identifies specific actions to protect anadromous salmonids; (4) CDFG's 1996 Steelhead Restoration and Management Plan for California, which identifies specific actions to protect steelhead; and (5) CDFG's Restoring Central Valley Streams, A Plan for Action (1993), which identifies specific actions to protect salmonids.

SPECIES OF FOCUSED EVALUATION

In addition to special-status fish species, recreationally and/or commercially-important fish species also are evaluated in this EA/IS. Recreationally and/or commercially-important species include white sturgeon (*Acipenser transmontanus*), American shad (*Alosa sapidissima*), and striped bass (*Morone saxatilis*). Both American shad and striped bass are non-native species.

Evaluating potential impacts on fishery resources within the Action/Project Area requires an understanding of fish species' life histories and lifestage-specific environmental requirements. General information is provided below regarding fish species of focused evaluation, as well as life histories of these species potentially occurring within the Action/Project Area.

Anadromous Salmonids

Chinook salmon have evolved a broad array of life history patterns that allow them to take advantage of diverse riverine conditions throughout the year. Four principal life history variants are recognized and are named for the timing of their spawning runs: fall-run, late fall-run, winter-run and spring-run. The Sacramento River supports all four runs of Chinook salmon. The larger tributaries to the Sacramento River (American, Yuba, and Feather rivers) and rivers in the San Joaquin Basin also provide habitat for one or more of these runs.

Table 3.3-1. Special-Status Fish Species that are evaluated in this Draft EA/IS.

Common Name	Scientific Name	Status (see below)
Central Valley fall-/late fall-run Chinook salmon ESU	*Oncorhynchus tshawytscha*	FSC, SSC
Central Valley spring-run Chinook salmon ESU	*Oncorhynchus tshawytscha*	FT, ST
Sacramento River winter-run Chinook salmon ESU	*Oncorhynchus tshawytscha*	FE, SE
Central Valley steelhead DPS	*Oncorhynchus mykiss*	FT
North American green sturgeon Southern DPS	*Acipenser medirostris*	FT, SSC
Hardhead	*Mylopharodon conocephalus*	SSC
River lamprey	*Lampetra ayresi*	SSC
Pacific lamprey	*Entosphenus tridentatus*	FSC
Sacramento splittail	*Pogonichthys macrolepidotus*	SSC

Status Key:
FE = Endangered
FT = Threatened
FSC = Species of Concern
SE = State Endangered
ST = State Threatened
SSC = State Species of Special Concern

As previously mentioned, Chinook salmon (winter-run, spring-run, fall- and late fall-run) generally do not spawn in the Action/Project Area (about RM 192). Rather, spawning is reported to occur primarily in the mainstem Sacramento River upstream of the Action/Project Area. Spawning habitat for winter-run Chinook salmon is restricted to the Sacramento River primarily between Keswick Dam (RM 302) and Red Bluff Diversion Dam (RBDD) (RM 258) (NMFS 2009b), where spawning occurs between late-April and mid-August, with a peak generally in June (Vogel and Marine 1991). All of the potential spring-run Chinook salmon holding and spawning habitat in the mainstem Sacramento River is located between Keswick Dam and RBDD (CDFG 1998), where spawning reportedly occurs from August through October, with peak spawning occurring during September (NMFS 2009b). Fall-run Chinook salmon spawning in the mainstem Sacramento River generally occurs from October through December (Moyle 2002; NMFS 2004; Vogel and Marine 1991). Most fall-run Chinook salmon spawning in the mainstem Sacramento River occurs between Keswick Dam and RBDD, although relatively infrequent and small amounts of spawning may extend as far downstream as the Action/Project Area. Review of available CDFW aerial redd survey information from 2001 – 2008 indicates that of all fall-run Chinook salmon spawning in the upper Sacramento River extending from Princeton Ferry to Keswick Dam, an average of only about 1.5% occurred in the approximate

15-mile long reach from Ord Ferry Bridge to Hamilton City Bridge, which encompasses the less than 1-mile long Action/Project Area. Late fall-run Chinook salmon spawning generally occurs from January through April in the mainstem Sacramento River, primarily from Keswick Dam to RBDD (Moyle 2002; NMFS 2004; Vogel and Marine 1991). However, a 2001-2008 average of less than 1% of all reported late fall-run Chinook salmon spawning in the upper Sacramento River occurred in the Ord Ferry Bridge to Hamilton City Bridge Reach.

Adult steelhead are not known to spawn within the Sacramento River in the vicinity of the Action/Project Area. Steelhead spawning in the mainstem Sacramento River is probably limited to the area upstream of RBDD, although specific information regarding steelhead spawning within the mainstem Sacramento River is limited due to lack of monitoring (NMFS 2004; 2009b). Most steelhead prefer to spawn in smaller tributaries (NMFS 2009b).

Thus, the Action/Project Area generally does not support spawning for anadromous salmonids, although it does serve as part of the migration corridor (both adult upstream and juvenile downstream) for all four runs of Chinook salmon and steelhead. A separate discussion of general life history and habitat requirements for each of the species/run of focused evaluation in this Draft EA/IS is provided below.

Winter-run Chinook Salmon

Winter-run Chinook salmon occur only in the Sacramento River; therefore, this species account is specific to the Sacramento River. The Sacramento River winter-run Chinook salmon ESU is listed as "endangered" under both the Federal and State ESA. In 1993, critical habitat for winter-run Chinook salmon was designated to include the Sacramento River from Keswick Dam, (RM 302) to Chipps Island (RM 0) at the westward margin of the Sacramento-San Joaquin Delta. The Action/Project Area is located within designated critical habitat of winter-run Chinook salmon.

According to NMFS (2009b), adult winter-run Chinook salmon immigration (upstream spawning migration) in the Sacramento River occurs from November through June. The majority of the run passes RBDD from January through May, with the peak passage occurring in mid-March (Hallock and Fisher 1985 as cited in NMFS 2009a), although the timing of migration may vary somewhat due to changes in river flows, dam operations, and water year type (Yoshiyama et al. 1998; Moyle 2002). Winter-run Chinook salmon primarily spawn in the main-stem Sacramento River between Keswick Dam (RM 302) and RBDD (RM 243) (NMFS 2009b). Winter-run Chinook salmon spawn primarily between mid-April and mid-August, with the peak spawning occurring in May and June (Vogel and Marine 1991). Winter-run Chinook salmon embryo incubation in the Sacramento River can extend into October (Vogel and Marine 1991).

Winter-run Chinook salmon fry rearing in the upper Sacramento River exhibit peak abundance during September, with fry and juvenile emigration past RBDD (located approximately 50 river miles upstream of the Action/Project Area for this EA/IS) occurring as early as mid-July and can continue through March (NMFS 1997; Vogel and Marine 1991). Emigration (downstream migration) of winter-run Chinook salmon juveniles past Knights Landing, located approximately

103 river miles downstream of the Action/Project Area, primarily occurs between November and March, peaking in December, with some emigration continuing through May in some years (Snider and Titus 2000a; Snider and Titus 2000b). The numbers of juvenile winter-run Chinook salmon caught in rotary screw traps at the Knights Landing sampling location were reportedly dependent on the magnitude of flows during the emigration period (Snider and Titus 2000a; Snider and Titus 2000b). Additional information on the life history and habitat requirements of winter-run Chinook salmon is contained in the NMFS (2009a) Central Valley Project (CVP) and State Water Project (SWP) Operations Criteria and Plan (OCAP) BO.

Adult and juvenile winter-run Chinook salmon utilize the Sacramento River in the Action/Project Area as a migration corridor. Based on available information, adult winter-run Chinook salmon generally migrate upstream through the Action/Project Area from November through June, and that most juvenile emigration occurs through the Action/Project Area after October.

Spring-run Chinook Salmon

The Central Valley spring-run Chinook salmon ESU is listed as "threatened" under both the Federal and State ESA. Critical habitat was designated for spring-run on September 2, 2005 (70 FR 52488), and includes the mainstem Sacramento River from Chipps Island (RM 0) to downstream of Keswick Dam, and stream reaches such as those of the Feather and Yuba Rivers, Big Chico, Butte, Deer, Mill, Battle, Antelope, and Clear creeks, as well as portions of the northern Delta. The Action/Project Area for this EA/IS is located within designated critical habitat of spring-run Chinook salmon.

Sacramento River spring-run Chinook salmon are known to use the Sacramento River as a migratory corridor to spawning areas in upstream tributaries. Historically, spring-run Chinook salmon did not utilize the mainstem Sacramento River downstream of the Shasta Dam site except as a migratory corridor to and from headwater streams (CDFG 1998).

Adult spring-run leave the ocean to begin their upstream migration in late January and early February (CDFG 1998) and enter the Sacramento River between March and September, primarily in May and June (NMFS 2009a). Lindley et al. (2007) indicate that adult spring-run migrate from the Sacramento River into spawning tributaries primarily between mid-April and mid-June. Butte Creek spring-run Chinook salmon adults migrate from February through June, with the peak occurring in mid-April (SJRRP 2010).

The primary characteristic distinguishing spring-run Chinook salmon from the other runs of Chinook salmon is that adult spring-run Chinook salmon hold in areas proximate to spawning grounds during the summer months until their eggs fully develop and become ready for spawning. Thus, adult spring-run Chinook salmon immigration and holding in the Central Valley occurs from mid-February through September (CDFG 1998; Lindley et al. 2004).

All of the potential spring-run Chinook salmon holding and spawning habitat in the mainstem Sacramento River is located between Keswick Dam and RBDD (CDFG 1998). Spring-run

Chinook salmon spawning occurs during September and October depending on water temperatures (NMFS 2009a). Spawning and embryo incubation has been reported to primarily occur during September through mid-February, with spawning peaking in mid-September (DWR 2004a; DWR 2004b; Moyle 2002; Vogel and Marine 1991).

Some fish may begin emigrating soon after emergence from the gravel, whereas others over-summer and emigrate as yearlings with the onset of intense fall storms (CDFG 1998). The emigration period for spring-run Chinook salmon extends from November to early May, with up to 69 percent of the YOY fish outmigrating through the lower Sacramento River and Delta during this period (CDFG 1998). As described in NMFS (2009a), juvenile spring-run Chinook salmon emigration at RBDD primarily occurs from November through January, and can extend into mid-May. Peak movement of juvenile (yearling) spring-run in the Sacramento River at Knights Landing occurs in December, and again in March and April for YOY juveniles. However, juveniles also are observed between November and the end of May (Snider and Titus 2000a; Snider and Titus 2000b). Additional information on the life history and habitat requirements of spring-run Chinook salmon can be found in the NMFS (2009a) CVP/SWP OCAP BO, and in the NMFS (2011) 5-Year Status Review of the Central Valley spring-run Chinook salmon ESU.

Adult and juvenile spring-run Chinook salmon utilize the Sacramento River in the Action/Project Area as a migration corridor. Adult spring-run Chinook salmon potentially could be migrating upstream through the Action/Project Area between March and September, although peak spawning migration through this area reportedly occurs during May and June. Based on available information, most juvenile emigration occurs through the Action/Project Area from November to May.

Fall-run Chinook Salmon

Central Valley fall- and late fall-run Chinook salmon are considered by NMFS to be the same ESU (64 FR 50394). NMFS determined that listing this ESU as threatened was not warranted (64 FR 50394), but subsequently classified it as a Federal Species of Concern because of specific risk factors, including population size and hatchery influence (69 FR 19975; CDFG 2011c). The Central Valley fall and late fall-run Chinook salmon ESU also is listed as a State Species of Special Concern (CDFG 2011c). The ESU includes all naturally spawned populations of fall-run Chinook salmon in the Sacramento and San Joaquin river basins and their tributaries east of Carquinez Strait, California. Because the Central Valley fall and late fall-run Chinook salmon ESU is not listed as threatened or endangered, critical habitat has not been designated. Although Central Valley fall- and late fall-run Chinook salmon are considered to be the same ESU, they are discussed and considered separately for the purposes of this Draft EA/IS.

In the Central Valley, fall-run Chinook salmon are the most numerous of the four salmon runs, and continue to support commercial and recreational fisheries of significant economic importance. Fall-run Chinook salmon is currently the largest run of Chinook salmon utilizing the Sacramento River system.

Adult fall-run Chinook salmon enter the Sacramento and San Joaquin rivers from July through December (Reclamation 2008). Migration of adult fall-run Chinook salmon into the Sacramento River Basin begins in July, peaks in October, and ends in December (Vogel 2011). Unlike spring-run Chinook salmon, adult fall-run Chinook salmon do not exhibit an extended over-summer holding period (RMT 2010). Rather, they stage for a relatively short period of time prior to spawning. Fall-run Chinook salmon spawn from October through December (Reclamation 2008; Vogel 2011).

Most fall-run Chinook salmon spawning in the mainstem Sacramento River occurs between Keswick Dam and RBDD, although relatively infrequent and small amounts of spawning may extend as far downstream as the Action/Project Area. Review of CDFW 2001 – 2008 aerial redd survey information indicates that of all fall-run Chinook salmon spawning in the upper Sacramento River (i.e., Princeton Ferry to Keswick Dam), an average of only about 1.5 percent occurred in the approximate 15-mile long reach from Ord Ferry Bridge to Hamilton City Bridge, which encompasses the less than 1-mile long Action/Project Area.

In general, the fall-run Chinook salmon spawning and embryo incubation period extends from October through March (NMFS 2004; Vogel and Marine 1991). In the Sacramento River Basin, fall-run Chinook salmon juvenile emigration occurs from January through June (Moyle 2002; Vogel and Marine 1991; Vogel 2011). Juvenile fall-run Chinook salmon emigration at RBDD begins as early as December, peaking in January and February during winter flow events, decreasing through the spring, and extending to as late as June or July (Gaines and Martin 2001, as cited in USFWS and CDFG 2012).

Adult and juvenile fall-run Chinook salmon primarily utilize the Sacramento River in the Action/Project Area as a migration corridor. Relatively infrequent and small amounts of Chinook salmon spawning may occur within the vicinity of the Action/Project Area. Adult fall-run Chinook salmon generally migrate upstream through the Action/Project Area from July through December. Available information indicates that most juvenile emigration occurs through the Action/Project Area from January through June.

Late Fall-run Chinook Salmon

Adult immigration of late fall-run Chinook salmon in the Sacramento River generally begins in late-October, and extends through March (USFWS and CDFG 2012). Spawning has been suggested to occur in tributaries to the upper Sacramento River (e.g., Battle, Cottonwood, Clear, Big Chico, Butte and Mill creeks) and the Feather and Yuba rivers, although these fish do not comprise a large proportion of the late fall-run Chinook population (USFWS 1995). Late fall-run Chinook salmon spawning generally occurs from January through April in the mainstem Sacramento River, primarily from Keswick Dam to RBDD (Moyle 2002; NMFS 2004; Vogel and Marine 1991). However, a 2001-2008 average of less than 1 percent of all reported late fall-run Chinook salmon spawning in the upper Sacramento River occurred in the Ord Ferry Bridge to Hamilton City Bridge Reach.

Late fall-run Chinook salmon embryo incubation can extend from January through June (Vogel and Marine 1991; USFWS and CDFG 2012). Post-emergent fry and juveniles rear and disperse from their spawning and rearing grounds in the upper Sacramento River and its tributaries during the April through December period, with low rates of emigration occurring from July into the fall, although fall and winter freshets may increase emigration rates (Vogel and Marine 1991; Vogel 2011). According to USFWS and CDFG (2012), juvenile late-fall run Chinook salmon rear in the upper Sacramento River from late-April through the following winter before emigrating to the estuary. Late fall-run Chinook salmon yearlings may use flow events as migration cues during the late-fall and winter, and some individuals may continue to emigrate for up to five months (Reclamation 2008).

Adult and juvenile late fall-run Chinook salmon primarily utilize the Sacramento River in the Action/Project Area as a migration corridor. Relatively infrequent and small amounts of late fall-run Chinook salmon spawning may occur within the vicinity of the Action/Project Area. Adult late fall-run Chinook salmon upstream migration through the Action/Project Area can begin during late October and extend through April. Although downstream migration or dispersal of juveniles can occur from April through December, the primary movement of yearlings is believed to occur during late fall and winter months.

Steelhead

The Central Valley steelhead distinct population segment (DPS) is listed as a "threatened" species under the Federal ESA, and has no State listing status. On February 16, 2000 (65 FR 7764), NMFS published a final rule designating critical habitat for Central Valley steelhead. Critical habitat was designated to include all river reaches accessible to listed steelhead in the Sacramento and San Joaquin rivers and their tributaries in California. NMFS proposed new Critical Habitat for spring-run Chinook salmon and Central Valley steelhead on December 10, 2004 (69 FR 71880) and published a final rule designating critical habitat for these species on September 2, 2005. This critical habitat designation includes the Action/Project Area within the Sacramento River.

Central Valley steelhead are known to use the Sacramento River as a migratory corridor to spawning areas in upstream tributaries. Historically, most steelhead likely did not utilize the mainstem Sacramento River downstream from the Shasta Dam site except as a migratory corridor to and from headwater streams (Reclamation 2008).

Adult steelhead immigration into Central Valley streams typically begins in August and continues into March (McEwan 2001; NMFS 2004), and generally peaks during January and February (Moyle 2002). Adult steelhead immigration can occur during all months of the year at RBDD, with upstream migration primarily occurring during September and October (NMFS 2009a). In Mill and Deer creeks, adult steelhead immigration has been represented to not occur from July through September, with peak migration occurring from October through mid-March (NMFS 2009a). Spawning usually begins during late-December and may extend through March,

but also can range from November through April (CDFG 1986). Steelhead reportedly spawn from December through April, with peaks from January though March, in small streams and tributaries (NMFS 2009a). Steelhead spawning in the mainstem Sacramento River is probably limited to the area upstream of RBDD, although specific information regarding steelhead spawning within the mainstem Sacramento River is limited due to lack of monitoring (NMFS 2004, 2009a). Most steelhead prefer to spawn in smaller tributaries (NMFS 2009a).

McEwan (2001) reports that steelhead fry and fingerlings rear and move downstream in the Sacramento River year-round, although most steelhead smolts reportedly emigrate from January through June. Based on CDFW sampling at Knights Landing, juvenile steelhead emigration primarily occurs from January through May with peaks occurring during March and April (Snider and Titus 2000, as cited in NMFS 2009a). Juvenile steelhead emigration at Knights Landing has been variously reported as not occurring from mid-May through mid-December, or June through October (NMFS 2009a).

Similar to the four runs of Chinook salmon, adult and juvenile steelhead primarily utilize the Sacramento River in the Action/Project Area as a migration corridor. Adult steelhead are not known to spawn within the Sacramento River in the vicinity of the Action/Project Area. Adult steelhead are generally believed to migrate upstream through the Action/Project Area from August through March, with peak immigration occurring during January and February. Juveniles may be present during their downstream migration primarily from January through May.

Green Sturgeon

On April 5, 2005, NMFS filed a proposed rule to list the southern DPS of North American green sturgeon as threatened under the ESA. On April 7, 2006, a final rule was issued and adopted, and the southern distinct population segment was listed as threatened. The final rule became effective June 6, 2006 (71 FR 17757 (April 7, 2006)). NMFS (2005) states that the main factor for the decline of the southern DPS of green sturgeon is the reduction of spawning habitat in the Sacramento and Feather rivers. On October 9, 2009, NMFS (74 FR 52300) designated critical habitat for the Southern DPS of North American green sturgeon. In the Central Valley, critical habitat for green sturgeon includes the Sacramento River, lower Feather River, lower Yuba River, the Sacramento-San Joaquin River Delta, and San Francisco Estuary. The Action/Project Area is within designated critical habitat for the Southern DPS of North American green sturgeon.

North American green sturgeon adults in the Sacramento River are reported to begin their upstream spawning migrations into freshwater during late February, prior to spawning between March and July, with peak spawning believed to occur between April and June (Adams et al. 2002). NMFS (2009a) reports that based on recent data gathered from acoustically tagged adult North American green sturgeon, they migrate upstream during May as far as the mouth of Cow Creek, near Bend Bridge on the Sacramento River. Heublein et al. (2009) observed that North

American green sturgeon enter San Francisco Bay in March and April and migrate rapidly up the Sacramento River to the region between GCID to Cow Creek. The fish lingered at these regions at the apex of their migration for 14–51 days, presumably engaged in spawning behavior, before moving back downriver (Heublein et al. 2009). Brown (2007) suggested that spawning in the Sacramento River may occur from April to June, and that the potential spawning period may extend from late April through July as indicated by the rotary screw trap data at the RBDD from 1994 to 2000.

Since 2008 and including 2011 data, green sturgeon spawning habitat has been confirmed within a 58-mile reach of the Sacramento River extending from approximately RM 207 to 265 (Poytress et al. 2012).

After spawning, the adults hold over in the upper Sacramento River between RBDD and Glenn Colusa Irrigation District (GCID) until November (Klimley et al. 2007). Some adult North American green sturgeon rapidly leave the system following their suspected spawning activity and re-enter the ocean in early summer (Heublein 2006).

Larvae and juvenile green sturgeon appear to be nocturnal (Cech et al. 2000), which may protect them from downstream displacement (LCFRB 2004). Green sturgeon larvae and juveniles (up to day 84) forage day and night, but activity is reported to peak at night. At day 110 to 118, juvenile green sturgeon move downstream at night, and habitat preference suggests that juveniles prefer deep pools with low light and some rock structure (Kynard et. al. 2005). Wintering juveniles forage actively at night between dusk and dawn and are inactive during the day, seeking the darkest available habitat (Kynard et al. 2005).

Juvenile green sturgeon migrate downstream and feed mainly at night. Juvenile green sturgeon are taken in traps at the RBDD and the GCID diversion in Hamilton City, primarily in the months of May through August. Peak counts occur in the months of June and July (68 FR 4433). Juvenile emigration may reportedly extend through September (Environmental Protection Information Center et al. 2001).

Green sturgeon primarily utilize the Sacramento River in the Action/Project Area as a migration corridor. Adult green sturgeon spawning occurs in the Sacramento River upstream of the Action/Project Area. Based upon available information, adult green sturgeon most likely migrate upstream through the Action/Project Area during spring, from February perhaps into June. After spawning, the adults hold over in the upper Sacramento River between RBDD and GCID until November, after which time they would be expected to pass through the Action/Project Area, although some adults may rapidly leave the system following spawning and re-enter the ocean in early summer. Juveniles may be present in the Action/Project Area during their downstream migration primarily from May through August, and most abundant during June and July.

Sacramento Splittail

USFWS removed Sacramento splittail from the list of threatened species on September 22, 2003, and did not identify it as a candidate for listing under the ESA. Sacramento splittail are, however, identified as a State Species of Special Concern. Splittail occur in the Sacramento River, its major tributaries, the San Joaquin River and the Delta.

Historically, Sacramento splittail were found as far up the Sacramento River as Redding, yet today are largely absent from the upper parts of their distribution range (Moyle 2002). It has been suggested that during wet years Sacramento splittail may migrate up the Sacramento River as far as RBDD (Moyle 2002). However, the extent of successful spawning in these upstream areas is unclear in consideration that spawning reportedly occurs in inundated, vegetated floodplains.

A gradual upstream migration begins in the winter months to forage and spawn, although some spawning activity has been observed in Suisun Marsh (Moyle 2002). During wet years, upstream migration is much more directed and fish tend to swim further upstream (Moyle 2002). Attraction flows are necessary to initiate travel onto floodplains where spawning occurs (Moyle et al. 2004).

Sacramento splittail are known to spawn on inundated floodplains, particularly within the Yolo Bypass (Moyle 2002). Spawning generally occurs in water with depths of three to six feet over submerged vegetation where eggs adhere to vegetation or debris until hatching (Moyle 2002; Wang 1986). Although Sacramento splittail spawning reportedly can occur anytime between late February and early July, peak spawning occurs during March and April (Moyle 2002). DWR (DWR 2004a) reported that Sacramento splittail spawning, egg incubation and initial rearing in the Feather River primarily occurs during February through May.

After hatching, splittail larvae remain in shallow weedy areas until water recedes, and they migrate downstream (Meng and Moyle 1995). The largest catches of Sacramento splittail larvae occurred in 1995, a wet year when outflow from inundated areas peaked during March and April (Meng and Matern 2001).

Juvenile Sacramento splittail prefer shallow-water habitat with emergent vegetation during rearing (Meng and Moyle 1995). Sommer et al. (2002) reports that juvenile splittail are more abundant in the Yolo Bypass floodplain in the shallowest areas of the wetland with emergent vegetation. Although it has been generally reported that downstream movement of juvenile splittail appears to coincide with drainage from the floodplains between May and July (Caywood 1974; Meng and Moyle 1995; Sommer et al. 1997), large numbers of YOY Sacramento splittail are typically captured in screw traps (set at the base of floodplains) in the Yolo and Sutter bypasses in May, with diminishing numbers in June (Sommer et al. 2004).

Available information suggests that Sacramento splittail spawn within inundated floodplain habitats, particularly in the Yolo Bypass. Because the Action/Project Area generally lacks inundated, vegetated floodplain habitat, it is unlikely that splittail spawn in the vicinity of the

Action/ Project Area. In addition, because suitable spawning habitat is not reported to occur in the vicinity or upstream of the Action/Project Area, it is unlikely that substantial numbers of juvenile splittail migrate through the Action/Project Area. Even if some amount of juvenile migration did occur through the Action/Project Area, it likely would be mostly completed by July.

Hardhead

Hardhead, a California Species of Special Concern, is a large, native cyprinid (minnow) species that is widely distributed throughout the Sacramento-San Joaquin River system, although it is absent from the valley reaches of the San Joaquin River (Moyle 2002).

Hardhead generally occurs in large, undisturbed low- to mid-elevation rivers and streams of the region (Moyle 2002). Hardhead spawning migrations occur during the spring, primarily in small tributary streams (USFWS and CDFG 2012). Most hardhead spawning is reportedly restricted to foothill streams (Wang and Reyes 2007). Hardhead reportedly spawn primarily during April and May (Reeves 1964; Grant and Maslin 1999), but may spawn into August in foothill tributaries (Moyle 2002). Spawning behavior has not been documented, but hardhead are believed to elicit mass spawning in gravel riffles (Moyle 2002). Hardhead forage the bottom of deep pools for aquatic insects, occasionally taking drifting insects on the surface (Moyle 2002).

Little is known about lifestage-specific temperature requirements of hardhead. However, temperatures ranging from approximately 65°F to 75°F are believed to be suitable (Cech et al. 1990), although most streams in which hardhead occur have summer water temperatures higher than 20°C (about 68°F) and optimal water temperatures apparently range from 24 – 28°C (about 75–83°F) (Knight 1985 as cited in Moyle 2002). Water temperature monitoring data is lacking in the vicinity of the Action/Project Area. However, water temperatures at RBDD, located about 65 miles upstream of the Action/Project Area, generally remain below 60°F during summer months (July-September). Therefore, it is not anticipated that water temperatures in the Sacramento River within the Action/Project Area are within the reported optimal water temperature range for hardhead (i.e., 75–83°F).

Based on the reported habitat utilization and water temperature suitability of hardhead, it is anticipated that there is limited potential for substantial numbers of hardhead to occur in the Action/Project Area, with the potential exception of the backwater area of the Big Chico Creek—Sacramento River confluence, which may have more suitable physical habitat conditions and water temperatures for hardhead than in the mainstem Sacramento River. Hardhead are reported to primarily spawn in small tributary streams, particularly foothill streams, and therefore, are not expected to spawn in the Action/Project Area. Adult hardhead could potentially be migrating through the Action/Project Area primarily during their spawning migration to tributaries of the Sacramento River during the spring months. Adult and juvenile lifestages of hardhead could potentially be found in the Action/Project Area year-round, but their distribution in the Action/Project Area would likely be primarily limited to the backwater area of the

confluence of Big Chico Creek and the Sacramento River, where habitat conditions may be suitable for hardhead.

River Lamprey

The river lamprey is not listed under CESA or the Federal ESA, although it is identified as a California Species of Special Concern. River lamprey are reported to be of no sport or commercial value (Fry 1973, as cited in Wang 1986).

River lampreys have generally not been studied in California (Moyle 2002). Most of the available information on their life history is based on studies in British Columbia (UC Davis 2012). Adult river lampreys are reportedly fish parasites in California rivers (Withler 1955; Kimsey and Fisk 1964; Hart 1973, all as cited in Wang 1986). Their most common prey species believed to be herring and salmon (UC Davis 2012).

Adult river lampreys migrate into fresh water in the fall and spawn during the winter or spring months in small tributary streams, although the timing and extent of their migration in California is poorly known (UC Davis 2012). Wang (1986) reports that adult river lamprey spawn from April to June in small tributary streams. Adults create saucer-shaped depressions in gravelly riffles for spawning by moving rocks with their mouths (UC Davis 2012).

Larval river lamprey (ammocoetes) burrow into sandy or muddy substrates near banks (Scott and Crossman 1973; Hart 1973, as cited in Wang 1986), and remain in silt-sand backwaters and eddies (UC Davis 2012). The ammocoete lifestage has been reported to last several years (Hart 1973, as cited in Wang 1986), and is believed be about three to five years (Moyle 2002). Ammocoetes begin their metamorphosis into adults during the summer when they are about 12 cm in total length (UC Davis 2012). During the final stages of metamorphosis, they congregate immediately upriver from saltwater and enter the ocean during late spring (Moyle et al. 1995), indicating that downstream migration of juveniles in the Sacramento River may occur during the winter through spring.

The habitat requirements and environmental tolerances of river lamprey have not been studied in California, but it is has been presumed the adults need clean, gravelly riffles in permanent streams for spawning, while the ammocoetes require sandy or silty backwaters or stream edges in which to bury themselves (Moyle 2002).

Because river lamprey have generally not been studied in the Sacramento River Basin, it is unknown to what extent, if any, river lamprey utilize habitat in the vicinity of the Action/Project Area. Based on their reported general life history and habitat requirements, adults may be migrating upstream through the Action/Project Area during April and May, and ammocoetes may be buried in areas with silty or sandy substrates in backwaters or near river banks within the Action/Project Area year-round. Juvenile downstream migration through the Action/Project Area may potentially occur during the winter through spring.

Pacific Lamprey

The Pacific lamprey is not listed under the California or Federal ESAs, although they are identified as a Federal Species of Concern. Pacific lamprey were petitioned for protection under the ESA in 2003, but USFWS determined that insufficient population information existed to warrant listing.

Adult Pacific lamprey typically migrate into freshwater streams between March and June (Moyle 2002), but upstream migrations have been observed during January and February (Entrix 1996, Trihey and Associates 1996a, both as cited in Moyle 2002). Most upstream movement is reported to occur at night (Moyle 2002; Chase 2001 as cited in USFWS 2010).

Spawning reportedly generally occurs between March and July (USFWS 2010). Spawning habitat requirements of Pacific lamprey have not been well studied, but it is believed that adults need clean, gravelly riffles in permanent streams to spawn successfully and that these requirements are thought to be similar to those of salmonids (Moyle 2002; USFWS 2010). Moyle (2002) reported that, while historic spawning locations of Pacific lamprey are not known, they have been observed spawning in Deer Creek, and likely could have migrated over 300 miles to spawn. Typically, spawning habitat is located near suitable ammocoete habitat and low-to-moderate gradient stream reaches with a mix of silt and cobble substrate are reported to potentially offer optimal spawning and rearing habitat (USFWS 2010).

Moyle (2002) reported that Pacific lamprey embryos hatch in approximately 19 days at 15°C (59°F). Eggs hatch into ammocoetes, spend a short time in the nest, and then drift downstream to suitable areas in sand, silt, or mud substrates (Moyle 2002; USFWS 2010).

Typical ammocoete habitat includes areas of low velocity with muddy or sandy substrate into which they burrow and remain in fresh water for approximately 3 to 7 years. Although mostly sedentary during their freshwater residence, ammocoetes are reported to have the ability to move downstream when disturbed or during high flow events (USFWS 2010).

Ammocoetes begin metamorphosis into macropthalmia (juveniles) when they reach 14-16 centimeters total length. Juveniles reportedly drift and swim downstream between late-fall and spring (USFWS 2010), however, others report that downstream migration is associated with increased streamflows during the winter and spring (Moyle 2002; Chelan County Public Utility District 2006; and Kostow 2002, as cited in USFWS 2010). Juvenile lifestages of lamprey (ammocoetes and macropthalmia), as well as adult lamprey, are reported to stay close to the stream bottom during their migration periods. Juveniles also are reported to prefer low light conditions and migrate mostly during the night (Moursund et al. 2003 as cited in Chelan County Public Utility District 2006).

Because Pacific lamprey have generally not been studied in the Sacramento River Basin, it is unknown to what extent, if any, Pacific lamprey utilize habitat in the vicinity of the Proposed Project. However, because lamprey reportedly spawn in habitats similar to those used for anadromous salmonid spawning, and because anadromous salmonids generally do not spawn

within the Action/Project Area, substantive lamprey spawning also would not be expected to occur in the Action/Project Area. Based on their reported general life history and habitat requirements, adults may be migrating upstream through the Action/Project Area during March through June, and ammocoetes may be buried in areas with silty or sandy substrates in backwaters or near river banks within the Action/Project Area year-round. Juvenile downstream migration through the Action/Project Area may potentially occur during the late-fall through spring.

White Sturgeon

White sturgeon is not listed as threatened or endangered under the Federal or State Endangered Species Acts, nor are they a State Species of Special Concern or a Federal Species of Concern. However, white sturgeon is a recreationally-important species in the Central Valley, and is regulated by CDFW.

Apparently triggered by photoperiod (Doroshov et al. 1997) and increases in river flow (Schaffter 1997), adult white sturgeon initiate their upstream migration into the lower Sacramento River from the Sacramento-San Joaquin Delta (Delta) and estuary during late fall and winter (Kohlhorst and Cech 2001). Some mature adult White Sturgeon move up the Sacramento River until they are concentrated near Colusa from March through May (Kohlhorst et al. 1991 as cited in Kohlhorst and Cech 2001). Although exact spawning locations are unknown, white sturgeon are reported to likely spawn between Knights Landing (RM 90) and Colusa (RM 143) (Kohlhorst 1976 as cited in Wang 1986; Moyle 2002; Shafter 1997 and CDFG 2002 as cited in Beamesderfer et al. 2005), or several kilometers upstream of Colusa (Miller 1972; Kohlhorst 1976; Schaffter 1997, all as cited in Israel et al. 2011). Vogel (2008) sampled adult sturgeon for a telemetry study near GCID between 2003 and 2006 and sampled white sturgeon as far upstream as RM 165.

Based upon the foregoing information, white sturgeon do not utilize the Sacramento River in the Action/Project Area. In the Sacramento River system, white sturgeon reportedly complete their life histories downstream of the Action/Project Area. Consequently, white sturgeon are not further evaluated in this EA/IS.

American Shad

American shad are not listed as threatened or endangered under the Federal or State ESAs, nor are they a State Species of Special Concern or a Federal Species of Concern. American shad are not native to the Central Valley, but they do support recreational fishing, which is regulated by CDFW.

Adult American Shad typically enter Central Valley rivers from April through early July (CDFG 1986), with the majority of immigration (and spawning) occurring from mid-May through June (Urquhart 1987). American shad broadcast spawn in the main channels of rivers, and reportedly spawn in the Sacramento River as far upstream as Red Bluff (Moyle 2002). One female

reportedly may lay from 120,000 to over 500,000 eggs (CDFG 2007). Egg incubation and hatching occurs shortly after spawning and is coincident with the spawning period. American shad larvae are planktonic for about 4 weeks, and drift downstream from spawning areas during this time (Stier and Crance 1985, as cited in Moyle 2002). The primary juvenile summer nursery areas in the Central Valley occur in the lower Feather River, the Sacramento River from Colusa to the north Delta, and to a lesser extent the south Delta (Moyle 2002).

Adult American shad may be migrating upstream through the Action/Project area primarily during April through June, with spawning potentially occurring in the vicinity of the Action/Project Area from about mid-May through June. Egg incubation and hatching is coincident with the spawning period, larvae are planktonic for about 4 weeks and drift downstream from spawning areas during this time. Primary juvenile rearing areas in the Sacramento River are located far downstream of the Action/Project Area, between Colusa and the Delta.

Striped Bass

Striped bass are not listed as threatened or endangered under the Federal or State ESAs, nor are they a State Species of Special Concern or a Federal Species of Concern. Striped bass are not native to the Central Valley, but they do support recreational fishing, which is regulated by CDFW.

In the Sacramento River, striped bass can be found as far upstream as RBDD (Moyle 2002). Adult and juvenile striped bass may be present in Central Valley rivers throughout the year, with peak abundance of adults occurring during the spring months (DeHaven 1979; DeHaven 1977). Striped bass spawning may begin in April, but reportedly peaks during May and early June (Moyle 2002).

In the Sacramento River, most striped bass spawning is believed to occur between Colusa and just downstream of the mouth of the Feather River (Moyle 2002). Sacramento River currents carry the semi-buoyant striped bass embryos and larvae to rearing habitats in the Delta and Suisun Bay (Moyle 2002).

Although most spawning reportedly occurs far downstream of the Action/Project Area, adult and juvenile striped bass could potentially occur within the Action/Project Area year-round.

3.3.2 REGULATORY SETTING

The following laws, regulations, standards, and plans are applicable to fisheries and aquatic resources addressed in this EA/IS.

3.3.2.1 FEDERAL

NATIONAL ENVIRONMENTAL POLICY ACT

NEPA requires Federal agencies to examine the impact of any major Federal actions affecting the environment (42 U.S.C. §102). Federal actions include projects undertaken or funded by the agencies as well as proposals over which the agency has approval powers. NEPA requires Federal agencies to identify and disclose potential impacts on fisheries and terrestrial resources within the Action Area that could potentially be impacted by a Federal Action. USFWS is the lead Federal agency under NEPA for this Proposed Action.

FEDERAL ENDANGERED SPECIES ACT

The Federal Endangered Species Act (ESA, 16 USC Section 153 et seq) requires that both USFWS and the NMFS maintain lists of threatened species and endangered species. An "endangered species" is defined as "…any species which is in danger of extinction throughout all or a significant portion of its range." A "threatened species" is defined as "…*any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range*" (16 USC 1532).

The Federal ESA prohibits the "taking" of any fish and wildlife species listed as threatened or endangered, including the destruction of habitat that would prevent species recovery. "Taking" is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct. Under Federal regulations, "take" is defined further to include habitat modification or degradation where it actually results, or is reasonably expected to result, in death or injury to wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Wildlife Federally listed as threatened also are protected from take, but protection of these species may be modified at the time of their listing.

Section 9 of the ESA makes it illegal to "take" any endangered species of fish or wildlife, and regulations contain similar provisions for most threatened species of fish and wildlife (16 USC 1538).

Section 7 of the ESA requires all Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat. To ensure against jeopardy, each Federal agency must consult with USFWS or NMFS, or both, if the Federal agency determines that its action might impact a listed species. NMFS jurisdiction under the ESA is limited to the protection of marine mammals and anadromous fishes; all other species are within USFWS jurisdiction.

The ESA requires projects that would result in adverse affects on any Federally listed threatened or endangered species to consult with and mitigate through consultation with the USFWS and/or NMFS. This consultation can be pursuant to either Section 7 or Section 10 of the ESA,

depending on the involvement of the Federal government (e.g., Federal funding sources, permits). Consultation with USFWS and NMFS would be necessary if the Proposed Action/Project may affect individuals or critical habitat for Federally listed species (such as Sacramento River winter-run Chinook salmon). Consultation will be conducted under Section 7 of the ESA for this Proposed Action.

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) establishes a management system for national marine and estuarine fishery resources. The 1996 amendments to the Magnuson-Stevens Act (16 USC 1801 et seq.) requires the identification of EFH for Federal-managed fishery species and the implementation of measures to conserve and enhance this habitat. This legislation requires that all Federal agencies consult with NMFS regarding all actions or proposed actions permitted, funded, or undertaken that may adversely affect "essential fish habitat (EFH)." EFH includes specifically identified waters and substrate necessary for fish spawning, breeding, feeding, or growth to maturity and covers a species' full life cycle (16 USC 1802(10)). The Magnuson-Stevens Act states that migratory routes to and from anadromous fish spawning grounds are considered EFH. The phrase "adversely affect" refers to the creation of any impact that reduces the quality or quantity of EFH. Federal activities that occur outside of EFH, but which may have an impact on EFH must be considered in the consultation process. For this Proposed Action, the Sacramento River within the Action Area and portions of Big Chico and Butte creeks potentially affected by the No Action Alternative are considered to be EFH for Chinook salmon.

CLEAN WATER ACT

The Clean Water Act (CWA) is a comprehensive set of statutes aimed at restoring and maintaining the chemical, physical and biological integrity of the nation's waters so that they can support "*the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water*."

Although the United States Environmental Protection Agency (USEPA) has initial authority for the implementation and enforcement of the CWA, in California this authority has been delegated to the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards (RWQCB). For the Proposed Action/Project in this EA/IS, the State has the authority for issuing a Section 401 certification regarding compliance with regulatory standards, and the USACE would be responsible for the issuance of a Section 404 permit for dredging activities. It is USACE's policy that they will not issue a permit until completion of an assessment of the presence of listed, proposed, or species of concern in the Action Area, pursuant to Section 7 of the ESA.

Additional discussion regarding the CWA is provided under Section 3.6 – Hydrology and Water Quality of this Draft EA/IS.

3.3.2.2 STATE

CALIFORNIA ENVIRONMENTAL QUALITY ACT

CEQA, or the California Environmental Quality Act, is a statute enacted in 1970 that requires State and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible. CDFW is serving as the CEQA lead agency for the Proposed Project. This EA/IS was prepared to fulfill CDFW's obligation under CEQA, and in accordance with the CEQA, as amended (Public Resources Code, Section 21000, et seq.) and the State Guidelines for Implementation of CEQA, as amended (California Code of Regulations, Title 14, Section 15000, et seq.). This document complies with CDFW's CEQA procedures for the preparation, processing, and review of environmental documents.

CALIFORNIA ENDANGERED SPECIES ACT

The California Endangered Species Act (CESA, Fish and Game Code Sections 2050 to 2089) establishes various requirements and protections regarding species listed as threatened or endangered under State law. California's Fish and Game Commission is responsible for maintaining lists of threatened and endangered species under CESA.

CESA is one of the laws CDFW administers to protect fish and wildlife resources by regulating the listing and "take" of endangered and threatened species. "*Take*" under California law means to "*…hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch capture, or kill…*" (Fish and Game Code Section 86). A "take" of such a species may be permitted by CDFW through issuance of permits for lawful activities pursuant to Fish and Game Code Section 2081. Under State laws, CDFW is empowered to review projects for their potential impacts to listed species and their habitats.

CESA is similar to the ESA but pertains only to State-listed endangered and threatened species. Under CESA, State agencies are subject to a general duty to "conserve" endangered and threatened species. Thus, "all state agencies, boards, and commissions shall seek to conserve endangered species and threatened species and shall utilize their authority in furtherance of the purposes of this chapter [1.5, regarding Endangered Species]" (Fish and Game Code Section 2055). Consistent with this duty, State agencies "*should not approve projects as proposed which would jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat essential to the continued existence of those species, if there are reasonable and prudent alternatives available consistent with conserving the species or its habitat which would prevent jeopardy*" (Fish and Game Code Section 2053). However, "*in the event specific economic, social, or other conditions make infeasible such alternatives, individual projects may be approved if appropriate mitigation and enhancement measures are provided*" (Fish and Game Code Section 2054).

Pursuant to CEQA (Public Resources Code Section 21104.2), State agencies must consult with CDFW when preparing environmental impact reports to assess the effects of proposed projects

on the continued existence of listed species. Agencies can approve a project that affects a listed species under CEQA, however, if the agency determines that there are "overriding considerations" (CEQA Guidelines Section 15093). This opportunity under CEQA, however, must be harmonized with the need under CESA, mentioned above, to provide "appropriate mitigation and enhancement measures" pursuant to Fish and Game Code Section 2054. CDFW may also authorize "incidental take statements" or "incidental take permits" pursuant to Fish and Game Code Section 2080.1 and 2081 where CDFW determines that existing Federal ESA incidental take authorization meets the standards of CESA or where CDFW ensures that the "*impacts of the authorized take shall be minimized and fully mitigated*".

FISH AND GAME CODE SECTION 1600 ET SEQ.: STREAMBED ALTERATION AGREEMENTS

Under Chapter 6 of the California Fish and Game Code, CDFW is responsible for the protection and conservation of the State's fish and wildlife resources. Section 1600 *et seq.* of the code defines the responsibilities of CDFW and the requirement for public and private applicants to notify CDFW if the project would "*divert, obstruct, or change the natural flow or bed, channel, or bank of any river, stream, or lake designated by the department [CDFG] in which there is at any time an existing fish or wildlife resource or from which those resources derive benefit, or would use material from the streambeds designated by the department*." If CDFW determines that a project may adversely affect existing fish and wildlife resources, a Lake or Streambed Alteration Agreement (LSAA) is required. A LSAA would be required for this Proposed Project.

3.3.3 ENVIRONMENTAL CONSEQUENCES

This Environmental Consequences section includes the following information: (1) the impact assessment methodology used to evaluate potential impacts on fisheries and aquatic resources; (2) the impact analysis, including impact mechanisms associated with evaluated activities under the Proposed Action/Project and the No Action Alternative, and the criteria used to determine the significance of potential impacts to fish and aquatic resources associated with implementation of the Proposed Action/Project; and (3) species-specific impact discussions and determinations associated with implementation of the Proposed Action/Project.

A key requirement of both NEPA and CEQA is the analysis of a project's environmental impacts. The "Environmental Consequences" chapter forms the scientific and analytic basis for the comparison of the Proposed Action/Project and the No Action Alternative (USFWS 2000).

NEPA and CEQA are similar laws with a common purpose of examining and weighing the potential environmental consequences of proposed Federal and State government actions before such actions are undertaken, respectively. The environmental analysis may be approached in the same manner for both NEPA and CEQA, but each law requires certain issues to specifically be addressed (CEQ and OPR 2013).

The Council on Environmental Quality's (CEQ) NEPA regulations describe how to evaluate potential effects of an action broadly and call for the lead agency to focus the analysis on the

relevant effects. Under NEPA, potential effects should be addressed in proportion to their significance (40 CFR § 1502.2(b)), meaning that severe impacts should be described in more detail than less consequential impacts. This is intended to help decision makers and the public focus on the project's key effects (40 CFR § 1508.8). Under NEPA, the general rule is that all alternatives must be analyzed and discussed to the same level of detail.

CEQA does not require alternatives to be addressed at all in negative declarations and mitigated negative declarations. An EIR, however, is required to examine alternatives, which are treated as means of avoiding or lessening one or more of the significant impacts associated with the project, though less detail is necessary than for analysis of the project, provided that the analysis of alternatives allows for meaningful comparison.[2] For an EIR prepared under CEQA, potential impacts that are less than significant need only be briefly described, whereas all potentially significant impacts must be addressed (14 CCR §15128; §15126). To assist lead agencies in evaluating impacts, the CEQA Guidelines provide an environmental checklist in Appendix G of the CEQA Guidelines that often guides the analysis.

Under NEPA, the No Action Alternative provides the frame of reference for determining impacts. The potential impacts, or net difference between the environmental impacts, of the Proposed Action are determined by comparison to the No Action Alternative. In the absence of reasonably foreseeable changes, the No Action Alternative may be no different than the existing affected environment. Conditions under the No Action Alternative should not be considered identical to existing conditions of the affected environment because future actions may occur regardless of whether the Proposed Action/Project is implemented. If it is different, as is the case with the No Action Alternative described and evaluated in this Draft EA/IS, then the differences between the existing affected environment and the No Action Alternative should be discussed (USFWS 2000). For all resources evaluated in this Draft EA/IS, the first analytical comparison titled "No Action Alternative Relative to Existing Conditions" describes the future conditions expected to occur if the Proposed Action/Project is not implemented – future conditions that would be different from the conditions presently experienced under the existing affected environment.

As described in Section 15125 of the State CEQA Guidelines (Title 14, Chapter 9 of the CCR), the environmental setting in an EIR will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant under CEQA. The courts have extended this same approach to negative declarations and mitigated negative declarations.

Therefore, in consideration of the above, the Environmental Consequences section of this Draft EA/IS describes the potential impacts associated with the following analytical comparisons.

[2] http://ceres.ca.gov/ceqa/more/tas/ceqa_nepa/section2.html

- No Action Alternative Relative to Existing Conditions (NEPA Analysis)
- Proposed Action/Project Relative to Existing Conditions (CEQA Analysis)
- Proposed Action/Project Relative to the No Action Alternative (NEPA Analysis)

Additionally, for this joint environmental document, CEQA requires significance determinations but NEPA does not; therefore specific significance determinations in this Draft EA/IS are made under CEQA (CEQ and OPR 2013). For all resources evaluated in this Draft EA/IS, the second analytical comparison titled "Proposed Action/Project Relative to Existing Conditions" is included for CEQA purposes and includes a determination of significance at the end of the discussion in this section.

3.3.3.1 ASSESSMENT METHODOLOGY

This impact assessment methodology describes the considerations and methodologies used to evaluate the potential for short-term, construction-related impacts, in addition to long-term impacts to fisheries and aquatic resources and their habitat. Potential impacts evaluated associated with implementation of the Proposed Action/Project primarily include short-term construction-type impacts associated with dredging and spoils disposal activities, and maintenance of the rock-toe and tree revetment (revetment). Under the No Action Alternative, potential impacts evaluated include both short-term construction-related impacts (primarily associated with removal of the revetment), and long-term impacts associated with removing the revetment, reduced performance of the M&T/Llano Seco Pumps Facility (including the fish screen), re-initiating diversion in Big Chico Crek and increasing diversion from Butte Creek.

Potential short-term impacts would generally be limited to the immediate Action/Project Area and would primarily be associated with construction activities. Potential construction-related impacts evaluated for the Proposed Action/Project include those associated with suction dredging, spoils disposal, and rock-toe and tree revetment (revetment) maintenance. The evaluation of potential short-term construction-related impacts is based on several considerations, including: (1) timing of project activities; (2) species-specific lifestage periodicity and habitat utilization in the Action/Project Area; (3) the potential for impacts to fish species of focused evaluation and their habitat, including the potential for physical injury or mortality, the potential for water quality impairment (e.g., the potential for hazardous spills and increased turbidity), and the potential for altering physical habitat conditions; and (4) the potential for altering freshwater ecosystem dynamics (e.g., predator-prey interactions and proliferation of invasive species).

The potential for long-term impacts to fish and aquatic resources are associated with reasonably foreseeable actions that would occur under the No Action Alternative (i.e., removal of the revetment, reduced performance of the M&T/Llano Seco Pumps Facility intake screen, re-initiating diversion in Big Chico Creek and increasing diversions from Butte Creek). Discussion of the potential for long-term impacts associated with the No Action Alternative specifically

addresses the west bank of the Sacramento River in the vicinity of the existing revetment, and within Butte and Big Chico creeks downstream of the anticipated future locations of diversion.

The discussion of potential long-term impacts associated with removal of the revetment under the No Action Alternative is based primarily on documented historical physical habitat conditions at the site of the existing revetment (e.g., river meandering and erosion rates) prior to construction of the revetment. The principles of the Standard Assessment Methodology, composed by the U.S. Army Corps of Engineers (2004), propose a technique for systematically analyzing, through a linked multi-parameter (habitat variable) quantification model application, the value of aquatic habitat as it pertains to lifestage responses of focus species. Although the specific models were not utilized for assessment purposes in this document, the principles and concepts of habitat alteration associated with the No Action Alternative were used in the evaluation of potential impacts to species of focused evaluation. Habitat variables considered include bank slope, substrate size, instream woody material and instream object cover, hydraulics, and overhanging shade/cover.

The discussion of potential long-term impacts associated with re-initiation of diversion in Big Chico Creek and increasing diversions from Butte Creek is based on the following considerations: (1) timing of anticipated diversions in Big Chico and Butte creeks (based on historical timing of the diversions prior to their discontinuation in 1997); (2) special-status species-specific lifestage periodicity in Big Chico and Butte creeks downstream of the diversions; and (3) the potential for impacts to special-status fish species associated with the diversions in Big Chico and Butte creeks, such as reduced flows and the potential for reduced flow-dependent habitat availability and less suitable habitat conditions.

3.3.3.2 SIGNIFICANCE CRITERIA

The significance criteria used to evaluate impacts on biological resources are based on and incorporate guidance contained in Section 1508.27 of the Council on Environmental Quality (CEQ) NEPA regulations regarding significance determinations; the mandatory findings of significance, as listed in Section 15065 of the State CEQA Guidelines (Title 14, Chapter 3 of the CCR); and criteria contained in Appendix G, “Environmental Checklist Form,” of the CEQA Guidelines.

The CEQ NEPA regulations found in Title 40, Code of Federal Regulation (CFR) requires agencies to undertake an assessment of the environmental effects of their proposed actions prior to making a decision. Section 1508.27 of those regulations defines the word *significantly*, which comes into play in the statutory mandate under NEPA for Federal agencies to prepare Environmental Impact Statements for major Federal actions *significantly* affecting the human environment. (42 U.S.C. Section 4321.) Under Section 1508.27, Federal agencies, in determining whether a major Federal action significantly affects the human environment, should consider both the *context* and the *intensity* of the effects at issue. Context relates to the setting for the proposed action (i.e., whether it is regional or local in scale). Intensity “refers to the severity of

impact." Among the factors to be considered in assessing intensity are "[t]he degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973."

In enacting CEQA, the Legislature found and declared that it was the policy of the State, among other things, to "[p]revent the elimination of fish or wildlife species due to man's activities" and "insure that fish and wildlife populations do not drop below self-perpetuating levels" (Public Resources Code Section 21001[c]). Under CEQA Guidelines section 15065, which echoes this policy statement, impacts are significant under CEQA if a proposed project would result in any of the conditions listed below.

- Substantially reduce the habitat of a fish or wildlife species.
- Cause a fish or wildlife population to drop below self-sustaining levels.
- Threaten to eliminate a plant or animal community.
- Substantially reduce the number or restrict the range of an endangered, rare or threatened species.

These impact categories, originally formulated in the 1970s, are broadly framed and leave room for expert judgment and application. The sample Initial Study Checklist found in Appendix G to the CEQA Guidelines identifies questions lead agencies should generally ask with respect to a proposed project's potential impacts on biological resources. These questions are often used to give rise to significance thresholds where a proposed project would do any of the following.

- 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 USFWS or CDFW.
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by USFWS or CDFW.
- 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.
- Conflict with any local policies or ordinances protecting biological resources.

For this analysis, all of the general criteria described above have been tailored to specifically evaluate potential project-related impacts on fish and aquatic resources as they might be affected by the Proposed Action/Project given its physical setting. Based on the foregoing general criteria, the Proposed Action/Project would have an adverse effect under NEPA and a significant impact under CEQA on fish and aquatic resources if it would contribute to any one of the following within the potentially affected environment:

- Degradation in the quantity or suitability of aquatic habitat of sufficient magnitude and/or duration to substantially affect species of focused evaluation.
- Loss of existing riparian habitat and/or SRA cover of sufficient magnitude and/or duration to substantially affect species of focused evaluation.
- Increase in predation of magnitude and/or frequency to substantially affect species of focused evaluation.
- Habitat modification or degradation of sufficient magnitude to substantially interfere with the movement (or migration) of species of focused evaluation.

Because the Proposed Action/Project would not result in the removal, filling or hydrologic interruption of water that could cause substantial adverse effects on fisheries and aquatic resources in Federally protected wetlands, this CEQA threshold is not addressed further in Section 3.3. Potential impacts to wetlands are addressed in Section 3.4 – Terrestrial Resources.

Presently, there are no adopted HCPs, NCCPs, or other approved local, regional, or State habitat conservation plans in the Action/Project Area that address fisheries resources. Therefore, this CEQA threshold is not considered further.

3.3.3.3 IMPACT ANALYSIS

Summarized below are the activities (e.g., dredging, spoils disposal, revetment removal) associated with the Proposed Action/Project or the No Action Alternative that have the potential to impact fisheries and aquatic resources, the mechanisms (e.g., turbidity, hazardous spills, physical habitat alteration) by which these activities have the potential to affect fisheries and aquatic resources and their habitat, how (e.g., behaviorally, physiologically) these phenomena can potentially impact fisheries and aquatic resources, and protective measures that will be implemented to avoid or minimize any potential impacts. As described in Chapter 2, resource-specific environmental commitments have been incorporated into the Proposed Action/Project. Detailed descriptions of the activities and impact avoidance and minimization measures associated with the Proposed Action/Project are provided in Chapter 2 of this EA/IS and in Appendix I (Draft MMRP).

Because the activities associated with the Proposed Action/Project have the potential to influence the same types of impact mechanisms and produce similary resultant effects on various fish species, the analysis below first addresses potential effects in a general manner, followed by more species-specific application, if necessary. The evaluations below describe the types of physical and biological effects to fisheries and aquatic resources that could occur as a result of the Proposed Project under the following three scenarios.

- No Action Alternative Compared to Existing Conditions (NEPA Analysis)
- Proposed Action/Project Compared to Existing Conditions (CEQA Analysis)
- Proposed Action/Project Compared to the No Action Alternative (NEPA Analysis)

Following the presentation of technical information, a conclusion is made at the end of each analytical comparison regarding whether the scenario evaluated, relative to the basis of comparison, would have an adverse effect under NEPA or a significant impact under CEQA on fisheries and aquatic resources, as appropriate.

NO ACTION ALTERNATIVE RELATIVE TO EXISTING CONDITIONS (NEPA ANALYSIS)

Under the No Action Alternative, the existing rock-toe and tree revetment would be removed, and dredging of sediment deposited in the vicinity of the M&T/Llano Seco Pumps Facility intake would not occur.

Because the existing 1,520-foot long rock-toe and tree revetment on the west bank of the Sacramento River in the Action/Project Area was originally anticipated to be a temporary structure, it also is anticipated that the revetment would be removed under the No Action Alternative once available funding was secured for the long-term project and appropriate regulatory compliance activities completed. Following revetment removal, it is probable that erosion of the west bank would continue to occur and the Sacramento River would continue to migrate to the west.

Consequently, the No Action Alternative would be expected to result in continued deposition of sediment proximate to the intake, and the continued downstream extension of deposited materials in the Sacramento River. This would result in the fish screen criteria not being met at the M&T/Llano Seco Pumps Facility intake screen, with the associated potential to adversely affect special-status fish species in the vicinity of the intake. Further, if diversions at the M&T/Llano Seco Pumps Facility intake were severely restricted or could no longer be made, then historical diversions from both Big Chico and Butte creeks could be either re-initiated or increased, respectively, to compensate for the loss of diversion from the Sacramento River.

The potential effects associated with the No Action Alternative on fisheries and aquatic resources are discussed below.

Removal of the Temporary Rock-toe and Tree Bank Revetment

The No Action Alternative includes removal of the rock-toe and tree revetment that was installed in 2007. As described in Chapter 2, this would entail removal of the approximately 9,120 tons of rock, several tiebacks, and tree clusters that were created from about 390 almond trees. Revetment removal activities would be anticipated to utilize similar access and staging areas, equipment and materials, personnel, and project commitments as were used in the construction and placement of the revetment in 2007. Rock-toe and tree revetment removal activities relevant to the potential for affecting fish species of focused evaluation are summarized below.

It is anticipated that rock and vegetation would be removed from the Sacramento River using a dragline, and removed from the revetment working along the top of the approximately 15-foot high bank. Excavation activities for removing rock tiebacks would be conducted with a dragline.

Removed material would be dumped on a 20-foot wide working area, and then loaded onto a dump truck for removal from the site.

Removal of the revetment could potentially result in short-term construction-related impacts and long-term habitat alteration impacts to fisheries and aquatic resources, and are further discussed below.

Construction-Related Impacts

Construction-related activities associated with the removal of the revetment have the potential to affect fish species of focused evaluation due to the potential for: (1) erosion, sedimentation and turbidity; (2) hazardous materials and chemical spills; (3) vibration and pressure waves; (4) direct harm; and (5) increased susceptibility to predation, as further discussed below.

Erosion, Sedimentation, and Turbidity

Activities associated with removing the existing rock-toe and tree revetment, as well as access, staging, storage, and disposal areas have the potential to contribute sediment and increase turbidity in waters within and downstream of the construction area above those levels generally found under Existing Conditions. Although most fish species are migratory and capable of moving freely throughout the Affected Environment, a sudden localized increase in turbidity may potentially affect some juvenile salmonids by temporarily disrupting normal behaviors that are essential to growth and survival such as feeding, sheltering, and migrating (NMFS 2003). Behavioral avoidance of turbid waters may be one of the most important effects of suspended sediments on salmonids (Birtwell et al. 1984; DeVore et al. 1980; Scannell 1988). Salmonids have been observed moving laterally and downstream to avoid turbidity plumes (Lloyd 1987; McLeay et al. 1984; Scannell 1988; Servizi and Martens 1991; Sigler et al. 1984). Potential turbidity increases also may affect the sheltering abilities of some fish species and may decrease their likelihood of survival by increasing their susceptibility to predation (NMFS 2003). It is possible that potential turbidity increases could result in similar effects to other (non-salmonid) fish species.

Downstream effects on fish from introduced sediment associated with construction-related activities are dependent on the lifestages present, the particle size distribution of introduced sediment, the concentration of suspended solids, and on the magnitude of instream flows (Cordone and Kelley 1961; Redding et al. 1987; Reid and Anderson 1999). Evidence from installation of pipelines within streams of various sizes indicates that sediment-induced effects diminish downstream from the construction area (Reid and Anderson 1999). Additionally, Reid and Anderson (1999) reported that recovery of fish populations, invertebrate fauna, and substrate integrity occurs within six weeks to two years after construction.

Exposure duration reportedly is a critical determinant of the occurrence and magnitude of potential physical or behavioral effects associated with increased turbidity (Newcombe and MacDonald 1991). Salmonids and other native fish species have evolved in systems that

periodically experience short-term pulses (days to weeks) of high suspended sediment loads, often associated with flood events, and are adapted to such high pulse exposures. Adult and larger juvenile salmonids reportedly appear to be little affected by the high concentrations of suspended sediments that occur during storm and snowmelt runoff episodes (Bjornn and Reiser 1991). However, research indicates that chronic exposure can cause physiological stress responses that can increase maintenance energy use and reduce feeding and growth (Lloyd 1987; Redding et al. 1987; Servizi and Martens 1991). Other studies, however, have reported that increased instream sediment loads do not significantly affect some species, including Chinook salmon (Cordone and Kelley 1961; Redding et al. 1987; Reid and Anderson 1999). Gregory and Levings (1998) reported that turbidity also provides refuge and cover from piscivorous fish and birds. In rivers with intense predation pressure, this benefit (i.e., enhanced survival) may balance the cost of detrimental physical effects (i.e., reduced growth). Turbidity levels of about 23 NTUs have been reported to minimize predation risk of some fish species (Gregory 1993).

Removal of the rock-toe and tree revetment likely would occur from the top of the bank. Although the removal of the revetment would be conducted from the river bank, the bucket of the dragline would enter the water column to remove materials. Therefore, temporary increases in turbidity would be expected in the Sacramento River at and proximately downstream of the existing revetment for the duration of the construction period. In addition, due to the movement of traffic between the construction staging areas, and storage and disposal areas, as well as from general construction activity, the potential exists for dirt and dust to accumulate on access roads and enter the Sacramento River as sediment throughout the construction period.

Hazardous Materials and Chemical Spills

Hazardous materials and chemicals in the form of gasoline, engine oil, lubricants, or other fluids used during construction activities could potentially enter the Sacramento River as a result of seepage or accidental spills. Accidental discharge of hazardous materials and chemicals could potentially affect fish that may be present in the immediate vicinity and downstream of the construction area by increasing physiological stress, altering primary and secondary production, and causing direct mortality.

The potential for hazardous materials and chemicals to enter the Sacramento River would expected to be greatest during removal of the revetment. However, because construction equipment would be operated from the shore, the potential for large quantities of hazardous materials and chemicals to enter the Sacramento River would likely be minimal.

Underwater Noise

During removal of the revetment, the potential exists for vibration and pressure waves generated by dragline activities to affect fish species in the vicinity of the construction activities. However, because construction equipment would be operated from the shore, the noise levels produced by removal activities are not expected to reach a level associated with adverse effects. For example,

it is assumed that the sound pressure level of a dragline would not exceed about 120 dB, well below the behavioral threshold (i.e., 150 dB) and injury thresholds (i.e., peak pressure of 206 dB; SEL of 183 and 187 dB) identified by NMFS for evaluating pile driving impacts on anadromous salmonids (see the section, below, evaluating underwater noise associated with dredging activities for additional discussion). Moreover, because excavation machinery will be located above water, the noise levels under water would be lower than those created in the air. Underwater noise would be generated by the dragline bucket scraping on the rocks during the rock-toe revetment removal. However, such noise also would be expected to be well below the behavioral and injury thresholds that were developed associated with impact pile driving.

Direct Harm

Because removal of the revetment includes using heavy machinery to remove the revetment structure, the machinery and its removal of large rock has some limited potential to directly "harm" juvenile fishes by direct physical contact, including physical injury or mortality. While no construction equipment would be located in the Sacramento River, the removal of portions of the revetment underwater could result in physical contact between a rock or the machinery and an individual fish. However, it would be expected that any individuals potentially present would vacate the immediate area in response to short-term increases in noise, turbidity and disturbance during construction activities, and relocate subsequent to construction.

Predation Risk

Construction activities associated with the removal of the revetment have the potential to increase the risk of predation of fish in the vicinity of the existing revetment due to the potential for increased erosion, sedimentation and turbidity, the potential for hazardous materials and chemical spills, increased noise levels, and localized physical disturbance.

As previously discussed, removal of the revetment has the potential for increasing turbidity and has the potential for resulting in chemical seepage or spills. It has been reported that behavioral avoidance of turbid waters may be one of the most important effects on fishes of suspended sediments (Birtwell et al. 1984; DeVore et al. 1980; Scannell 1988). Because increased turbidity and sedimentation could cause changes in fish behavior, the potential for predation also could be increased. Potential seepage or spilling of chemicals also could result in physiological stress and/or avoidance behavior, resulting in the potential for increased susceptibility to predation. Noise and physical disturbance has the potential to result in temporary relocation of fish away from the immediate construction activity. However, the amount of potential increased predation on juveniles of special-status fish species that could result from potential temporary displacement during construction-related activities is not expected to be substantial.

Rock-Toe and Tree Revetment Removal Construction-related Impact Avoidance and Minimization Measures

It would be anticipated that standard construction-related impact avoidance/minimization measures that could be implemented during rock-toe revetment removal would be similar to those that were described for installation of the revetment in the 2007 EA/IS (CDFG and USFWS 2007). As described in the 2007 Final EA/IS (CDFG and USFWS 2007), "…*potential impacts associated with revetment removal would be less than significant with mitigation incorporated. Specifically, removal of the rock revetment after the five-year planning period would result in impacts similar to those associated with construction of the revetment. Additionally, these impacts would be mitigated in similar manner to those mitigation measures implemented for construction of the revetment*."

Therefore, it is reasonably expected that impact avoidance and minimization measures that were implemented with placement of the rock-toe and tree revetment also would be implemented with revetment removal. These measures include typical impact avoidance measures and BMPs (e.g., a Stormwater Pollution Prevention Plan as required by the conditions of an NPDES permit, and complying with the RWQCB Section 401 Permit conditions). A Spill Prevention and Response Plan to minimize the potential for chemical spills or seepage into the Sacramento River. Standard construction practices to avoid direct physical harm such as the operation of equipment slowly and deliberately to alert and scare adult and juvenile salmonids away from the work area, such as operating the dragline bucket to splash-cast the bucket into the water, and a person wading ahead of the equipment to scare fish away from the work area. In addition, an environmental awareness training program would be implemented for construction personnel.

In consideration of the impact avoidance and minimization measures, as well as the July 1 through October 15 in-river construction window specifically established to avoid/minimize potential effects on special-status fish species, it is expected that construction-related activities associated with rock-toe and tree revetment removal would not substantially affect fish species of focused evaluation.

Aquatic Habitat Modification Impacts

In addition to the potential for short-term construction-related impacts associated with removal of the rock-toe and tree revetment described above, removal of the revetment also would result in changes of both intermediate and long-term duration in physical habitat conditions in the vicinity of the existing revetment. Aquatic habitat modification associated with the No Action Alternative would result in continued erosion of the west bank of the Sacramento River which would occur as a result of flood flows and, to a lesser extent, wave wash associated with boat traffic through the area. The western bank would continue to migrate in a westerly direction. Episodic turbidity (and subsequent downstream sedimentation) would be associated with bank erosion events, although turbidity (and sedimentation) would be masked if erosion occurs during high-flow events when the river is already extremely turbid. If the annual rate of bank erosion

under the No Action Alternative resumed at a rate similar to that which was observed at the site between 1996 and 2006 (i.e., pre-revetment installation), annual erosion rates could range from about 20 to 60 feet per year, with up to 100-feet per year during wet winters. Assuming that future erosion rates and hydrologic conditions would be similar to those observed in the past, additional erosion of 100-feet and 500-feet could occur over a subsequent five-year period (CDFG and USFWS 2007).

On a short-term basis over the next few years, the continued erosion of the bank would result in the continued exposure of loose sand substrates, the predominance of relatively high bank slopes, and a general lack of instream object (hydraulic roughness) elements (**Figure 3.3-1**).

Over a longer term, continued erosion would eventually begin to affect the recently restored riparian habitats on the Capay Unit of the SRNWR (for additional detail, see Section 3.4.3.3), potentially undercutting the root systems of larger trees and shrub species that inhabit the recently restored vegetation communities comprised of Valley Oak Woodland, Valley Oak Riparian Forest and Cottonwood Riparian Forest. As the Sacramento River continues to migrate west over time under the No Action Alternative, it is anticipated that individual trees and/or shrubs from these three community types would become unstable, potentially being recruited into the Sacramento River as instream woody material (IWM).

Figure 3.3-1. Photograph of the Upstream End of the West Bank of the Sacramento River at the Upstream End of the Site Prior to Construction of the Rock-toe and Tree Revetment (Photo Taken on 10/24/2006) (Source: Tetra Tech 2012a).

Shaded Riverine Aquatic Habitat

Shaded riverine aquatic (SRA) habitat is defined by the USFWS (1992), as the "…*unique, nearshore aquatic area occurring at the interface between a river (or stream) and adjacent woody riparian habitats*." Key characterizations of this nearshore aquatic area include: (1) the adjacent bank being composed of natural, eroding substrates supporting riparian vegetation that either overhangs or protrudes in the water; and (2) the water containing variable amounts of IWM, such as leaves, logs, branches, and roots, often substantial detritus, and characterized by variable water velocities, depths, and flows.

Riparian habitats are considered to be one of the most ecologically productive and diverse terrestrial environments (NMFS 2003). Vegetation in riparian areas influences channel processes by stabilizing bank lines through root reinforcement, providing a source of IWM, and by retaining sediment during high-flow events. Riparian areas provide energy sources for aquatic organisms by producing organic input (e.g., leaf litter) and terrestrial organisms that fall into the water and are preyed upon by fish. Riparian vegetation also provides shade that regulates light and water temperature regimes (Naiman and Decamps 1997). In addition, riparian vegetation and large wood can provide low velocity habitat for fish during periods of flooding, while instream large wood provides similar habitat, as well as shelter from predators, habitat for prey species, and sediment storage and channel stability (Spence et al. 1996). Fish species, including anadromous salmonids, utilize the microhabitats created by streamside vegetation for cover and thermal refuge, especially during fry and juvenile lifestages (DWR 2003; NMWC 2004).

The following sections describe the potential effects of removing the rock-toe and tree revetment by addressing key attributes of SRA habitat. Key attributes addressed include overhanging shade/cover, instream woody material, bank slope (and associated water depth and velocity), and substrate.

Overhanging Shade/Cover

Removal of the rock-toe and tree revetment would result in changing the characteristics of overhanging shade/cover as represented by riparian vegetation. On a short-term basis, it is reasonable to assume that removal of the revetment would result in conditions similar to those that existed prior to installation of the revetment in 2007 because the plants that have volunteered on the revetment since 2007 would no longer be present.

Prior to construction of the rock-toe and tree revetment, riparian vegetation and overhanging shade/cover was sparse on the west bank of the Sacramento River in the Action/Project Area. For the most part, vegetation above the eroding bank consisted of grasses, which did not provide overhanging shade or cover. The exception was the riparian vegetation associated with the estimated 250 linear feet of riparian habitat bordering the Sacramento River in the downstream portion of the Action/Project Area. At this location, the riparian forest was characterized as a tall overstory of deciduous broadleaf trees comprised primarily of valley oak. Other native riparian forest species include Fremont cottonwood, box elder (*Acer negundo*), Oregon ash (*Fraxinus*

latifolia), and western sycamore (*Platanus racemosa*). Understory species in the Action/Project Area riparian forest community include poison oak (*Toxicodendron diversilobum*), wild blackberry (*Rubus ursinus*), Himilayan blackberry (*Rubus discolor*), wild grape (*Vitis californica*), elderberry (*Sambucus nigra ssp. Caerulea*) and saplings of tree species (CDFG and USFWS 2007).

Since construction of the rock-toe and tree revetment in 2007, voluntary recruitment of riparian vegetation has occurred in the revetment area. Monitoring conducted during November 2011 demonstrates the recruitment of woody riparian vegetation. Woody vegetation (primarily willows and box elders) has become established on top of the rock-toe, at the base of the bank, and on the lower angle portions of the bank above the rock-toe. According to Tetra Tech (2012a), significant numbers of riparian plants have volunteered onto both the top of the rock revetment and onto the reduced-angle lower bank slope above the contact with the revetment. The large woody debris piles anchored on the top of the rock-toe appears to be sites of preferential establishment of boxelders, sycamore and willows (**Figure 3.3-2**), probably because of their effects on local flow velocities (Tetra Tech 2012a).

Figure 3.3-2. Upstream View of the Lower (Downstream) End of the Rock-toe and Tree Revetment. In Addition to the Embedded Tree Clusters, Note the Presence of Volunteered Riparian Vegetation Species Including Sycamore, Box Elder and Willows on the Ssurface of the Rock (Source: Tetra Tech 2012a).

Under the No Action Alternative, removal of the rock-toe and tree revetment would result in the removal of volunteer woody vegetation that has become established along the bank immediately above of the rock-toe, and within and proximate to the clusters anchored on top of the rock-toe. The removal of the rock-toe and tree revetment also would be expected to result in the discontinued recruitment of woody riparian vegetation along the west bank of the Sacramento River presently represented by the the volunteer woody vegetation made up of willows, box elders and sycamores. It is reasonable to assume that removal of the revetment would immediately result in conditions similar to those that existed prior to installation of the revetment in 2007. Because the localized area on top of the bank would be disturbed during the removal of the revetment by operation of the dragline, it is expected that this area would provide minimal overhanging shade/cover immediately after revetment removal. This localized area would not be expected to provide overhanging shade/cover for several years until the bank has eroded and become more proximate to the stands of existing and restored riparian vegetation on the Capay Unit.

In the absence of the rock-toe revetment and because the eastern third of the Capay Unit is located within the 150-year meander zone (i.e., Inner River Zone), it is also expected that the Sacramento River would resume its westward migration in the vicinity of the Capay Unit. Assuming that future erosion rates and hydrologic conditions would be similar to those observed in the past, rates could range from about 20 to 60 feet per year (near-term), or an additional erosion of 100-feet and 500-feet could occur over a subsequent five-year period (CDFG and USFWS 2007).

Between 2007 and 2010, TNC, supported by the USFWS, CALFED Bay-Delta Program, and the National Wild Turkey Federation, spent three years restoring 570 acres of the Capay Unit, transforming the former agricultural lands, which were primarily orchards, into native grasslands, savanna, and riparian forest (Daugherty 2010; USFWS 2010a). Through these efforts, several new plantings of native trees and plants, including elderberry shrubs, added to the pre-existing 90 acres of riparian forest (Daugherty 2010).

The arrangement of restoration plantings at the Capay Unit were designed to maximize structural and compositional diversity, both vertically and horizontally, across the fields that now comprise the Capay Unit (TNC 2005). Planting strips were aligned with the directional flow of the Sacramento River. Plants were spaced 11 feet apart in the planted rows and the rows are spaced at 15 feet apart (spacing = 11' x 15' for cottonwood riparian forest, mixed riparian forest, valley oak riparian forest) or 30 feet apart (spacing = 11’ x 30’ for elderberry savanna and valley oak woodland). These spacings were calculated to ensure a planting density of 264 overstory plants per acre (mixed riparian forest, cottonwood riparian forest, valley oak riparian forest) or 132 overstory plants per acre (elderberry savanna and valley oak woodland) (TNC 2005).

Where appropriate, an understory plant (e.g., shrub, forb, grass, or vine) was planted either next to an overstory plant or clustered with other understory plants (TNC 2005). The grassland community, and the understory components of the other five communities (i.e., cottonwood

riparian forest, mixed riparian forest, valley oak riparian forest, valley oak woodland, and elderberry savanna) was seeded in grasses and forbs. Where possible, restoration efforts used local ecotypes for understory species, preferably collected within 20 miles of the restoration site (TNC 2005). The restoration work was completed in 2010.

Without the revetment in place, continued erosion of this area is expected to recruit overhanging shade and cover after the first few years following revetment removal. As river processes continue to work and the bank retreats from the current bank edge near the revetment, the recently restored habitat located about 60 feet inland would become exposed to the erosive processes of the river. As an example of the inland vegetation that would eventually be affected, terrestrial resource surveys conducted during 2012 report that individual elderberry shrubs within the Action/Project Area on the Capay Unit generally ranged from between 8 to 20 feet in height. Continued long-term erosion would eventually begin to undercut the root systems of the recently restored riparian habitats on the Capay Unit, which may include vegetation such as herbland cover, native grassland, blackberry scrub, riparian scrub, mixed riparian forest, cottonwood riparian forest and valley oak. Eventually, as the west bank erodes, larger woody and riparian species near the edge of the migrating river bank could serve as SRA habitat that overhangs above the water's edge and provides shade and cover for aquatic species near the west bank of the Sacramento River.

Removal of the rock-toe and tree revetment, as part of the No Action Alternative, would be expected to provide a near-term, immediate decrease in the amount of riparian vegetation (hence, overhanging shade/cover), particularly in consideration of the fact that the riparian vegetation that has become and will continue to become established in the bank immediately above the rock-toe matures over time. In annual surveys by USFWS (Michny 1989; Michny and Deibel 1986) above the SRBPP project area (between Chico Landing and Red Bluff), only about 10–20 percent as many juvenile salmon were present along riprap as along non-riprapped natural riverbanks, and the highest densities of juveniles always occurred in areas with shaded riparian cover. The near-term, immediate decrease in overhanging shade/cover associated with revetment removal is expected to provide species of focused evaluation decreased predator avoidance/escape cover from avian predators, decreased productivity and nutrient inputs from allochthonous leaf litter, and decreased food sources to juvenile lifestages, and decreased shading and microhabitat thermal refugia for species of focused evaluation. These adverse effects to the juvenile lifestage of species of focused evaluation, in particular anadromous salmonids, could be realized immediately at the time of revetment removal. Over a longer period of time, these potential near-term impacts could be offset as the migrating river bank approaches areas of more mature vegetation in the restored habitat areas on the Capay Unit, which could then serve as SRA habitat and potential sources of IWM. However, achievement of such aquatic habitat benefits would be dependent on the timing and magnitude of hydrologic conditions in the Sacramento River. As previously discussed, it is anticipated that bank erosion could extend into the restored areas within one to a few years.

Instream Woody Material

IWM is of particular importance to healthy riverine ecosystems, and reportedly may be the most important structural component promoting stable fisheries resources (National Research Council 1996) because it is an important feature in physical habitat formation, sediment and organic-matter storage, and in maintaining both essential habitat complexity and refugia (USFWS 2000). The influence of IWM on the bioenergetics and the mortality risk of fish species likely varies with the size of the fish and its predators. Instream object cover, such as IWM, may produce offsetting effects. Although IWM provides juvenile fish with predator avoidance/escape cover, IWM also may attract and provide velocity refugia and feeding stations for predators. Nonetheless, IWM is assumed to provide overall benefits for juvenile fish by providing velocity refugia, feeding stations, and predator avoidance/escape cover.

Removal of the rock-toe and tree revetment would result in changing the distribution and abundance of IWM along the west bank of the Sacramento River. Near-term, it is reasonable to assume that removal of the revetment would result in conditions similar to those that existed prior to installation of the revetment in 2007. Over a longer period of time, these potential near-term impacts could be offset as the migrating river bank approaches areas of more mature vegetation in the restored habitat areas on the Capay Unit, which could then serve as potential sources of IWM.Prior to construction of the rock-toe and tree revetment, IWM was largely not present on the west bank of the Sacramento River in the Action/Project Area. For the most part, vegetation above the eroding bank consisted of grasses, and continued erosion of this area without the rock-toe and tree revetment was not expected to recruit substantive amounts of IWM. The exception was the riparian vegetation associated with the estimated 250 linear feet of riparian habitat bordering the Sacramento River in the downstream portion of the Action/Project Area. Although the specific amount of inundated IWM at that location was not estimated, it was acknowledged that as the west bank of the Sacramento River continued to erode, flows would continue to undercut stands of vegetation resulting in the deposit of small and large woody material into the Sacramento River.

Consequently, the 2007 construction of the rock-toe and tree revetment included the anchoring of several tree clusters at two elevations (atop the rock-toe, and partially buried within the rock-toe at an intermediate elevation), to provide instream cover over a range of flows. Each tree cluster consisted of 10 to 16 trees, depending on the size of each tree, and extended for approximately 40 to 50 feet in length. The clusters were spaced approximately 10 to 15 feet apart. Approximately 390 almond trees were obtained from the M&T Chico Ranch/Llano Seco Rancho for use in construction of the tree clusters.

Based on monitoring conducted during November 2011, the tree clusters anchored on top of the rock-toe, as well as the tree clusters anchored into the rock-toe extending into the Sacramento River, remain in place. There does not appear to have been any loss of large woody debris from the structure (Tetra Tech 2012a). In fact, monitoring reveals the recruitment of additional instream woody material (**Figure 3.3-3**). Woody vegetation (primarily willows) has become

established at the base of the bank and on the lower angle portions of the bank. Although this woody vegetation may be considered in the discussion of riparian vegetation (above), when this vegetation is inundated it does serve as instream object cover.

Under the No Action Alternative, removal of the rock-toe and tree revetment would result in the removal of wood clusters protruding into the river from the rock-toe, tree clusters anchored to the top of the rock-toe, and removal of volunteer woody vegetation that has become established along the bank immediately above of the rock-toe, and within and proximate to the clusters anchored on top of the rock-toe. Due to the need to have the dragline, dump trucks and construction equipment located on top of the bank, it is expected that no landside recruitment of woody material would occur from the time of revetment removal and extending into the future. One source of significant contribution of woody material on the west side of the Sacramento River in the Action/Project Area would be associated with approximately 250 linear feet of bankline Valley/Foothill Riparian habitat located at the downstream end of the revetment site. Woody material recruitment at this site would occur once the bank erodes into this riparian vegetation. Another source of woody material is represented by the restoration actions undertaken on the Capay Unit. As previously discussed, it is anticipated that bank erosion subsequent to rock-toe revetment removal could access planted trees within one to a few years.

Figure 3.3-3. Upstream View of the Middle Section of the Rock-toe and Tree Revetment, Showing Very Dense Volunteered Riparian Vegetation Species Growing on the Top of the Rock, and the Presence of the Emplaced Large Woody Material on the Top of the Rock and Within the Rock (Source: Tetra Tech 2012a).

The removal of IWM associated with rock-toe and tree revetment removal would be expected to reduce the suitability of juvenile salmonid rearing habitat. Habitat suitability would be reduced by reducing or eliminating velocity refugia, feeding stations, and predator avoidance/escape cover. These adverse effects to the juvenile lifestage of species of focused evaluation, including special-status fish species, would be realized immediately at the time of revetment removal, and would be expected to extend into the future, until continued erosion of the west bank resulted in recruitment of trees planted associated with restoration of the Capay Unit.

Bank Slope

Prior to construction of the tock-toe and tree revetment during 2007, the average slope of the west bank of the Sacramento River within the 1,520 foot revetment area was very steep with a slope of about 1:1 (CDFG and USFWS 2007). During the 2007 construction, no grading was used to change the bank slope. Rather, the stone toe was placed in the river to result in a 10:1 cross grade, which significantly reduced the slope of the west bank within the Action/ Project Area.

Removal of the rock-toe and tree revetment can be expected to initially result in a bank slope similar to that which existed prior to installation of the rock-toe and tree revetment in 2007. The change in bank slope from the existing condition (10:1 cross grade) to a very steep slope (approximately 1:1) is expected to affect species of focused evaluation through the alteration of important habitat variables. Water depth and water velocity on the Sacramento River are hydrologic variables indicative of the availability of a diversity of hydraulic conditions, including shallow water habitat. An average bank slope of 10:1 in the bank revetment area provides a reliable index to the availability of shallow water habitat over a range of flows.

The biological response of fish species of focused evaluation to bank slope is highly dependent on lifestage (USACE 2004). Adult species of focused evaluation may have limited access to shallow water habitat and are considered less sensitive to the bank slope habitat variable than juveniles. However, the existing rock-toe and tree revetment bank slope of 10:1 provides juvenile species of focused evaluation, including special-status species, with habitat highly valued for its contribution to predator avoidance from larger piscivorous fish, and increased macroinvertebrate foraging opportunities.

Removal of the rock-toe and tree revetment and changing the bank slope from 10:1 to approximately 1:1 would be expected to result in decreased habitat use, including decreased predator avoidance opportunity, and decreased foraging utilization by juvenile species of focused evaluation. These adverse effects to the juvenile lifestage of fish species of focused evaluation, including special-status fish species, would be realized immediately at the time of revetment removal, and would be expected to extend into the future. It is presently uncertain whether removal of the rock-toe revetment would result in bank slope significantly different from that which occurred prior to rock-toe revetment installation.

Substrate

Removal of the rock-toe and tree revetment would result in changing the substrate conditions of the bank. It is reasonable to assume that removal of the revetment would result in the previous substrate conditions that existed prior to installation of the revetment in 2007.

The soils of the Sacramento River floodplain consist of moderately well drained, or somewhat poorly drained soils of recent alluvium. The Columbia Soil Series occupies areas along both sides of the Sacramento River. Like most alluvial soils these are generally stratified, contain a small amount of organic matter in the surface layer, and have little or no differentiation between horizons. Columbia soils are characterized by stratified fine sandy loam, or silt loam soils. Deeper layers may include very fine sandy loam, contain stratified thin layers of loamy fine sand and sand that are massive to single grain. In the Action/Project Area, removal of the revetment would result in erosion of the west bank of the Sacramento River, and substrate conditions would be expected to be characterized as primarily containing loose sands and loamy fine sand with little cobble or gravel-sized substrate.

Because studies have indicated that riprapped banks in the Sacramento River have shown lower juvenile salmonid densities and higher predator densities (Michny 1989; Michny and Deibel 1986) than non rip-rapped banks, when the rock-toe and tree revetment was constructed during 2007 it incorporated a particle size distribution intended to minimize predation risk. The median size of the rock used for the rock-toe was 0.75 feet, the 30th percentile was 0.63 feet and the 100th percentile was 0.94 feet (Tetra Tech 2012a). Thus, the particle size distribution used in the bank revetment was expected to provide species of focused evaluation, particularly juvenile salmonids, benefits in foraging and predator avoidance. The particle size distribution used in the bank revetment was established to provide flow breaks, hydraulic roughness, and velocity refugia elements important as shelter and feeding stations.

Since initial construction, the upper, nearly vertical and unprotected portion of the bank (above the rock-toe) has continued to erode and deposit sediment, primarily comprised of fine sands and silt, on top of and within the upper layer of the rock-toe (Tetra Tech 2012a). In addition to providing water velocity refugias, feeding stations, predator avoidance shelters, and predator exclusion habitat, the heterogeneous surface substrate particle size composition has increased the amount of habitat suitable for aquatic macroinvertebrate colonization. These beneficial effects to the juvenile lifestage of special-status species have been realized since 2008, subsequent to the first winter flows and deposition of materials on top of the rock-toe (Tetra Tech 2012a).

Removal of the rock-toe and tree revetment and changing the substrate composition from a heterogeneous rock-toe material and deposited silt and sand, to an anticipated composition dominated by loose sands and loamy fine sand with little cobble or gravel-sized substrate would be expected to result in decreased habitat use, including decreased predator avoidance opportunity, and decreased foraging utilization by juvenile species of focused evaluation. These adverse effects to the juvenile lifestage of species of focused evaluation, including special-status

fish species, would be realized immediately at the time of revetment removal, and would be expected to extend into the future.

The exception to these adverse effects on the juvenile lifestage pertains to lamprey, both river and Pacific lamprey. Larval lamprey (ammocoetes) burrow into sandy or muddy substrates near banks, and may remain in these areas for several years. Removal of the rock-toe and tree revetment and conversion of that area into anticipated muddy/sandy substrates that are consistently inundated may provide additional incubatory habitat for the lamprey species.

Summary of Potential Effects Associated with Rock-Toe and Tree Revetment Removal

In summary, the NEPA analysis suggests that construction-related activities associated with removal of the rock-toe and tree revetment as part of the No Action Alternative would not be expected to substantively adversely affect fish species of focused evaluation in the Sacramento River, due to implementation of construction-related impact avoidance and minimization measures. Revetment removal under the No Action Alternative would not sufficiently increase predation or degrade the quantity or quality of aquatic habitat used by fish species of focused evaluation. However, habitat alteration, both immediately at the time of revetment removal and extending into the near-term future, would result in substantial adverse effects due to decreased habitat suitability, particularly for rearing juvenile special-status fish species, with the exception of river and Pacific lamprey. However, as river processes continue to work after the first few years following revetment removal and the bank retreats from the current bank edge near the revetment, the recently restored habitat located about 60 feet inland on the Capay Unit would become exposed to the erosive processes of the river. Eventually, larger woody and riparian species near the edge of the migrating river bank could serve as SRA habitat and potential sources of IWM. However, achievement of such aquatic habitat benefits would be dependent on the timing and magnitude of hydrologic conditions in the Sacramento River. As previously discussed, it is anticipated that bank erosion could extend into the vegetation communities where restoration has occurred within one to a few years, although the full benefit of SRA habitat and potential sources of IWM may not be realized for several years.

Performance of the M&T/Llano Seco Pumps Facility Intake Screen

As previously discussed, under the No Action Alternative, the ability to divert water at the M&T/Llano Seco Pumps Facility intake screen could be adversely affected. Specifically, it is anticipated that NMFS/CDFW anadromous salmonid sweeping velocity criteria would no longer be able to be met, resulting in potential increased impingement of juvenile anadromous salmonids and potentially other special-status species at the screen, and increased predation risk associated with lower water velocities proximate to the artificial structure in the river. Although specific screening criteria have not been developed for green sturgeon, reduced sweeping velocities have potential for increased impingement, entrainment, and predation potential of green sturgeon, and the larval stages of other fishes potentially present in the Action/Project

Area. Therefore, reduced performance of the pumping facility screen could adversely affect fish species of focused evaluation, including special-status species, by causing injury or mortality.

Further, if diversions at the M&T/Llano Seco Pumps Facility intake were restricted or could no longer be made, then historical diversions from both Big Chico and Butte creeks could be re-initiated or increased, respectively, to compensate for the loss of diversion from the Sacramento River. If this were to occur, adverse effects to fish species of focused evaluation could occur in the Sacramento River as a result of the reduced sweeping velocities, and on Big Chico and Butte creeks, as a result of increased diversions.

Re-initiation of Diversions in Butte and Big Chico Creeks

As described in Chapter 1 of this Draft EA/IS, USFWS, CDFW, M&T Chico Ranch, and Llano Seco Rancho entered into the 1996 Agreement for relocation of the M&T/Llano Seco Pumps Facility from Big Chico Creek to the Sacramento River to enhance instream conditions for Chinook salmon and steelhead in Big Chico Creek. As part of the agreement, M&T Chico Ranch and Llano Seco Rancho agreed to forego diversion of up to 40 cfs at the Parrott-Phelan Diversion Dam on Butte Creek to provide flow enhancement for the creek. The diversion was relocated from Big Chico Creek to the Sacramento River during 1997.

As originally designed and constructed, the 1997 Relocation Project provided major benefits to the fisheries resources in the Sacramento River Valley including:

- The removal of a major obstacle to the recovery of spring-run Chinook salmon on Big Chico Creek through the relocation of the pumping plant.
- Increased flows in lower Big Chico Creek.
- Elimination of reverse flows from the Sacramento River to the diversion point on Big Chico Creek, thereby improving conditions for migratory Chinook salmon and steelhead.
- Reduced potential of entrainment of juvenile anadromous salmonids through the construction of a new fish screen facility on the Sacramento River.
- Dedication of up to 40 cfs in Butte Creek to enhance fisheries resources including spring-run Chinook salmon (Federally and State listed as threatened), steelhead (Federally listed as threatened), and fall-run Chinook salmon (Federal species of concern).

Potential effects to fish species of focused evaluation associated with the potential re-initiation of diversions from Big Chico Creek and increased diversion from Butte Creek, resulting from the No Action Alternative, are described below.

Butte Creek

As part of the 1996 Agreement, M&T Chico Ranch/Llano Seco Rancho agreed to implement a bypass at the Parrott-Phelan Dam on Butte Creek of up to 40 cfs of their Butte Creek water right entitlement for the period of October 1 through June 30, the water would provide instream flows

in Butte Creek to support Butte Creek fisheries (as long as replacement water for the amount of water bypassed in Butte Creek would be guaranteed from the Central Valley Project at the new diversion located on the Sacramento River). Under the No Action Alternative, flows in Butte Creek dedicated under the 1996 Agreement likely would be reduced by up to 40 cfs below the Parrott-Phelan Diversion Dam, which could potentially impact listed species such as spring-run Chinook salmon and steelhead in Butte Creek.

According to the Draft Recovery Plan (NMFS 2009b), the success of numerous restoration efforts that have been undertaken on Butte Creek are illustrated by the abundance of spring-run Chinook salmon that have been observed since 1998. One of the important restoration efforts includes the dedicated instream flows provided by M&T Chico Ranch/Llano Seco Rancho under the 1996 Agreement.

Because the Butte Creek spring-run Chinook salmon population is now considered persistent and viable, the watershed is considered a conservation stronghold for all lifestages of spring-run Chinook salmon. Butte Creek is one of the most productive spring-run Chinook salmon streams in the Sacramento Valley (DWR 2005), and is one of only three streams (in addition to Deer and Mill creeks) that harbor a genetically distinct, sustaining population of spring-run Chinook salmon (CDFG 1998, as cited in CDFG 2008). Therefore, the viability of the Central Valley spring-run Chinook salmon Evolutionarily Significant Unit (ESU) is reliant upon sustaining the Butte Creek spring-run Chinook salmon population (NMFS 2009b).

Since the early 1990s, restoration actions in Butte Creek have focused on improving instream flow during the critical spring immigration period, thereby increasing the likelihood that fish will succeed in reaching the upstream holding and spawning areas, even in dry years (NMFS 2009b). The dedicated water provided by M&T Chico Ranch/Llano Seco Rancho under the 1996 Agreement contributes to these spring-run Chinook salmon adult immigration flows. In addition, the dedicated water also contributes to ameliorating the relatively high water temperatures that are of concern during the late spring, particularly in the lower reaches of Butte Creek (NMFS (2009b), and their effects on upstream migrating adult and downstream migrating juvenile spring-run Chinook salmon. The dedicated water also provides flow enhancement for upstream migrating adult and downstream migrating juvenile fall-run Chinook salmon and steelhead.

Under the No Action Alternative, reduction of flows during the period extending from October through June in Butte Creek from the Parrott-Phelan Diversion Dam to the confluence with the Sacramento River would result in less suitable habitat conditions for fish species of focused evaluation. More specifically, these flow reductions would result in less suitable flow conditions during the critical spring-run Chinook salmon adult upstream migration period, during the fall-run Chinook salmon and steelhead adult upstream migration period, and during the juvenile spring-run and fall-run Chinook salmon, as well as the juvenile steelhead, downstream migration period. Consequently, the NEPA analysis suggests that the No Action Alternative would be expected to result in substantive adverse effects to special-status anadromous salmonids in Butte Creek, primarily through habitat degradation of sufficient magnitude to substantially interfere

with the migration of species of focused evaluation. ESA and CESA consultations also would be necessary.

Big Chico Creek

Under the No Action Alternative, it may be necessary to relocate the diversion to its previous location on Big Chico Creek. The old pumping station, which was located on Big Chico Creek approximately 0.75 miles upstream from the confluence with the Sacramento River, diverted water through a series of four unscreened pumps with a rated capacity of 135 cfs (1996 Agreement). The original M&T Chico Ranch/Llano Seco Rancho pumping plant on Big Chico Creek is still in operational condition, and Reclamation continues to identify this location as a point of diversion. If water diversions from Big Chico Creek were resumed, the potential exists to adversely affect anadromous salmonids in Big Chico Creek during certain months of the year. In the 1980s, the M&T Chico Ranch and Llano Seco Rancho pump station on Big Chico Creek was identified as impacting both resident and anadromous juvenile fish, particularly spring-run Chinook salmon, by entrainment (M&T Chico Ranch 2006).

A small dependent population of spring-run Chinook salmon continues to occur in Big Chico Creek, but relies on extant independent populations for its continued survival. The annual population size of spring-run Chinook salmon in Big Chico Creek numbers in the tens or hundreds of fish, with no returning spawners in some years (NMFS 2009b). Steelhead also occur in Big Chico Creek, but is considered a remnant population. The numbers of steelhead in the creek have not been estimated.

Available information indicates that spring-run Chinook salmon and steelhead holding, spawning, and juvenile rearing habitat occur in the reaches of Big Chico Creek and tributaries located several miles upstream of the old pumping station point of diversion. Thus, some of the impacts associated with diversions at the old pumping plant site were associated with juvenile salmonid downstream migration in Big Chico Creek. Juvenile salmonids originating in upstream areas of Big Chico Creek reportedly were directly entrained through the unscreened pumps. Although it would be anticipated that the intakes would be screened if diversions from the old pumping plant site in Big Chico Creek were re-initiated, it is unlikely that NMFS and CDFW screen criteria can be met, particularly the sweeping velocity criterion. This would be most likely to occur during base flow periods. Although base flows in Big Chico Creek during the summer (i.e., June-October) typically range from 20 to 25 cfs above Five-Mile Diversion, most of this base flow is lost to infiltration in the region of Big Chico Creek's outwash fan (i.e., generally, the City of Chico) and, thus, surface flows do not extend downstream of Rose Avenue by late summer during most years (USFWS 1995 as cited in NMFS 2009b). Thus, diversions from the old pumping plant site in Big Chico Creek would not affect bypass flows during late summer and early fall due to lack of hydrologic continuity with upstream areas. Moreover, additional impacts were associated with the reverse flows from the lower Sacramento River and the lowermost portion of Big Chico Creek that occurred during pumping in certain months of the year, which NMFS (2009b) reported as a key stressor to juvenile spring-run Chinook salmon. However,

diversions during the summer months from the lowermost portion of Big Chico Creek may have the least potential to impact spring-run Chinook salmon because upstream adult migration could occur during late winter and early spring, and downstream juvenile migration is believed to primarily occur from November to May.

Under the No Action Alternative, re-initiation of pumping at the old pumping site in Big Chico Creek would result in less suitable conditions for fish species of focused evaluation. More specifically, pumping at that location would be expected to result in localized conditions that would not meet all of NMFS and CDFW screen criteria, and would result in reverse flow conditions – both of which would represent potential adverse effects to fish and aquatic resources and their habitat, including Central Valley spring-run Chinook salmon, Central Valley steelhead, and potentially additional special-status species (e.g., river lamprey, Pacific lamprey, hardhead, California roach). Overall, reverse flow conditions and reinitiation of pumping in Big Chico Creek and have the potential to reduce aquatic habitat quantity and suitability, increase predation and interfere with the upstream and downstream movement of these fish species in Big Chico Creek.

PROPOSED ACTION/PROJECT RELATIVE TO EXISTING CONDITIONS (CEQA ANALYSIS)

The Proposed Action/Project includes dredging in the vicinity of the M&T/Llano Seco Pumps Facility intake and disposal of dredged spoils, and continued maintenance and monitoring of the rock-toe and tree revetment. The impact mechanisms associated with each of these activities and potential effects on fisheries and aquatic resources are discussed below.

Activities and Impact Mechanisms

Dredging and Spoils Disposal

Activities associated with dredging and spoils disposal have the potential to affect fish and aquatic species nearby and downstream of the activity areas. As described in Chapter 2, it is anticipated that up to two dredge cycles (during separate years) could occur, potentially removing up to 100,000 cubic yards of material per dredge cycle, in the area immediately upstream, adjacent to, and downstream of the M&T/Llano Seco Pumps Facility via suction dredge. Due to production capacity constraints associated with the dredging technique that would be used, the actual amount of material removed may be less than 100,000 cubic yards per dredge cycle. The first dredge may occur as early as 2014. Specific features associated with the Proposed Action/Project, including locations for dredging, staging and spoils disposal are included in Chapter 2 (Figure 2-1) to show the relative locations of these components.

The removal, transport, and placement of dredged sediments are the primary components of the dredging process (BCDC 1998). These activities, in addition to general construction-related activities associated with access, staging, storage and disposal areas have the potential to affect fish species of focused evaluation due to the potential for: (1) sedimentation and turbidity; (2) hazardous materials and chemical spills; (3) underwater noise; (4) entrainment; (5) reduced prey

availability; (6) physical habitat modification; (7) increased susceptibility to predation; and (8) spreading or introducing invasive aquatic species, as further discussed below.

Sedimentation and Turbidity

Suction dredging includes sediment material removal, which could result in a short-term increase in turbidity in the vicinity of dredging activities. Increased turbidity has the potential to have direct physiological effects on fish, such as increased stress response, reduced oxygen exchange capacity in the gill lamellae, or behavioral effects, such as plume avoidance or attraction, reduced predator avoidance, and reduced feeding (Anchor 2003 as cited in USACE and Port of West Sacramento 2011).

However, because suction dredges are typically designed specifically to ensure loosened substrate material is removed via the suction pipe, most dredging operations are reported to result in low sediment re-suspension rates, ranging from 0.1 percent to greater than 5 percent, with most cutterhead-type equipment producing re-suspension rates at the low end of this range (Anchor 2003; Hayes and Wu 2001; both as cited in USACE and Port of West Sacramento 2011). Furthermore, as distance increases from the dredge pipe and cutterhead, turbidity decreases (USACE and Port of West Sacramento 2011), which is likely to result in a relatively limited area with increased turbidity. Because the Sacramento River is a relatively large river with substantial flow in the Action/Project Area, it is likely that the small amount of sediment re-suspended as a result of suction dredge operations would blend into background conditions relatively quickly. USACE and Port of West Sacramento (2011) reported that an extensive literature search conducted by Anchor (2003) concluded that most dredging projects are not expected to produce total suspended solids concentrations in the range documented to cause significant adverse effects to sensitive aquatic biological organisms (Anchor 2003 as cited in USACE and Port of West Sacramento 2011). In addition, implementation of BMPs and other environmental commitments, including the in-water construction work window of July 1 – October 15, are anticipated to minimize the potential for impacting fish species of focused evaluation associated with the potential for increased turbidity levels in the Sacramento River.

Hazardous Materials and Chemical Spills

Construction activities associated with dredging have the potential to adversely affect fisheries resources through accidental seepage or discharge of hazardous materials or chemical. Toxic substances generally used at construction sites include gasoline, lubricants, and other petroleum-based products, all of which could potentially impact aquatic habitat as a result of spills or leaks from construction machinery. These substances can adversely affect aquatic organisms by causing physiological stress, altering behavior, and mortality. Accidental discharge of petroleum products can form oily films on the water surface that can reduce dissolved oxygen levels. However, use of specific design elements, construction techniques, and, environmental commitments, including implementation of standard construction BMPs, a Hazardous Materials Control, Spill Prevention and Response Plan, and the in-water construction work window of July

1 – October 15, would minimize or avoid construction-related effects associated with hazardous materials and chemical spills on fish within the immediate vicinity of, and downstream from, the in-river work area. In addition, construction areas (e.g., staging and storage) would be located as far away as possible from the Sacramento River and sensitive habitat types, including riparian and floodplain habitat, to minimize or avoid potential impacts on fish species and aquatic habitat. ***Environmental Commitments HAZ-1*** and ***HAZ-2*** would be implemented as described in Chapter 2 (see Section 2.2.3 – Environmental Commitments and Mitigation Measures).

Underwater Noise

Dredging will involve equipment and activities that will produce pressure waves, and create underwater noise and vibration, thereby temporarily altering in-river conditions. High levels of underwater acoustic noises have been shown to adversely affect fish within close proximity of the noise source (NMFS 2006).

Underwater noise resulting from anthropogenic sources can have a variety of impacts on aquatic species. Impacts can range from no adverse impacts, to significant behavioral disturbances, to hearing loss, physical injury and mortality (CBD 2012). Behavioral responses can range from subtle to strong behavioral reactions such as startle response or complete avoidance of an area (CEDA 2011). The potential effects depend on a number of factors, including the duration, nature and frequency content of the sound, the received level (sound level at the animal), the overlap in space and time with the organism and sound source, and the context of exposure (CBD 2012).

Sounds can be described in terms of their intensity, which is measured or expressed in decibels (dB), pitch or frequency (in Hertz or kilohertz) and their duration (in seconds or milliseconds). Anthropogenic sound sources can be broadly divided into high intensity impulsive sources, such as pile driving, and less intensive but more continuous sources like shipping and dredging (CEDA 2011). Sound waves represent pressure changes, the unit for pressure is Pascal, and the reference pressure in underwater acoustics is defined as one micro Pascal, or 1 μPa (Thomsen et al. 2009).

The effects of sound are strongly dependent on hearing abilities, which differ greatly between aquatic organisms. In general, fish hear over a relatively narrow band, and their hearing sensitivity is better at lower frequencies than some marine mammals. Some fish, such as salmon, only detect differences in the movements of the particles moving within the sound wave and have poor hearing sensitivity (CEDA 2011).

According to NMFS (2006), the loss of hearing sensitivity may adversely affect a salmonid's ability to orient itself (i.e., due to vestibular damage), detect predators, locate prey, or sense their acoustic environment. Chronic noise exposure can reduce a salmonid's ability to detect piscine predators either by reducing the sensitivity of the auditory response in the exposed salmonid, or masking the noise of an approaching predator. Noise exposure also may result in a salmonid's

unusual behavior or swimming characteristics, and therefore enhance its potential as a target for predators (NMFS 2006).

Although little data from noise exposure studies utilizing salmonids are available, NMFS assumes that studies on other fish species can serve as surrogates for salmonids. As stated in NMFS (2006), Scholik and Yan (2002) studied the effects of the noise generated by a 55 hp outboard motor over a period of 2 hours on the auditory sensitivity of the fathead minnow. The noise level was adjusted to 142 dB (re: 1μPa), which was equivalent to the noise levels measured at 50 meters from a 70 hp outboard motor. The experimental fathead minnow experienced decreased hearing sensitivity over the range of frequencies normally associated with their hearing capabilities, as measured using electrophysiological responses of their auditory nerves under general anesthesia.

While the understanding of potential adverse effects on fish due to underwater noise continues to expand, NMFS has identified an immediate need for interim standards and guidelines based on the best currently available scientific information. Although temporary threshold shifts (TTS) in hearing sensitivity is not actual injury, but rather a temporary fatiguing of the auditory system, it can potentially increase the risk of predation, and reduce foraging or spawning success (Stadler and Woodbury 2009). With respect to underwater sound in general, insufficient knowledge exists to confidently predict at what levels sound can cause injury, such as temporary or permanent hearing threshold shifts (CEDA 2011). However, for the purposes of establishing interim thresholds, NMFS considers TTS to be synonymous with injury (Stadler and Woodbury 2009). Currently, NMFS is supporting interim dual criteria as thresholds for assessing the onset of physical injury to fishes exposed to the underwater sounds generated by impact pile driving. The interim criteria use two metrics – peak sound pressure level (SPL) and sound exposure level (SEL). The NMFS' interim criterion for physical injury to fish is a 206 dB peak, regardless of fish size. For cumulative sound exposure levels (SEL), criteria are 187 dB re 1 μPa per unit of time for fish weighing greater than 2 grams, and 183 dB re 1 μPa per unit of time for fish less than 2 grams (Reine et al. 2012). The unit of time is generally considered to encompass a single day (Stadler and Woodbury 2009).

In addition, NMFS recognizes that a single-strike SEL below a certain level will not contribute to the overall cumulative SEL because it has virtually no effect on a fish, and has adopted a conservative SEL for "effective quiet" of 150 dB (Stadler and Woodbury 2009), which is considered to be a behavioral threshold.

The NMFS criteria were developed for specific application to pile driving, not necessarily for application to dredging activities. However, NMFS (2006) did use the criteria in consideration of large-scale dredging activities in a BO addressing dredging of the Stockton Deep Water Ship Channel.

As described in Chapter 2, the Proposed Action/Project involves the utilization of a swinging ladder suction dredge, which is a more recent version of a conventional cutterhead suction

dredge. The following activities are described here to provide context regarding sources and potential impacts of underwater noise.

The dredge boat will be an anchored barge with a basket cutterhead mounted to a ladder positioned at the front of the boat. The barge is not self-powered and will be directed by two skiff boats to the excavation site.

The in-river anchoring technique for a swinging ladder cutterhead dredge uses three spuds - two spuds are located on the bow, and one spud on the stern of the dredge barge, all of which are hydraulically lowed into the bottom sediment to hold the barge in working position.

Once the dredge barge is set in place, the swinging ladder sweeps an arc in front of the dredge barge removing sediment through the action of the cutterhead and suction pipe, which are powered by a 550 hp motor on the dredge barge. The cutterhead dredge is restricted to the length of the ladder, and can sweep in the river channel about 4 to 5 feet. After a sweep is completed, the spuds on the dredge barge will be hydraulically lifted, and the barge will be moved by the skiff boat to the next section to be dredged. The dredge then resets its spuds and completes another dredging sweep.

After completion of the initial pass, the dredge barge will be maneuvered by a skiff boat back to the top of the sediment field of the preceding pass, and the process will be repeated as necessary to cover the width of the gravel deposit.

Under the Proposed Action/Project, dredging activities would produce sounds from the cutterhead and suction pipe, engine noise from the 550 hp deck-mounted motor, sediment slurry travelling through the suction and discharge pipe, hydraulic placement of the anchoring spuds, and skiff boat operation.

In their BO regarding the maintenance dredging of the Stockton Deep Water Ship Channel, NMFS (2006) reported that studies conducted by Clarke et al. (2002) found that hydraulic cutterhead dredging activity resulted in measured sound energy in the 70 to 1,000 Hz range, and the sound energy peaked at a level of 100 to 110 dB (presumably re:1μPa, although it was not cited in the report text) at an unspecified distance from the dredge. NMFS (2006) estimated the point source sound level in two different ways, yielding point source noise energy of 153 dB and 125 dB. Presumably, these point source noise energy estimates were inclusive of several dredging noise emitting activities, including the cutterhead and suction pipe, engine noise from the dredger, and sediment slurry travelling through the suction and discharge pipe.

Dredging-related equipment to be used under the Proposed Action/Project (e.g., less than 50-ft hull, 550-hp engine, 8-inch suction and discharge pipe, 50 and 100-hp support skiffs) is much smaller than the equipment used for the Stockton Deep Water Ship Channel dredging (e.g., 2,000-hp hydraulic pump motor, 16-inch suction and discharge pipe, two 750-hp support tenders), and much smaller than the equipment used in much of the reported literature. It is reasonable to assume, therefore, that the point source sound levels associated with dredging activities under the Proposed Action/Project would be less than those reported elsewhere.

CEDA (2011) stated that underwater sounds due to rock breaking by mechanical action can be considerably stronger than those of routine dredging activities. Under the Proposed Action/Project, routine dredging of deposited sediment (sand and gravel) would occur and, therefore, louder noises associated with rock breaking activities would not be expected.

Depending on the dredged material, a regular rumbling sound will be produced from the suction or discharge pipes (CEDA 2011). Because relatively high frequency sounds are emitted by the transport of sand and gravel through a suction pipeline, such sounds can be expected to attenuate faster than lower frequency sounds, thereby limiting potential impact ranges (CEDA 2011). Such would be the case expected under the Proposed Action/Project.

Under the Proposed Action/Project, the dredge barge spuds will be hydraulically lowered and raised. The spuds will not be hammered into place. Therefore, it is expected that minimal underwater noise will be generated by spud placement.

In-river operations will involve two motorized work boats. One skiff boat (100 hp) would advance the non-motorized dredge barge to the next section in the river, and one work boat (50 hp) would be used to support general operations, including refueling the dredge equipment once per day to transfer approximately 120 gallons of fuel to the barge. It has been reported that, in general, small boats with outboard or inboard engines produce sound that is generally highest in the mid-frequency (1 to 5 kHz) range and at moderate (150 to 180 dB re 1 μPa @ 1 m) source levels, although the output characteristics can be highly dependent on speed (CBD 2012). Under the Proposed Action/Project, the support skiffs will be intermittently run, at the lowest possible effective speeds.

Although few studies have documented the effects of anthropogenic sounds on the behavior of fishes, and behavioral responses to low-frequency sounds generated by dredging operations are not well documented, dredging-induced noise is frequently cited by resource agencies as having potentially negative impacts on anadromous fish migrations (Reine et al. 2012). According to CEDA (2011), it is very unlikely that underwater sound from dredging operations can cause injury to fish. Temporary loss of normal hearing capabilities might happen if individuals are in the immediate vicinity of a dredger and are exposed for a long time, which is unlikely (CEDA 2011). Under the Proposed Action/Project, individuals will be able to move away from the immediate vicinity of the cutterhead suction dredge to the remaining portions of the Sacramento River channel. Also, any individuals potentially exposed to dredging activity noise, would likely be exposed for a relatively short period of time as they pass through the area on their migration route. Consequently, under the Proposed Action/Project, it is unlikely that anadromous salmonids would occur in the immediate vicinity of the dredger, be exposed to dredging-related noise for a long time, and experience temporary loss of normal hearing capabilities.

Under the Proposed Action/Project, if anadromous salmonids are exposed to dredging-related noise, then it is possible that they may exhibit a behavioral response such as startle or avoidance behaviors, the ecological significance of which would vary among species (CEDA 2011). For example, such behaviors for juvenile anadromous salmonids have the potential to result in a

temporary disruption of transient foraging associated with downstream migration, but such potential disruption would be of very limited duration and spatial extent.

Underwater noise levels anticipated to occur associated with dredging activities under the Proposed Action/Project would be expected to be well below the potential injury interim criteria thresholds (i.e., peak pressure of 206 dB; SEL of 183 and 187 dB) and the behavioral threshold (i.e., 150 dB) identified by NMFS for evaluating pile driving impacts on anadromous salmonids. The suite of considerations discussed above, in addition to implementation of environmental commitments, particularly including the in-water construction work window of July 1 – October 15 and utilization of a slow cutterhead rotation speed where feasible, would avoid and minimize the potential for underwater noise to adversely impact fish species of focused evaluation.

Entrainment

Aquatic organisms present within the immediate dredging vicinity could potentially be injured or entrained by being drawn into the suction field of the dredge head or by contact with the dredging apparatus during dredging activities. The entrainment potential for fish and other aquatic organisms is based on factors related to the dredging operation (including the strength of the entrainment field generated by hydraulic dredging, total area dredged, and the speed of dredging), the lifestage- and species-specific presence, behavior and swimming ability, and other ecological factors (Klimley et al. 2009 as cited in USACE and Port of West Sacramento 2011). Larval and juvenile lifestages are generally more susceptible to being entrained, as larger individuals are typically stronger swimmers, and more likely to avoid entrainment (Klimley et al. 2009; SWCA 2009; both as cited in USACE and Port of West Sacramento 2011). Organisms swimming close to the bottom also would likely be more susceptible to entrainment than individuals swimming closer to the surface. Additionally, the likelihood of entrainment may increase in narrow channels with slower and shallower waters (Killgore et al. 2010; Reine and Clark 1998; both as cited in USACE and Port of West Sacramento 2011). Studies from the Columbia and Frasier rivers have indicated that salmonids are generally less likely to become entrained in dredging activities than non-anadromous fish species (McGraw and Armstrong 1990; Larson and Moehl 1990; Reine and Clarke 1998; all as cited in USACE and Port of West Sacramento 2011).

A conventional cutterhead dredge would allow a 30-foot sweeping arc on each side of centerline, or a width of about 60 feet per dredging pass. However, under the Proposed Action/Project, the swinging ladder cutterhead dredge allows only about a 9-foot arc on each side of centerline, or a width of about 18 feet per pass. In consideration of the fact that the width of the Sacramento River in the vicinity of the dredging activities can be generally characterized as approximately 600 feet wide (Tetra Tech 2012a), there is a relatively low probability of a downstream migrating juvenile anadromous salmonid encountering the cutterhead and suction hose entrainment field.

In its BO addressing dredging of the Stockton Deep Water Ship Channel, NMFS (2006) evaluated the probability of entraining juvenile anadromous salmonids by a cutterhead suction

dredger with a 16-inch diameter intake pipe powered by a 2,000 hp hydraulic suction pump. In consideration of burst swimming capabilities, they concluded that it is unlikely that either a steelhead smolt or a winter-run Chinook salmon smolt that detects the presence of the cutterhead would be unable to escape its field of influence, even within 0.5 meters of the cutterhead, unless its swimming ability was in some way compromised. NMFS (2006) further suggested that from modeling a quarter hemisphere flow field for a deeper entrenched cutterhead, the flow velocities within 0.5 meters of the cutterhead would approach the burst speed limits for smaller salmonids. Under the Proposed Action/Project, it is likely that any juvenile anadromous salmonids also would have sufficient burst speed capacity to overcome the intake velocity of the dredge, considering that the cutterhead section dredger proposed to be used has an 8-inch diameter intake pipe powered by a 550 hp hydraulic suction pump.

In addition to the relatively low probability of encountering the flow velocity field of the cutterhead suction dredge, and the likely ability to avoid the entrainment field, impacts to fish species of focused evaluation are further avoided by implementation of environmental commitments. In particular, the in-water construction work window of July 1 – October 15, utilization of a slow cutterhead rotation speed where feasible, and conducting entrainment monitoring if fish are identified in dredge slurry would further contribute to the avoidance of the potential for entrainment of fish species of focused evaluation.

Prey Availability

Benthic macroinvertebrate (BMI) production is highest in areas characterized by high dissolved oxygen concentrations with gravel substrates. Therefore, suction dredge activities could potentially impact fish species' food availability by temporarily reducing aquatic BMI abundance as a result of removing colonization substrate, as well as via direct entrainment of BMI. Relative to the entire upper Sacramento River, the dredge area would represent a very small fraction of the area with the potential area for macroinvertebrate production. Therefore, the removal of deposited sediment, including gravel substrate, likely represents a minimal potential impact on food availability for fish species of focused evaluation.

It has been reported that the benthic community is likely to re-colonize dredged areas relatively quickly. Specifically, USACE and Port of West Sacramento (2011) described several reports, which indicated that dredging does not substantially impact the BMI community, and specifically does not substantially impact the community as a food source. NMFS (2006) and others indicated that, although dredging would initially remove benthic organisms, it is likely that the benthic fauna would re-colonize relatively quickly following dredging (Bradwood Landing 2008; McCauley et al. 1977; Oliver et al. 1977; Rosenberg 1977; Van Dolah et al. 1984; Nichols et al. 1990; Kenny and Rees 1994; Harvey et al. 1998; all as cited in USACE and Port of West Sacramento 2011). Therefore, potential impacts of dredging to prey availability for fish species of focused evaluation would likely be temporary and minimal.

Physical Habitat Modification

It is anticipated that dredging of the deposited sediment would not appreciably alter habitat characteristics for those lifestages of the fish species potentially utilizing the Action/Project Area. Specifically, it is likely that most habitat utilization in the Action/Project Area occurs during adult upstream migration or juvenile downstream migration, with the latter also associated with transient rearing. Migrating adults likely would not be affected by changes in depth, substrate size, or velocity. Juvenile emigration (and transient rearing) also likely would not be substantially impacted. Specifically, dredging activities are not anticipated to remove instream woody material or other escape cover. Potential changes in substrate characteristics (e.g., size distribution), depth, and water velocity also are not anticipated to improve predator habitat conditions.

In addition, dredging-related activities, including the use of construction access, staging, storage and disposal areas, will not include removal of aquatic or riparian vegetation or permanent modification of physical habitat conditions (e.g., bank slope, substrate, etc.) in the Action/Project Area. Therefore, the potential for permanent alteration to physical fisheries habitat in the Action/Project Area would be minimal.

Predation Risk

Dredging activities have the potential to increase the risk of predation of fish in the vicinity of dredging activities due to the potential for increased sedimentation and turbidity, the potential for hazardous materials and chemical spills, and the potential for altered behavior and habitat utilization. Altered fish behavior could result in the potential for increased susceptibility to predation. The potential for the suction of fish towards the dredge could injure or alter behavior of individuals, also potentially resulting in increased susceptibility to predation. The amount of increased predation that could result from increased turbidity, a chemical spill, or directly associated with dredging activities is unknown. However, the implementation of previously identified impact avoidance measures to reduce the potential for turbidity, hazardous spills, and entrainment, including the in-river work construction window of July 1 through October 15, would likely also minimize the potential for increased predation of fish species.

Invasive Species

Dredging activities have the potential to encourage the establishment or proliferation of aquatic invasive species from possible contaminants attached to the dredging equipment. In general, the presence of invasive aquatic species can alter ecosystem dynamics, affecting prey availability and predator-prey dynamics for fish species in the Sacramento River. For example, New Zealand mudsnails (*Potamopyrgus antipodarum*, NZMS) were first discovered in California (Owens River) in 1999. The NZMS has the ability to adapt to new ecosystems and alter food web dynamics. Controlling the spread of the NZMS is a top priority for CDFW.

The following procedures for decontaminating field gear (i.e., waders, wading boots, boot insoles, nets, wading sticks, or anything else that comes into contact with the water) developed by CDFG (2008) will be followed prior to entering the Sacramento River in the Action/Project Area.

Freezing field gear will be the first option if a freezer is available. Freezing has no adverse effect on field gear or on the environment, and is the most cost effective means of decontamination. Used field gear will be placed into new large plastic bags, sealed and placed before placing into a freezer (<0 °C) for a minimum of six hours, prior to entering the Action/Project Area.

If a freezer is not available, then all field gear that previously came into contact with water at other locations will be placed into a new large plastic bag, and a decontamination solution (5% Sparquat) will be added to allow complete immersion of all field gear for a minimum of 15 minutes. Any debris remaining on the gear will be removed with a stiff brush.

California's waterways currently face the challenge of invasion by quagga mussels (*Dreissena bugensis*) and zebra mussels (*Dreissena polymorpha*). Preventing the spread of quagga and zebra mussels is a top priority for CDFW. A new, freshly painted barge will be used for the proposed dredging operations, which will avoid the potential transport and spread of aquatic invasive species into the Sacramento River. Nonetheless, as applicable, the following watercraft decontamination protocol for quagga and zebra mussels developed by CDFG (2008) will be followed prior to watercraft entering the Sacramento River in the Action/Project Area.

Prior to entering the Action/Project Area, all plants and mud will be removed from the watercraft, trailer, and equipment and disposed of in the trash. All water will be drained from the barge, skiff, and transport boats, including the motor, motor cooling system, live wells, bilges, and lower end unit. The watercraft, trailer, and all of the boat equipment (i.e., ropes, anchors, etc.) that previously came into contact with the water at other locations will be pressure washed with 140°F water. The engine will be flushed with 140°F water for at least 10 minutes, and 140°F water will be run through the live wells, bilges, and all other areas that could contain water. Areas that cannot be washed, but have come into contact with the water, will be sprayed or wiped with a solution of 4% muriatic acid.

Implementation of these impact avoidance measures will minimize the potential for spreading or introducing non-native aquatic species, and thereby minimize the potential for associated impacts to fish species of focused evaluation.

Bank Revetment Monitoring and Maintenance

As described in Chapter 2, the Proposed Action/Project would extend monitoring and maintenance of the rock-toe and tree revetment until a long-term solution is developed and completed. Inspections of the rock-toe and tree revetment conducted during April 2010 and November 2011 indicated no evidence of either accelerated erosion of the upper bank or damage to the revetment itself, nor does there appear to have been any loss of large woody debris from

the structure (Tetra Tech 2012a). Based on these inspections, maintenance activities associated with the revetment are not anticipated to occur frequently. If maintenance is needed, the types of potential maintenance activities would include: (1) inspecting for movement of revetment due to slippage of the underlying bank, and making repairs to stabilize the area; (2) repairing areas of localized scour and erosion, particularly in the toe zone, by adding rock and other materials; (3) dispersing large build-ups of debris to eliminate eddy currents; and (4) re-anchoring or replacing woody material and brush structures if they become rotted, disintegrated, or washed out due to high flow events.

If required, maintenance activities would be accomplished from the landward side with appropriate equipment, as was conducted during the initial rock-toe and tree revetment in 2007. No future bank grading is anticipated at the site. Based on construction activities that were used when constructing the revetment in 2007, if localized scour and erosion in the toe zone require active maintenance, then rock would be imported to the site by truck, dumped on a working area along the top of the bank, and placed in the water at the base of the bank by a dragline. Any in-river maintenance activities would be restricted to the construction window extending from July 1 through October 15 to avoid/minimize impacts to fish species of focused evaluation, particularly special-status anadromous salmonids. If woody material and brush structures need to be replaced, then they will be re-incorporated into the revetment by anchoring with cables and large boulders to prevent loss during overtopping flows. If necessary, orchard-type trees would be placed along the top of the rock by using a dragline or other appropriate machinery, and would be cabled to the boulder anchors and each other (see Appendix I – Mitigation Monitoring and Reporting Program for additional information regarding environmental commitments, mitigation measures, implementation responsibilities, and funding mechanisms).

Construction-related activities associated with rock-toe and brush revetment maintenance include the potential for impacts to fish and aquatic resources from erosion, sedimentation and turbidity, hazardous materials and chemical spills, vibration and pressure waves, direct harm, and increased susceptibility to predation. However, because construction activities associated with periodic maintenance of the rock-toe and tree revetment could be accomplished from the landward side, and because no bank grading is anticipated at the site, the potential for short-term construction-related impacts to fish and aquatic resources would be minimal with implementation of impact avoidance measures. Replacement of the rock or brush, as needed, on the revetment would incorporate project commitments, including impact avoidance/minimization measures, consistent with those described in the 2007 Final EA/IS (CDFG and USFWS 2007). These measures include typical impact avoidance measures and BMPs (e.g., a Stormwater Pollution Prevention Plan, complying with the RWQCB Section 401 Permit conditions), a Spill Prevention and Response Plan to minimize the potential for chemical spills or seepage into the Sacramento River, and standard construction practices to avoid direct physical harm, as previously described.

Impact Determinations

This section includes CEQA evaluations and CEQA significance determinations of the potential impacts that could result from the above-described activities associated with the Proposed Action/Project, relative to Existing Conditions, for each fish species of focused evaluation.

FAR-1. *Potential for the Proposed Action/Project to impact winter-run Chinook salmon.*

During the in-river work period (July 1 through October 15), the only lifestage of winter-run Chinook salmon in the Action/Project Area is juvenile emigration (and transient rearing). Although juvenile winter-run Chinook salmon downstream migration in the Upper Sacramento River reportedly can extend from mid-July through March, it is likely that most juvenile emigration occurs through the Action/Project Area after October. No other lifestages of winter-run Chinook salmon could potentially be affected by short-term, construction-related activities.

Based on the above, the Proposed Action/Project would not be expected to: (1) substantially degrade the quantity or suitability of aquatic habitat used by winter-run Chinook salmon; (2) result in the loss of existing riparian habitat and/or SRA cover of sufficient magnitude and/or duration to substantially affect winter-run Chinook salmon; (3) increase predation to substantially affect winter-run Chinook salmon; or (4) result in habitat modification or degradation of sufficient magnitude to substantially interfere with the movement (or migration) of winter-run Chinook salmon.

The Proposed Action/Project Alternative, relative to Existing Conditions, is anticipated to result in less-than-significant construction-related impacts to winter-run Chinook salmon based on: (1) the limited potential occurrence of juveniles emigrating through the Action/Project Area during construction-related activities; (2) the previously presented considerations and evaluations of specific activities and related impact mechanisms; (3) incorporation of environmental commitments (described in Chapter 2, Section 2.2.3 – Environmental Commitments and Mitigation Measures); and (4) adherence to BMPs, the SWPPP, and requirements specified through the ESA and CESA consultations, the Streambed Alteration Agreement, and the Section 401 Permit. Anticipated long-term habitat modifications also would be less-than-significant to winter-run Chinook salmon under the Proposed Action/Project, relative to Existing Conditions.

FAR-2. *Potential for the Proposed Action/Project to impact spring-run Chinook salmon.*

Based on available information, adult upstream migrating spring-run Chinook salmon could potentially occur in the Action/Project Area during the in-river work period (July 1 through October 15). Although it has been generally reported that adult spring-run Chinook salmon upstream migration in the Upper Sacramento River can occur between March and September, peak spawning migration through this area reportedly occurs during May and June. Thus, there is some limited potential that adult upstream migrating spring-run Chinook salmon could be exposed to construction-related activities in the Action/Project Area from July through September. Also, there is a very limited potential that downstream migrating and transient

rearing juvenile spring-run Chinook salmon could occur in the Action/Project Area during the in-river work period.

Adult Chinook salmon are less vulnerable to in-river construction activities than juvenile lifestages because of their increased size and swimming capability. Direct mortality to adult spring-run Chinook salmon is not anticipated because of their ability to avoid dredger suction entrainment, and their ability to avoid rock-toe and tree revetment maintenance activities.

Based on the above, the Proposed Action/Project would not be expected to: (1) substantially degrade the quantity or suitability of aquatic habitat used by spring-run Chinook salmon; (2) result in the loss of existing riparian habitat and/or SRA cover of sufficient magnitude and/or duration to substantially affect spring-run Chinook salmon; (3) increase predation to substantially affect spring-run Chinook salmon; or (4) result in habitat modification or degradation of sufficient magnitude to substantially interfere with the movement (or migration) of spring-run Chinook salmon. Incorporation of BMPs and other environmental commitments (described in Chapter 2) into the Proposed Action/Project, in combination with requirements specified through the ESA and CESA consultations, the Streambed Alteration Agreement, and the NPDES and Section 401 Permits, would result in less-than-significant construction-related impacts to spring-run Chinook salmon. Anticipated long-term habitat modifications also would be-less-than significant to spring-run Chinook salmon under the Proposed Action/Project, relative to Existing Conditions.

FAR-3. *Potential for the Proposed Action/Project to impact fall-run Chinook salmon.*

Adult and juvenile fall-run Chinook salmon primarily utilize the Sacramento River in the Action/Project Area as a migration corridor. Adult fall-run Chinook salmon generally migrate upstream through the Action/Project Area from July through December, and therefore have the potential to be exposed to construction-related activities during the July 1 through October 15 in-river work window for the Proposed Action/Project. Relatively infrequent and small amounts of Chinook salmon spawning may occur within the vicinity of the Action/Project Area. Available information indicates that juvenile downstream migrants are generally not likely to occur in the Action/Project Area during the in-river work window, because although juvenile fall-run Chinook salmon emigration at RBDD reportedly can extend to as late as June or July, emigration begins as early as December, peaks during January and February, and decreases through the spring.

Direct mortality to adult fall-run Chinook salmon is not anticipated because of their ability to avoid dredger suction entrainment and rock-toe and tree revetment maintenance activities. Construction-related activities would not represent a blockage to adult fall-run Chinook salmon upstream migration, particularly considering that rock-toe and tree revetment maintenance activities would be restricted to one bank, and a dredging swath would encompass only about 18 feet, relative to the approximate 600-foot width of the Sacramento River in the Action/Project Area.

Although relatively infrequent and small amounts of spawning may extend as far downstream as the Action/Project Area, most fall-run Chinook salmon spawning in the mainstem Sacramento River occurs between Keswick Dam and RBDD. Of all fall-run Chinook salmon spawning in the upper Sacramento River (i.e., Princeton Ferry to Keswick Dam), an average of only about 1.5 percent has been observed to occur in the approximate 15-mile long reach from Ord Ferry Bridge to Hamilton City Bridge, which encompasses the less than 1-mile long Action/Project Area. Fall-run Chinook salmon spawning in the upper Sacramento River generally extends from October through December, which overlaps with the in-river work window for only the first two weeks of October. Thus, given these restricted spatial and temporal distributions relative to the Proposed Action/Project, there is a very low probability that fall-run Chinook salmon spawning could be impacted by construction-related activities. It also is highly unlikely that short-term or long-term habitat alteration associated with the Proposed Action/Project would substantively impact fall-run Chinook salmon spawning.

Based on the above, the Proposed Action/Project would not be expected to: (1) substantially degrade the quantity or suitability of aquatic habitat used by fall-run Chinook salmon; (2) result in the loss of existing riparian habitat and/or SRA cover of sufficient magnitude and/or duration to substantially affect fall-run Chinook salmon; (3) increase predation to substantially affect fall-run Chinook salmon; or (4) result in habitat modification or degradation of sufficient magnitude to substantially interfere with the movement (or migration) of fall-run Chinook salmon. Given the foregoing impact considerations, and incorporation of BMPs and other environmental commitments (described in Chapter 2) into the Proposed Action/Project, in combination with requirements specified through the Streambed Alteration Agreement, and the NPDES and Section 401 Permits, would result in less-than-significant construction-related impacts to fall-run Chinook salmon under the Proposed Action/Project, relative to Existing Conditions.

FAR-4. *Potential for the Proposed Action/Project to impact late fall-run Chinook salmon.*

Because adult late fall-run Chinook salmon generally migrate upstream through the Action/Project Area from late October through March, there is no to little potential for them to be exposed to construction-related activities during the July 1 through October 15 in-river work window for the Proposed Action/Project. Although relatively infrequent and small amounts of spawning may extend as far downstream as the Action/Project Area, late fall-run Chinook salmon spawning in the mainstem Sacramento River occurs from January through April, and therefore would not be impacted by construction-related activities. Neither short- nor long-term habitat alteration associated with the Proposed Action/Project would be expected to substantively impact late fall-run Chinook salmon spawning habitat. Of all late fall-run Chinook salmon spawning in the upper Sacramento River, an average of less than 1.0 percent has been observed to occur in the approximate 15-mile long reach from Ord Ferry Bridge to Hamilton City Bridge, which encompasses the less than 1-mile long Action/Project Area.

Late fall-run Chinook salmon post-emergent fry and juveniles rear and disperse from their spawning and rearing grounds in the upper Sacramento River and its tributaries during the April

through December period, with low rates of emigration occurring from July into the fall. Some juvenile late fall-run Chinook salmon rear in the upper Sacramento River from late-April through the following winter before emigrating during the late fall and winter. Because post-emergent fry and juveniles disperse downstream at low rates from July into the fall, they have the potential to be subjected to in-river construction activities associated with the Proposed Action/Project.

Based on the above, the Proposed Action/Project would not be expected to: (1) substantially degrade the quantity or suitability of aquatic habitat used by late fall-run Chinook salmon; (2) result in the loss of existing riparian habitat and/or SRA cover of sufficient magnitude and/or duration to substantially affect late fall-run Chinook salmon; (3) increase predation to substantially affect late fall-run Chinook salmon; or (4) result in habitat modification or degradation of sufficient magnitude to substantially interfere with the movement (or migration) of late fall-run Chinook salmon.

However, the Proposed Action/Project , relative to Existing Conditions, is anticipated to result in less-than-significant construction-related impacts to late fall-run Chinook salmon based on: (1) the low rates of dispersal and limited potential occurrence of juveniles emigrating through the Action/Project Area during construction-related activities; (2) the previously presented considerations and evaluations of specific activities and related impact mechanisms; (3) incorporation of environmental commitments (described in Chapter 2); and (4) adherence to BMPs, the SWPPP, and requirements specified through the Streambed Alteration Agreement and the Section 401 Permit.

FAR-5. *Potential for the Proposed Action/Project to impact steelhead.*

In the Central Valley, adult steelhead immigration has been variously reported as extending from August into March with peaks during January and February or, at RBDD, as possibly occurring during all months of the year with upstream migration primarily occurring during September and October. Regardless, it is reasonable to assume that some adult upstream migrating steelhead would have the potential to be exposed to construction-related activities during the Proposed Action/Project in-river work window of July 1 through October 15.

Steelhead spawning in the mainstem Sacramento River is probably limited to the area upstream of RBDD, and occurs during winter, outside of the in-river construction window. It also is highly unlikely that short-term or long-term habitat alteration associated with the Proposed Action/Project would substantively impact steelhead spawning, or migration.

Although it has been suggested that steelhead fry and fingerlings rear and move downstream in the Sacramento River year-round, most steelhead juvenile downstream migration likely occurs in the Action/Project Area from January through May. Nonetheless, there is some limited potential that downstream migrating (and transient rearing) juvenile steelhead could be exposed to construction-related activities associated with the Proposed Action/Project.

Direct mortality to adult steelhead is not anticipated because of their ability to avoid dredger suction entrainment, and their ability to avoid rock-toe and tree revetment maintenance activities.

Construction-related activities would not represent a blockage to adult steelhead upstream migration, particularly considering that rock-toe and tree revetment maintenance activities would be restricted to one bank, and a dredging swath would encompass only about 18 feet, relative to the approximate 600-foot width of the Sacramento River in the Action/Project Area.

Based on the above, the Proposed Action/Project would not be expected to: (1) substantially degrade the quantity or suitability of aquatic habitat used by steelhead; (2) result in the loss of existing riparian habitat and/or SRA cover of sufficient magnitude and/or duration to substantially affect steelhead; (3) increase predation to substantially affect steelhead; or (4) result in habitat modification or degradation of sufficient magnitude to substantially interfere with the movement (or migration) of steelhead.The Proposed Action/Project Alternative, relative to Existing Conditions, is anticipated to result in less-than-significant construction-related impacts to steelhead based on: (1) the relatively low potential occurrence of adults and juveniles migrating through the Action/Project Area during construction-related activities; (2) the previously presented considerations and evaluations of specific activities and related impact mechanisms; (3) incorporation of environmental commitments (described in Chapter 2); and (4) adherence to BMPs, the SWPPP, and requirements specified through the Streambed Alteration Agreement and the Section 401 Permit.

FAR-6. *Potential for the Proposed Action/Project to impact green sturgeon.*

Green sturgeon primarily utilize the Sacramento River in the Action/Project Area as a migration corridor. During the in-river work period (July 1 through October 15), the only lifestage of green sturgeon expected in the Action/Project Area is juvenile emigration (and transient rearing). Although it has been suggested that juvenile emigration from the upper Sacramento River may extend through September, juveniles may be present in the Action/Project Area during their downstream migration primarily from May through August, and most abundant during June and July.

However, direct construction-related impacts to green sturgeon juveniles would be expected to be minimal under the Proposed Action/Project given that larvae and juvenile green sturgeon appear to be nocturnal, their foraging activity is reported to peak at night, they move downstream at night, and habitat preference suggests that juveniles prefer deep pools.

Based on the above, the Proposed Action/Project would not be expected to: (1) substantially degrade the quantity or suitability of aquatic habitat used by green sturgeon; (2) result in the loss of existing riparian habitat and/or SRA cover of sufficient magnitude and/or duration to substantially affect green sturgeon; (3) increase predation to substantially affect green sturgeon; or (4) result in habitat modification or degradation of sufficient magnitude to substantially interfere with the movement (or migration) of green sturgeon.

Consequently, the Proposed Action/Project Alternative, relative to Existing Conditions, is anticipated to result in less-than-significant construction-related impacts to green sturgeon, particularly in consideration of the incorporation of environmental commitments to minimize

and avoid potential impacts (described in Chapter 2) and adherence to BMPs, the SWPPP, and requirements specified through the ESA consultations, the Streambed Alteration Agreement, and the Section 401 Permit. Anticipated long-term habitat modifications also would be less-than-significant to green sturgeon under the Proposed Action/Project, relative to Existing Conditions.

FAR-7. *Potential for the Proposed Action/Project to impact Sacramento splittail.*

During wet years, Sacramento splittail reportedly may migrate up the Sacramento River as far as RBDD. Although a gradual upstream migration begins in the winter months to forage and spawn, and spawning reportedly can occur between late February and early July, peak spawning occurs during March and April and, in the Feather River, spawning, egg incubation and initial rearing primarily occur during February through May. These time periods are outside of the in-river work period for the Proposed Action/Project.

Moreover, available information suggests that it is unlikely that Sacramento splittail spawn in the vicinity, or upstream of the Action/Project Area. Even if some spawning were to occur upstream of the Action/Project Area, it is unlikely that substantial numbers of juvenile splittail would be exposed to construction-related impacts, because downstream migration of juveniles in the Sacramento River is mostly completed by July.

Based on the above, the Proposed Action/Project would not be expected to: (1) substantially degrade the quantity or suitability of aquatic habitat used by Sacramento splittail; (2) increase predation to substantially affect Sacramento splittail; or (3) result in habitat modification or degradation of sufficient magnitude to substantially interfere with the movement (or migration) of Sacramento splittail.

Therefore, the Proposed Action/Project Alternative, relative to Existing Conditions, is anticipated to result in less-than-significant construction-related impacts to Sacramento splittail because of: (1) the minimal potential occurrence of adults and juveniles migrating through the Action/Project Area during construction-related activities; (2) the previously presented considerations and evaluations of specific activities and related impact mechanisms; (3) incorporation of environmental commitments to minimize and avoid potential impacts (described in Chapter 2); and (4) adherence to BMPs, the SWPPP, and requirements specified through the Streambed Alteration Agreement and the Section 401 Permit. Anticipated long-term habitat modifications also would be less-than-significant to Sacramento splittail under the Proposed Action/Project, relative to Existing Conditions.

FAR-8. *Potential for the Proposed Action/Project to impact hardhead.*

Based on the reported habitat utilization and water temperature suitability of hardhead, there is limited potential that hardhead would occur in the Action/Project Area during the Proposed Action/Project in-river work period. Although there is a possibility that hardhead may use the backwater area of the Big Chico Creek-Sacramento River confluence, which may have more suitable physical habitat conditions and water temperatures for hardhead than in the mainstem

Sacramento River, that specific location is not expected to be impacted by construction-related activities.

Based on the above, the Proposed Action/Project would not be expected to: (1) substantially degrade the quantity or suitability of aquatic habitat used by hardhead; (2) result in the loss of existing riparian habitat and/or SRA cover of sufficient magnitude and/or duration to substantially affect hardhead; (3) increase predation to substantially affect hardhead; or (4) result in habitat modification or degradation of sufficient magnitude to substantially interfere with the movement (or migration) of hardhead.

The Proposed Action/Project Alternative, relative to Existing Conditions, is anticipated to result in less-than-significant construction-related impacts to hardhead because of the low probability of occurrence in the construction area, incorporation of environmental commitments to minimize and avoid potential impacts (described in Chapter 2, Section 2.2.3 – Environmental Commitments and Mitigation Measures), and adherence to BMPs, the SWPPP, and requirements specified through the Streambed Alteration Agreement and the Section 401 Permit. Anticipated long-term habitat modifications also would be less-than-significant to hardhead under the Proposed Action/Project, relative to Existing Conditions.

FAR-9. *Potential for the Proposed Action/Project to impact river lamprey.*

It is unknown to what extent, if any, river lamprey spawning occurs proximate to the Action/Project Area. However, spawning reportedly occurs from April through June and therefore, would not be impacted by construction-related activities associated with the Proposed Action/Project. Moreover, because river lamprey are reported to primarily spawn in smaller tributary streams, and because of the restricted dredging area, it is highly unlikely that short-term or long-term habitat alteration associated with the Proposed Action/Project would substantively impact river lamprey spawning.

After spawning, ammocetes are carried downstream by water currents and burrow in mud, sandy or silty backwaters or stream edges, where they begin a filter-feeding existence which can last for several years. Based on the fact that the rock-toe and tree revetment does not consist of mud, sand or silt in the area of consistent inundation, it is not anticipated that the Action/Project Area contains suitable lamprey ammocoete habitat. Therefore, because the July 1 through October 15 in-river work period is not concurrent with spawning, and ammocetes would not be expected to be adversely impacted by construction-related activities, potential impacts to river lamprey associated with the Proposed Action/Project would be negligible.

Based on the above, the Proposed Action/Project would not be expected to: (1) substantially degrade the quantity or suitability of aquatic habitat used by river lamprey; (2) increase predation to substantially affect river lamprey; or (3) result in habitat modification or degradation of sufficient magnitude to substantially interfere with the movement (or migration) of river lamprey. In addition, in consideration of incorporation of environmental commitments (described in Chapter 2), and adherence to BMPs, the SWPPP, and requirements specified through the

Streambed Alteration Agreement and the Section 401 Permit, the Proposed Action/Project would result in less-than-significant impacts to river lamprey.

FAR-10. *Potential for the Proposed Action/Project to impact Pacific lamprey.*

Although upstream migrations of Pacific lamprey have been observed during January and February, adult Pacific lamprey typically migrate into freshwater streams between March and June, which is outside of the in-river construction window. Although it is unknown to what extent, if any, Pacific lamprey spawning occurs proximate to the Action/Project Area, spawning reportedly generally occurs between March and July, which potentially could overlap somewhat with the in-river construction window. However, because of the restricted dredging area relative to the entire upper Sacramento River, it is highly unlikely direct effects associated with dredging or short-term or long-term habitat alteration associated with the Proposed Action/Project would substantively impact river lamprey spawning.

Similar to river lamprey, after spawning Pacific lamprey ammocetes are carried downstream by water currents and burrow in mud, sandy or silty backwaters or stream edges, where they begin a filter-feeding existence which can last for several years. Based on the fact that the rock-toe and tree revetment does not consist of mud, sand or silt in the area of consistent inundation, it is not anticipated that the Action/Project Area contains suitable lamprey ammocoete habitat. Therefore, because of the July 1 through October 15 in-river work period and the restricted dredging area, and because ammocetes would not be expected to be adversely impacted by construction-related activities, potential impacts to Pacific lamprey associated with the Proposed Action/Project would be minimal.

Based on the above, the Proposed Action/Project would not be expected to: (1) substantially degrade the quantity or suitability of aquatic habitat used by Pacific lamprey; (2) increase predation to substantially affect Pacific lamprey; or (3) result in habitat modification or degradation of sufficient magnitude to substantially interfere with the movement (or migration) of Pacific lamprey. In addition, in consideration of incorporation of environmental commitments (described in Chapter 2), and adherence to BMPs, the SWPPP, and requirements specified through the Streambed Alteration Agreement and the Section 401 Permit, the Proposed Action/Project would result in less-than-significant impacts to Pacific lamprey.

FAR-11. *Potential for the Proposed Action/Project to impact American shad.*

Adult American shad may be migrating upstream through the Action/Project area primarily during April through June, with spawning potentially occurring (although not documented) in the vicinity and upstream of the Action/Project Area from about mid-May through June. Egg incubation and hatching is coincident with the spawning period, larvae are planktonic for about 4 weeks and drift downstream from spawning areas during this time. However, it is unlikely that juvenile rearing occurs to any meaningful extent in the Action/Project Area, because the main summer nursery areas occur downstream in the Sacramento River from Colusa to the north Delta, the lower Feather River and, to a lesser extent, the south Delta. Consequently, the

Proposed Action/Project has the potential to result in relatively minimal amounts of entrainment of juvenile American shad from dredging during the July portion of the July 1 through October 15 in-river work period.

Based on the above, the Proposed Action/Project would not be expected to: (1) substantially degrade the quantity or suitability of aquatic habitat used by American shad; (2) result in the loss of existing riparian habitat and/or SRA cover of sufficient magnitude and/or duration to substantially affect American shad; (3) increase predation to substantially affect American shad; or (4) result in habitat modification or degradation of sufficient magnitude to substantially interfere with the movement (or migration) of American shad. In addition, in consideration of incorporation of environmental commitments (described in Chapter 2), and adherence to BMPs, the SWPPP, and requirements specified through the Streambed Alteration Agreement and the Section 401 Permit, the Proposed Action/Project would result in less-than-significant impacts to Pacific lamprey.

FAR-12. *Potential for the Proposed Action/Project to impact striped bass.*

Although striped bass reportedly can be found as far upstream as RBDD, peak abundance of adults occurs during the spring months, and spawning reportedly peaks during May and early June with most spawning occurring between Colusa and just downstream of the mouth of the Feather River, which is prior to the July 1 though October 15 in-river work period and downstream of the Action/Project Area. Even if some small amount of spawning were to occur in the vicinity and upstream of the Action/Project Area, then exposure to in-river construction-related activities would be minimal because eggs hatch within 2 to 3 days after fertilization, followed by a net movement of the larval fish from upstream locations to downstream, tidal portions of the river.

Based on the above, the Proposed Action/Project would not be expected to: (1) substantially degrade the quantity or suitability of aquatic habitat used by striped bass; (2) result in the loss of existing riparian habitat and/or SRA cover of sufficient magnitude and/or duration to substantially affect striped bass; (3) increase predation to substantially affect striped bass; or (4) result in habitat modification or degradation of sufficient magnitude to substantially interfere with the movement (or migration) of striped bass. Consequently, it is expected that striped bass would have minimal exposure to the Action/Project Area during the in-river construction period. Because of expected minimal exposure, and in consideration of incorporation of environmental commitments (described in Chapter 2), and adherence to BMPs, the SWPPP, and requirements specified through the Streambed Alteration Agreement and the Section 401 Permit, the Proposed Action/Project would result in less-than-significant impacts to striped bass.

PROPOSED ACTION/PROJECT RELATIVE TO THE NO ACTION ALTERNATIVE (NEPA ANALYSIS)

The previous sections examined project-related activities, impact mechanisms, and potential effects on fish species of focused evaluation for the No Action Alternative and the Proposed Action/Project, both relative to Existing Conditions. Effects to fisheries resources resulting from

changed future conditions expected to occur under the No Action Alternative that would differ from the existing affected environment (i.e., Existing Conditions) were discussed in the NEPA analysis presented above. For additional NEPA analysis purposes, this section presents those considerations under the Proposed Action/Project, relative to the No Action Alternative.

Construction-Related Impacts

Under the Proposed Action/Project relative to Existing Conditions, short-term impacts associated with dredging and rock-toe and tree revetment maintenance construction-related activities were found to be less-than-significant for all of the fish species of focused evaluation. Neither dredging nor rock-toe and tree revetment maintenance activities would occur under the No Action Alternative. Therefore, comparison of short-term impacts associated with dredging and rock-toe and tree revetment maintenance construction-related activities under the Proposed Action/Project, relative to the No Action Alternative, is analogous to the comparison of the Proposed Action/Project relative to Existing Conditions. Consequently, it is expected that short-term construction-related substantive adverse effects to aquatic habitat quantity and suitability, increased predation, and habitat modification interfering with upstream and downstream fish migration would not occur for all fish species of focused evaluation under the Proposed Action/Project relative to the No Action Alternative.

Under the No Action Alternative, the existing rock-toe and tree revetment would be removed. Revetment removal activities would be anticipated to utilize similar access and staging areas, equipment and materials, personnel, and project commitments (including impact avoidance and minimization measures) as were used in the construction and placement of the revetment in 2007. In consideration of the impact avoidance and minimization measures, as well as the July 1 through October 15 in-river construction window specifically established to avoid/minimize potential effects on special-status fish species, it is expected that construction-related activities associated with rock-toe and tree revetment removal would not substantially affect fish species of focused evaluation. Thus, the simple maintenance of the rock-toe and tree revetment under the Proposed Action/Project, compared to removal of the revetment under the No Action Alternative would not be expected to result in substantial construction-related effects, either beneficial or adverse, to fish species of focused evaluation.

Aquatic Habitat Modification Impacts

The No Action Alternative relative to Existing Conditions would result in physical habitat modification, both immediately at the time of revetment removal and extending one to several years into the future, that would be expected to result in substantive adverse effects to fish species of focused evaluation, particularly special-status anadromous salmonids and their habitat. Over a longer period of time, these potential near-term impacts could be offset as the migrating river bank approaches areas of more mature vegetation in the restored habitat areas on the Capay Unit, which could then serve as SRA habitat and potential sources of IWM.

Aquatic habitat modification associated with the No Action Alternative would result in continued erosion of the west bank of the Sacramento River. The continued erosion of the bank would result in the continued exposure of loose sand substrates, the predominance of relatively high bank slopes, and a general lack of instream object (hydraulic roughness) elements. Removal of the rock-toe and tree revetment, as part of the No Action Alternative, would be expected to provide an overall decrease in the amount of riparian vegetation (hence, overhanging shade/cover), particularly in consideration of the fact that the riparian vegetation that has become and will continue to become established in the bank immediately above the rock-toe matures over time. These effects would be expected to provide species of focused evaluation decreased predator avoidance/escape cover, decreased productivity and nutrient inputs from allochthonous leaf litter, decreased food sources, and decreased shading and microhabitat thermal refugia for juvenile lifestages of species of focused evaluation. These adverse effects to the juvenile lifestage of species of focused evaluation, in particular anadromous salmonids, could be realized immediately at the time of revetment removal, and extending up to several years into the future. As previously discussed, these potential near-term impacts could be offset in the future as the migrating river bank approaches areas of more mature vegetation in the restored habitat areas on the Capay Unit, which could then serve as SRA habitat and potential sources of IWM.

The exception to these adverse effects on the juvenile lifestage pertains to lamprey, both river and Pacific lamprey. Larval lamprey (ammocoetes) burrow into sandy or muddy substrates near banks, and may remain in these areas for several years. Removal of the rock-toe and tree revetment and conversion of that area into anticipated muddy/sandy substrates that are consistently inundated may provide additional incubatory habitat for the lamprey species.

The substantive adverse effects to fish species of focused evaluation in the Sacramento River, particularly special-status anadromous salmonids, associated with habitat modification would not occur under the Proposed Action/Project. Consequently, the Proposed Action/Project represents near-term net beneficial effects to fish species of focused evaluation, particularly special-status anadromous salmonids, relative to the No Action Alternative. However, over the long-term, the Proposed Action/Project may not represent net beneficial effects regarding SRA habitat and IWM, due to the continued erosion and migration of the west bank and recruitment of the tree plantings associated with restoration of the Capay Unit.

Performance of the M&T/Llano Seco Pumps Facility Intake Screen

Following revetment removal, it is probable that erosion of the west bank would continue to occur and the Sacramento River would continue to migrate to the west. Consequently, the No Action Alternative would be expected to result in continued deposition of sediment proximate to the intake, and the continued downstream extension of deposited materials in the Sacramento River. This would result in the fish screen criteria not being met at the M&T/Llano Seco Pumps Facility intake screen, with the associated potential to adversely affect special-status fish species in the vicinity of the intake by causing injury or mortality.

The substantive adverse effects to fish species of focused evaluation, particularly special-status anadromous salmonids, associated with reduced performance of the M&T/Llano Seco Pumps Facility intake screen would not occur under the Proposed Action/Project. Consequently, the Proposed Action/Project represents beneficial screen performance effects to fish species of focused evaluation, particularly special-status anadromous salmonids, relative to the No Action Alternative.

Re-initiation of Diversions in Butte and Big Chico Creeks

If diversions at the M&T/Llano Seco Pumps Facility intake were restricted or could no longer be made, then historical diversions from both Butte and Big Chico creeks could be re-initiated, resulting in potential adverse effects to fish species of focused evaluation in Butte and Big Chico creeks during certain months of the year.

Flow reductions in Butte Creek would result in less suitable flow conditions during the critical spring-run Chinook salmon adult upstream migration period, during the fall-run Chinook salmon and steelhead adult upstream migration period, and during the juvenile spring-run and fall-run Chinook salmon, as well as the juvenile steelhead, downstream migration period. Consequently, the No Action Alternative would be expected to result in adverse effects to special-status anadromous salmonids as well as the quantity and suitability of aquatic habitat in Butte Creek.

Under the No Action Alternative, re-initiation of pumping at the old pumping site in Big Chico Creek would be expected to result in localized conditions during certain months of the year that would not meet all of NMFS and CDFW screen criteria, and would result in reverse flow conditions – both of which could represent potential adverse effects to fish and their habitat, including Central Valley spring-run Chinook salmon, Central Valley steelhead, and potentially additional special-status species.

The potential adverse effects to fish species of focused evaluation, particularly special-status anadromous salmonids, associated with reinitiation of diversions in Butte and Big Chico creeks would not occur under the Proposed Action/Project. Therefore, the Proposed Action/Project represents net beneficial effects to fish species of focused evaluation, particularly special-status anadromous salmonids, relative to the No Action Alternative.

3.3.4 ENVIRONMENTAL COMMITMENTS

As previously discussed, fisheries and aquatic resources in and proximately downstream of the Action/Project Area would have the potential to be affected by water pollution associated with construction-related activities, both for the Proposed Action/Project and the No Action Alternative. However, implementation of BMPs and other protective measures incorporated into the project description, developed for water quality resources and further described in Section 2.2.3 of this Draft EA/IS, also would serve as impact avoidance and minimization measures for fisheries and aquatic resources.

Standard water pollution prevention measures, including erosion and sediment control measures, proper maintenance of equipment and storage of materials, proper control of non-stormwater discharges, and hazardous spill prevention and response measures would be implemented as part of the Proposed Action/Project, and for construction-related activities under the No Action Alternative. These measures, together with other water quality protective measures incorporated into the project description, are adequate to avoid water quality-related potentially significant effects under both NEPA and CEQA for fisheries and aquatic resources.

In addition to avoiding and minimizing potential water quality effects on fisheries and aquatic resources, one of the water quality measures (***Environmental Commitment WQ-3***) also contributes to the avoidance/minimization of the potential for entrainment of juvenile fishes into the suction dredge. That measure includes submerging the cutterhead within the substrate to the maximum extent practicable when the dredge pumps are engaged, and reducing the dredge ladder swing speed to the extent practicable – both of which additionally serve to minimize the potential for fishes to encounter the cutterhead and suction dredge and, thereby, the potential for entrainment.

In addition to the previously described water quality-related measures, additional environmental commitments and protective measures have been specifically developed to avoid and minimize potential impacts to fisheries and aquatic resources and are incorporated into the Proposed Project (see Chapter 2, Section 2.2.3). These measures are fully detailed in the Mitigation Monitoring and Reporting Program (Appendix I), and are summarized below.

- ***Environmental Commitment FAR-1:*** *Implement measures to minimize the injury or mortality of fish in the immediate work area associated with rock-toe and tree revetment maintenance activities.*
- ***Environmental Commitment FAR-2:*** *Prepare and implement an environmental awareness training program for project personnel.*
- ***Environmental Commitment FAR-3:*** *Decontaminate field gear and dredging equipment to avoid introduction of invasive species.*
- ***Environmental Commitment FAR-4:*** *Conduct entrainment monitoring if construction crews identify fish in dredge slurry.*

3.4 TERRESTRIAL RESOURCES (BOTANICAL AND WILDLIFE)

3.4.1 AFFECTED ENVIRONMENT/ENVIRONMENTAL SETTING

3.4.1.1 ACTION/PROJECT AREA

The proposed Action/Project Area is located downstream of the confluence of Big Chico Creek and the Sacramento River just south of the Bidwell-Sacramento River State Park at RM 193. The terrestrial resources evaluation area includes both banks of the Sacramento River (see

Chapter 2, Figure 2-1). The Action/Project Area on the west bank of the Sacramento River is predominantly within the Capay Unit of the SRNWR and includes the construction area on the bank of the river, the construction staging area, and the existing access road that connects to County Road 23. A small portion of the Action/Project Area associated with removal of the rock-toe and tree revetment under the No Action Alternative or maintenance of the revetment under the Proposed Action/Project would occur on private land downstream (south) of the Capay Unit of the SRNWR (also referred to as the Stile Property). The Action/Project Area on the east bank of the Sacramento River includes the M&T Chico Ranch property on the east bank of Big Chico Creek and the Sacramento River including the spoils disposal area, and access road that connects to River Road.

The Action/Project Area evaluated for terrestrial resources is generally consistent with that which was evaluated previously for the 2001 and 2007 projects (CDFG 2001; CDFG and USFWS 2007). However, on the M&T Chico Ranch property, the Action/Project Area differs slightly from that which was described in the environmental documentation for the 2001 and 2007 projects involving gravel bar excavations. Specifically, the 2001 and 2007 projects included areas of high quality riparian forest adjacent to the east bank of Big Chico Creek, which was used as a transportation corridor for heavy construction equipment (e.g., excavator, dump trucks) that were used to haul excavated material between the gravel bar and the spoils disposal site on the M&T property. The portion of the riparian forest included as part of Action/Project Area in this Draft EA/IS is limited to a narrow strip immediately adjacent to the disturbed access road and the existing spoils stockpile and the de-watering containment areas. It is anticipated that ground-disturbing activities would be limited to previously disturbed areas, and no riparian vegetation removal would occur in the riparian forest adjacent to the two containment areas, the staging areas, and the existing spoils stockpile on the M&T Chico Ranch property.

For the purposes of this analysis, the Action/Project Area is defined as the area in which direct or indirect impacts to terrestrial resources could occur. The Action/Project Area is functionally defined as:

- For valley elderberry longhorn beetle (VELB): The area within 100 feet of the construction footprint suitable for elderberry shrubs, the host plant for VELB (*Desmocerus californicus dimorphus*).
- For upland, ground nesting, and aquatic species: The area within the construction right-of-way.
- For nesting resident and migratory songbirds: The area within 100 feet (30 meters) of suitable trees and shrub nesting habitat.

3.4.1.2 TERRESTRIAL RESOURCES IN THE ACTION/PROJECT AREA

Consistent with the CALFED EIR/EIS Multi-Species Conservation Strategy and other environmental documents (CDFG and USFWS 2007; CDFG and USFWS 2007a) prepared for

projects in the area, four main habitat types have been identified as occurring within the Action/Project Area. These include valley riverine aquatic, valley/foothill riparian forest, upland/cropland, and grassland. To update information about the vegetation communities, and to delineate the vegetation community boundaries within the Action/Project Area, a vegetation community assessment was conducted during 2012. Based on species composition within each field-assessed vegetation community, applicable vegetation community designations were assigned to each area using classifications described in *A Manual of California Vegetation, Second Edition* (Sawyer et al. 2011). In addition, an equivalent wildlife habitat community (i.e., California Wildlife Habitat Relationship (CWHR) Habitat Type) was designated for each vegetation community, based on *A Guide to Wildlife Habitats of California* (Mayer and Laudenslayer 1988). The CWHR system was developed to recognize and logically categorize major vegetative complexes at a scale sufficient to predict wildlife-habitat relationships (CDFW 2013).

A total of 10 vegetation communities were identified in the Action/Project Area and characterized using the California Native Plant Society (CNPS) vegetation community types described by Sawyer et al. (2011). These included one grassland community, two shrubland vegetation communities, four woodland/forest vegetation communities, riverine aquatic habitat, disturbed/ruderal vegetation, and agricultural areas (**Figure 3.4-1, Table 3.4-1**). A number of classification systems have been developed for California vegetation. Each of these classification systems is unique in its structure and purposes, and many have evolved over time. To allow for comparison between previously collected information in the Action/Project Area and the 2012 survey findings, Table 3.4-1 includes the name of the CNPS vegetation community type as well as the corresponding name of the vegetation community type identified during the earlier surveys conducted in 2005 and 2006.

Sensitive natural communities are land cover types that are especially diverse, regionally uncommon, or of special concern to local, State, and Federal agencies. The Sacramento River and the riparian forest community described below qualify as sensitive natural communities. Removal or degradation of these communities could constitute a potentially significant impact under CEQA.

Each of the four main habitat types located within the Action/Project Area, along with the corresponding 2012 CNPS Vegetation Community characterization (if different), is described below.

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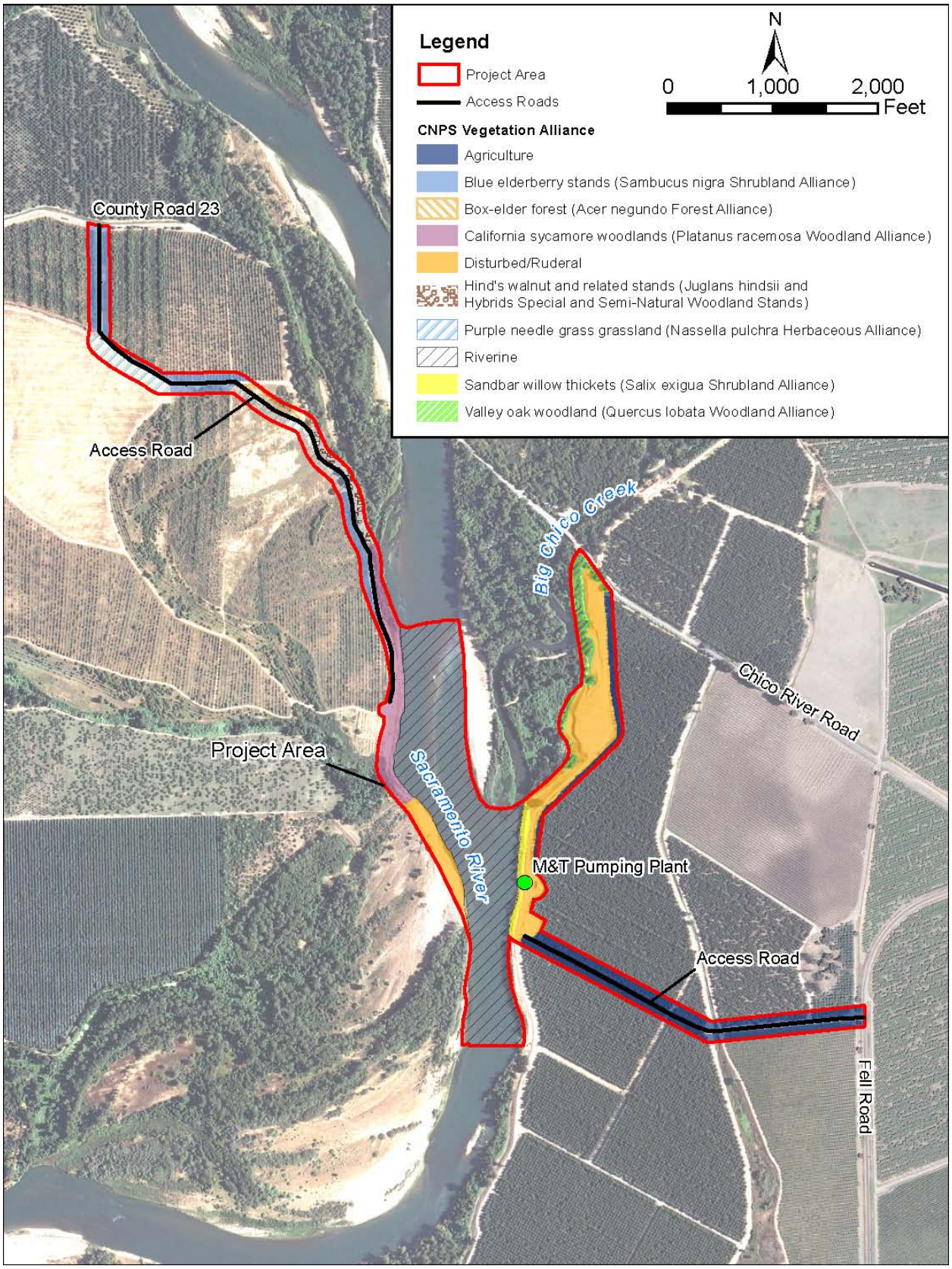

Figure 3.4-1. California Native Plant Society Vegetation Communities in the Action/Project Area.

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Table 3.4-1. Vegetation Communities in the Action/Project Area.

Vegetation Community[1]	CWHR Wildlife Habitat Type[2]	2007 Characterization of Habitat Types in the Action/Project Area	Dominant Overstory Species	Subdominant or Understory Species or Description
Purple Needle Grass Grassland (*Stipa pulchra* Herbaceous Alliance)	Perennial Grassland	Grassland	No Overstory	Purple needle-grass *(Stipa pulchra)* Blue wildrye (*Elymus glaucus)* Creeping ryegrass *(Leymus triticoides)* Meadow barley *(Hordeum brachyantherum)* Deer-grass *(Muhlenbergia rigens)* Santa Barbara sedge *(Carex barbarae)* Narrow-leaved sedge *(Carex amphibola)*
Blue Elderberry Stands (*Sambucus nigra* Shrubland Alliance)	Valley Foothill Riparian	Valley Foothill Riparian	Elderberry *(Sambucus nigra* ssp. *caerulea)* Box elder *(Acer negundo)* Coyote brush *(Baccharus sp.)* Valley oak *(Quercus lobata)* Sycamore *(Platanus racemosa)*	Native grasses California wild grape *(Vitis californica)* Poison oak *(Toxicodendron diversilobum)* Western raspberry *(Rubus leucodermis)* Stinging nettles *(Urtica dioica)*
Sandbar Willow Thickets (*Salix exigua* Shrubland Alliance)	Valley Foothill Riparian	Valley Foothill Riparian	Sandbar willow *(Salix exigua)* Arryo willow *(Salix lasiolepis)* Black willow *(Salix goodingii)* Hind's walnut *(Juglans hindsii)* Box elder *(Acer negundo)* White alder *(Alnus rhombifolia)* Fremont cottonwood (*Populus fremontii)*	Curly dock *(Rumex crispus)* Himalayan blackberry *(Rubus armeniacus)* California wild grape *(Vitis californica)*
California Sycamore Woodlands (*Platanus racemosa* Woodland Alliance)	Valley Foothill Riparian	Valley Foothill Riparian	Sycamore *(Platanus racemosa)* Fremont cottonwood (*Populus fremontii)* Sandbar willow *(Salix exigua)* Arryo willow *(Salix lasiolepis)* Black willow *(Salix goodingii)*	Native and non-native grasses Black mustard *(Brassica nigra)* Tall reedy grass Stinging nettles *(Urtica dioica)* California wild grape *(Vitis californica)* Curly dock *(Rumex crispus)* Himalayan blackberry *(Rubus armeniacus)*
Agricultural	Deciduous Orchard	Upland/Cropland	English walnut *(Juglans regia)*	N/A

Vegetation Community[1]	CWHR Wildlife Habitat Type[2]	2007 Characterization of Habitat Types in the Action/Project Area	Dominant Overstory Species	Subdominant or Understory Species or Description
Riverine	Riverine Aquatic	Valley Riverine Aquatic	N/A	N/A
Hind's Walnut and Related Stands (*Juglans hindsii* and Hybrids Special and Semi-Natural Woodland Stands)	Valley Foothill Riparian	Valley Foothill Riparian	Sycamore *(Platanus racemosa)* Valley oak *(Quercus lobata)* Fremont cottonwood (*Populus fremontii)* Box elder *(Acer negundo)* Sandbar willow *(Salix exigua)* Arryo willow *(Salix lasiolepis)* Black willow *(Salix goodingii)* Hind's walnut *(Juglans hindsii)*	No Understory
Box-Elder Forest (*Acer negundo* Forest Alliance)	Valley Foothill Riparian	Valley Foothill Riparian	Elderberry *(Sambucus nigra* ssp. *caerulea)*	Native Grasses
Valley Oak Woodland (*Quercus lobata* Woodland Alliance)	Valley Oak Woodland	Valley Foothill Riparian	Valley oak *(Quercus lobata)* Sycamore *(Platanus racemosa)* Coyote brush *(Baccharus sp.)* Box elder *(Acer negundo)*	California wild grape *(Vitis californica)* Native and non-native grasses Hind's walnut *(Juglans hindsii)* Elderberry *(Sambucus nigra* ssp. *caerulea)* Poison oak *(Toxicodendron diversilobum)* Western raspberry *(Rubus leucodermis)* Pokeberry *(Phytolacca Americana)*
Disturbed/Ruderal	Barren	N/A	No Overstory	Turkey mullein *(Croton setigerus)* Rush skeletonweed *(Chondrilla juncea)* Yellow starthistle *(Centaurea solstitialis)* Black mustard *(Brassica nigra)* Wild radish *(Raphanus raphanistrum)* rye grass *(Festuca perennis)* Puncture vine *(Tribulus terrestris)* Bindweed *(Convolvulus arvensis)* Non-native grasses

[1] As categorized in *A Manual of California Vegetation*, Second Edition (Sawyer et al. 2011).

[2] As categorized in *A Guide to Wildlife Habitats of California* (Mayer and Laudenslayer 1988).

VALLEY RIVERINE AQUATIC

Valley Riverine Aquatic habitat includes the water column of flowing streams and rivers in low-gradient channel reaches below an elevation of approximately 300 feet that are not tidally influenced. This includes associated SRA, pool, riffle, run, and unvegetated channel substrate (including seasonally exposed channel bed) habitat features, and sloughs, backwaters, overflow channels, and flood bypasses hydrologically connected to stream and river channels.

Valley Riverine Aquatic habitat exists in the following structural classes:

1. Open water, which is defined as greater than two meters in depth and/or beyond the depth of floating rooted plants. Open water and does not include substrate.
2. The submerged zone is between open water and the shoreline.
3. The shore is seldom flooded (except for wave wash or fluctuations in flow) and contains less than 10 percent canopy cover.

For the purposes of this Draft EA/IS the Valley Riverine Aquatic group is represented by the Riverine CNPS vegetation type.

The open water zones of large rivers provide resting, food, and escape cover for many species of waterfowl. Many species of insectivorous birds forage for their prey over water. Additionally, a vast array of mammals depends on riverine habitats and associated sub-communities for various life cycles.

Plant species commonly found adjacent to valley riverine aquatic habitat generally are associated with valley foothill riparian habitat (CNPS vegetation types in the study area: Blue Elderberry stands, Box-Elder forest, California Sycamore woodlands, Sandbar Willow thickets, and Valley Oak woodlands), as described below.

Wildlife species that commonly utilize this habitat type are waterfowl, raptors, shorebirds, landbirds and small mammals such as river otter (*Lutra canadensis*), muskrat (*Ondatra zibethicus*), and beaver (*Castor canadensis*).

Within the Action/Project Area valley riverine aquatic habitat contains large and small woody debris (contributed by the adjacent valley-foothill riparian forest), which serve as cover and flow refuge for fish species and terrestrial species with aquatic life stages or that spend substantial amounts of time in aquatic habitats (e.g., western pond turtle).

Construction of the Proposed Action/Project and No Action Alternative would take place primarily within valley riverine aquatic habitat. There are 65.2 acres of this habitat-type in the Action Area (Figure 3.4-1).

VALLEY-FOOTHILL RIPARIAN FOREST

Valley-Foothill Riparian Forest habitat includes all successional stages of woody vegetation, commonly dominated by willow (*Salix* spp.), Fremont cottonwood (*Populus fremontii*), valley

oak (*Quercus lobata*), or western sycamore (*Platanus racemosa*), within the active and historical floodplains of low-gradient reaches of streams and rivers generally below an elevation of 300 feet (CDFG and USFWS 2007). Valley-Foothill Riparian Forest consists of a canopy cover of 20 to 80 percent closure that is approximately 98 feet high. Typically, the habitat type contains a sub-canopy tree layer and an understory shrub layer that frequently is 30 to 50 percent wild grape. Herbaceous vegetation constitutes about one percent of the cover, except in openings where tall forbs and shade-tolerant grasses occur (Conard et al. 1977).

Riparian forest in the Action/Project Area has a tall overstory of deciduous broadleaf trees comprised primarily of valley oak (*Quercus lobata*). Other native riparian forest species include Fremont cottonwood, box elder (*Acer negundo*), Oregon ash (*Fraxinus latifolia)*, and western sycamore. Understory species in the riparian forest community include poison oak (*Toxicodendrondiversilobum*), and native California blackberry (*Rubus ursinus*), wild grape (*Vitis californica*), blue elderberry (*Sambucus nigra ssp. caerulea*) and saplings of tree species. Other plant species commonly found in or associated with Valley-Foothill Riparian Forest habitat include mugwort (*Artemesia douglassiana*), pipevine (*Aristolochia californica*), mule fat (*Baccharis salicifolia*), coyote-brush (*baccharis pilularis*), telegraphweed (*Heterotheca grandiflora*), hybridized black walnut (*Juglans nigra*), California wild rose (*Rosa californica*), Himalaya blackberry (*Rubus armeniacus*), tree of heaven (*Ailanthus altissima*), California sycamore (*Platanus racemosa*), wild fig (*Ficus platypoda*), California manroot (*Marah fabaceus*), sandbar willow (*Salix exigua*), Goodding's black willow (*Salix gooddingii*), arroyo willow (*Salix lasiolepis*), button–bush (*Cephalanthus occidentalis var. californicus*), tule (*Schoenoplectus acutus*), white alder (*Alnus rhombifolia*), and smartweed (*Polygonum* spp.).

Valley-Foothill Riparian Forest provides food, water, migration and dispersal corridors, and escape, nesting, and thermal cover for an abundance of wildlife. At least 50 amphibians and reptiles occur in lowland riparian systems. Many are permanent residents, while others are transient visitors (Brode and Bury 1984). In one study conducted on the Sacramento River, 147 bird species were recorded as nesters or winter visitants (Laymon 1984). Additionally, 55 species of mammals are known to use California's Central Valley riparian communities (Trapp et al. 1984).

Characteristic wildlife includes egrets, herons, ducks, raptor species, swallows, bats, broad-footed mole (*Scapanus latimanus*), western gray squirrel (*Sciurus griseus*), striped skunk (*Mephitis mephitis*), ringtail (*Bassariscus astutus*), and raccoon (*Procyon lotor*).

The largest patch of Valley-Foothill Riparian Forest habitat occurs on the M&T Chico Ranch property on the east bank of the Sacramento River, south and east of Big Chico Creek. Although this patch of riparian habitat was included in the 2007 project area, it is not part of the Action/Project Area for this project because no ground-disturbing activities would occur in this area (Figure 3.4-1). Riparian habitat on the west bank of the Sacramento River is composed of mature native and nonnative trees located along the bank adjacent to the location of the rock-toe and tree revetment.

Since construction of the rock-toe and tree revetment in 2007, voluntary recruitment of riparian vegetation has occurred in the revetment area. Monitoring conducted during November 2011 demonstrates the recruitment of woody riparian vegetation. Woody vegetation (primarily willows and box elders) has become established on top of the rock-toe, at the base of the bank, and on the lower angle portions of the bank above the revetment. According to Tetra Tech (2012a), significant numbers of riparian plants have volunteered onto both the top of the rock-toe and tree revetment and onto the reduced-angle lower bank slope above the contact with the revetment. The large woody material piles anchored on the top of the revetment appear to be sites of preferential establishment of box elders, sycamore and willows (see Figure 3-3.3, above), probably because of their effects on local flow velocities (Tetra Tech 2012a).

For the purposes of this Draft EA/IS the Valley-Foothill Riparian Forest habitat is represented by the following CNPS Vegetation Communities presented in Figure 3.4-1: Blue Elderberry stands (*Sambucus nigra* Shrubland Alliance), Box-Elder forest (*Acer negundo* Forest Alliance), California Sycamore woodlands (*Platanus racemosa* Woodland Alliance), Sandbar Willow thickets (*Salix exigua* Shrubland Alliance), and Valley Oak woodlands (*Quercus lobata* Woodland Alliance). These CNPS Vegetation Communities are generally described below.

Blue Elderberry Stands (*Sambucus nigra* Shrubland Alliance)

In this alliance group, elderberry shrubs are dominant in the shrub canopy, often occurring with blackberry, wild rose, and willow shrubs. The shrub canopy is open to continuous, and the herbaceous layer is variable and usually grassy. In general, blue elderberry stands are often found in riparian areas, including banks and terraces along streams (Buck-Diaz et al 2012). However, in restored areas of planted elderberry shrubs on the Capay Unit, the shrubs are densely planted in rows.

Box-Elder Forest (*Acer negundo* Forest Alliance)

In this alliance group box elder is dominant in the tree canopy, often occurring with various species of willow trees, valley oak, Fremont cottonwood, black walnut and Oregon ash. The tree canopy is intermittent to continuous, and it may be two-tiered. The shrub layer is open to intermittent, and the herbaceous layer is sparse to abundant. Stands occur near streams and in bottomlands. Soils are deep alluvium (Buck-Diaz et al 2012).

California Sycamore Woodlands (*Platanus racemosa* Woodland Alliance)

In this alliance group, California sycamore is dominant in the tree canopy, often occurring with various species of willow trees and shrubs, valley oak, Fremont cottonwood, black walnut, box elder, and Oregon ash. The canopy and shrub layers are open to intermittent, and the herbaceous layer is sparse to grassy. Stands form in gullies, intermittent streams, springs, seeps, stream and river banks, and terraces adjacent to floodplains that are subject to high-intensity flooding. Soils are rocky or cobbly alluvium with permanent moisture at depth (Buck-Diaz et al 2012).

Sandbar Willow Thickets (*Salix exigua* Shrubland Alliance)

In this alliance group, sandbar willow is dominant in the shrub canopy, often occurring with Himalaya blackberry and common buttonbush. Emergent trees may be present, including various willow species, Fremont cottonwood, box elder, and alder species. The shrub canopy is intermittent to continuous, and the herbaceous layer is variable. Stands occur in temporarily flooded floodplains, depositions along rivers and streams, and at springs (Buck-Diaz et al 2012).

Valley Oak Woodlands (*Quercus lobata* Woodland Alliance)

In this alliance group, valley oak is dominant in the tree canopy, often occurring with various species of willow trees and shrubs, valley oak, Fremont cottonwood, black walnut, box elder, and Oregon ash. The canopy is open to continuous. Shrubs are common to occasional, including wild grape and wild rose. The herbaceous layer may be grassy. Stands are found in valley bottoms and lover slopes. Soils are alluvial or residual (Buck-Diaz et al 2012).

UPLAND CROPLAND

Upland cropland habitat includes agricultural lands farmed for grain, field, truck, and other crops for profit that are not seasonally flooded and includes a variety of sizes, shapes, and growing patterns of vegetation. Most croplands support annuals, planted during the spring and harvested during summer or fall. Cropland vegetation is grown as a monoculture, using tillage or herbicides to eliminate unwanted vegetation. Cropland habitats do not conform to normal habitat stages. Instead, cropland is regulated by the crop cycle in California. These habitats can be annual or perennial, vary according to location in the State, and germinate at various times of the year. Most cropland types in California are annuals and are managed in a crop rotation system. Generally, the crop rotation system employs a combination of annual and perennial crops on a 5 to 7 year rotation. Croplands are established on the State's most fertile soils, which historically supported an abundance of wildlife unequalled in other areas.

For the purposes of this analysis, the Upland Cropland habitat type is represented by the following CNPS Vegetation Communities presented in Figure 3.4-1: Agriculture, Disturbed/Ruderal, and Hind's Walnuts and related stands (*Juglans hindsii* and hybrids Special and Semi-Natural Woodland Stands). These CNPS Vegetation Communities are generally described below.

Many species of rodents and birds have adapted to croplands and are controlled by fencing, trapping, and poisoning to prevent excessive crop losses (California Department of Food and Agriculture 1975). Common wildlife that utilize this habitat type include raptors, waterfowl, ground foraging avian species, and small mammals such as rodents, western gray squirrel, striped skunk, ringtail, and raccoon.

The Disturbed/Ruderal vegetation community borders the access roads, as well as the staging and containment areas, and existing spoils stockpile on the east portion of the Action/Project Area. Additionally, the walnut orchards are located adjacent to the access road, and staging and

containment areas on the M&T Chico Ranch property. Prior to the 2007 Temporary Maintenance Project, upland cropland (Agriculture Vegetation Community) also was located on west portion of the Action/Project Area owned by USFWS (the Capay Unit of the SRNWR) and the Stile property. The land on the Capay Unit was managed under a cooperative Land Management Agreement for interim farming. However, the area was plowed to accommodate restoration activities.

Agricultural

Agricultural lands can consist of any land that is either recently or actively being farmed and can consist of a variety of plants. The vegetation, soils, and hydrology may all be altered from their natural setting to accommodate the farming activities. Agricultural lands within the Action/Project Area are located on the M&T Chico Ranch property and primarily consist of walnut orchards.

Disturbed/Ruderal

This habitat type has no overstory and is typically inhabited by primary successional species and other invasive plants. Some typical species found Disturbed/Ruderal habitats within the Action/Project Area include turkey mullein *(Croton setigerus)*, rush skeletonweed *(Chondrilla juncea)*, yellow starthistle *(Centaurea solstitialis)*, black mustard *(Brassica nigra)*, wild radish *(Raphanus raphanistrum)*, rye grass *(Festuca perennis)*, puncture vine *(Tribulus terrestris)*, bindweed *(Convolvulus arvensis)*, and other non-native grasses.

Hind's Walnuts and Related Stands (*Juglans hindsii* and Hybrids Special and Semi-Natural Woodland Stands)

In this alliance, non-native walnuts are the dominant in the tree canopy, often occurring with valley oak, Fremont cottonwood, box elder, and Oregon ash. On the Sacramento River floodplain, black walnuts are all non-native hybrids of *Juglans hindsii* and *J. major* (Arizona walnut), a result of commercial English walnut agriculture (Kirk 2003). The shrub and herb layers may contain riparian or upland species. Stands are found along intermittently flooded or saturated riparian corridors, floodplains, stream and river banks, and terraces. The majority of stands are semi-natural in origin (Buck-Diaz et al 2012).

GRASSLAND

Perennial Grassland habitats occur in two forms in California: coastal prairie, found in areas of northern California under maritime influence, and relics in habitats now dominated by annual grasses and forbs (Cooper and Heady 1964). Annual Grassland habitats are open grasslands composed primarily of annual plant species. Many of these species also occur as understory plants in other habitats. Structure in Annual Grassland depends largely on weather patterns and livestock grazing. Dramatic differences in physiognomy, both between seasons and between years, are characteristic of this habitat. Fall rains cause germination of annual plant seeds. Plants

grow slowly during the cool winter months, remaining low in stature until spring, when temperatures increase and stimulate more rapid growth (Garrison et al. 1977).

Grassland habitat includes upland vegetation communities dominated by introduced and native annual and perennial grasses and forbs, including nonirrigated and irrigated pasturelands. Plant species commonly found in Grassland habitat are: fiddleneck (*Amsinckia menziesii*), wild oats (*Avena spp.*), silver hairgrass (*Aira caryophyllea*), ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceous*), quaking grass (*Briza minor*), red maids (*Calandrinia ciliat*), star thistle (*Centaurea solstitialis*), sticky mouse ears (*Cerastium glomeratum*), blue dicks (*Dichelostemma capitatum*), annual hairgrass (*Deschampsia danthonioides*), stork's bill (*Erodium cicutarium*) cut-leaf geranium (*Geranium dissectum*), fitch's spikeweed (*Hemizonia fitchii*), goldfields (*Lasthenia sp*.), rye grass, spanish lotus (*Acmispon americanus var. americanus*), California bur clover (*Medicago polymorpha*), popcorn flower (*Plagiobothrys nothofulvus*), annual bluegrass (*Poa annua*), vinegar weed (*Trichostema lanceolatum Benth.*), white hyacinth (*Triteleia hyacinthina*), mugwort, creeping wildrye (*Elymus triticoides*), and annual fescue (*Festuca octoflora*).

For the purposes of this Draft EA/IS the Grassland habitat type is represented by the Purple Needlegrass grasslands (*Stipa pulchra* Herbaceous Alliance) CNPS Vegetation Community presented in Figure 3.4-1.

Many wildlife species use annual grasslands for foraging including the western fence lizard, common garter snake, western rattlesnake, black-tailed rabbit, California ground squirrel, Botta's pocket gopher, western harvest mouse, California vole, badger, coyote, fox, and deer.

Native Perennial Grassland habitat borders the access road on the west bank of the Sacramento River.

Purple Needle Grass Grasslands (*Stipa pulchra* Herbaceous Alliance)

In this alliance, purple needle grass is characteristic to co-dominant in the herbaceous layer, often occurring with brome fescue (*Festuca bromoides)*, soft chess (*Bromus hordeaceus*), long-beaked stork's bill *(Erodium botrys)*, and others. Herbs are <1 m in height and cover is open to continuous. Stands occur within valleys and foothills on all topographic locations. Inland soils are often deeper with high clay content, and soils near the coast are shallower and rocky. Purple needle grass is tolerant of grazing and fire, and these disturbances appear important in maintaining some stands that have become invaded by non-native annuals (Buck-Diaz et al 2012).

3.4.1.3 RECENT MONITORING INFORMATION

CDFW, USFWS, M&T Chico Ranch and Llano Seco Rancho are responsible for overseeing the monitoring of riparian and grassland vegetation that was planted on the SRNWR and Llano Seco Rancho as mitigation for the loss of habitat associated with the 2007 M&T Chico Ranch/Llano Seco Rancho Pumping Plant Maintenance of Channel Alignment River Mile 192.5 Project (2007

Temporary Maintenance Project). Performance standards indicated that the mitigation will be considered successful if the shoreline communities on the Capay Unit of the SRNWRC maintain 60 percent survival and the riparian floodplain community on the Llano Seco Rancho maintain 80 percent survival after five years (CDFG and USFWS 2007).

As a result of these monitoring efforts, additional information is available to supplement the information presented above regarding vegetation and wildlife communities. Relevant findings from these monitoring efforts are summarized below.

GRASSLAND RESTORATION AND BANK SWALLOW CONSERVATION EASEMENT MITIGATION MONITORING AT THE SRNWR, THE RIO VISTA UNIT AND THE CAPAY UNIT

The Riparian Vegetation and Native Grassland Mitigation Plan and the Bank Swallow Mitigation Plan developed as part of the 2007 Temporary Maintenance Project (Appendix F and G, respectively, of CDFG and USFWS 2007) specified implementation of riparian vegetation restoration and monitoring, and establishment of a bank swallow colony conservation easement. On-site mitigation was conducted at the Capay Unit immediately adjacent to the rock-toe and tree revetment, and included maintenance of 2.5 acres of natural recruitment of native grasses and forbs following a prescribed burn conducted by the refuge and an additional 2.5 acres of native grassland understory. This grassland restoration forms the understory component of a Valley Oak Woodland restoration being implemented and maintained by TNC. Off-site mitigation included 6.0 acres of native grassland restoration at the Rio Vista Unit (Silveira et al. 2012).

The USFWS is responsible for native grassland restoration mitigation at the Rio Vista Unit and Capay Unit of the SRNWR. These restoration and monitoring efforts are consistent with the long-term wildlife and habitat management goal of the SRNWR and the associated riparian and floodplain wildlife and habitat objectives (USFWS 2005).

The most recent Annual Mitigation Report (Silveira et al. 2012) describes the restoration actions that have occurred, the results of annual monitoring, and the changes in species composition that have occurred over time.

Monitoring results show the mitigation project to be successful for native grassland restoration through the first four seasons of maintenance (Silveira et al. 2012). The overall frequency of native grasses at the Rio Vista Unit increased from 83% in 2008 to 93% in 2009 and 2010 (Silveira et al. 2012). The 2010 monitoring confirmed the health of dormant 2009 native grasses. The 201l monitoring suggests that, at least a portion of the 49% dormant native perennial grasses observed in 2010 may not have survived. Both blue wild-rye and creeping rye-grass decreased in 2011 (35% and 24%, respectively). While frequency frame results show a decline in native grass frequency, photo station results suggest that the native grasses still dominate the site by cover. Native and non-native forbs have been detected during various years and at relatively low frequencies compared to the native grasses planted at the site until 2012. Both native and non-native forbs increased during 2010 and 2011. However, non-native forbs increased dramatically

in 2012, necessitating mowing/herbicide weed control treatments, which appeared only partially successful due to apparent herbicide resistance of Conyza. Active non-native weed control is ongoing at the Rio Vista Unit (Silveira et al. 2012).

Similar to the Rio Vista Unit, the non-native species have increased at the Capay Unit mitigation site (**Figure 3.4-2**). Understory vegetation at the 2.5-acre valley oak woodland restoration site at the Capay Unit consisted of 63% native species during the 2009 monitoring (Silveira et al. 2012). Blue wild-rye (36%) was the dominate plant, followed by creeping rye-grass (14%) and mugwort (13%). Natural recruitment sites immediately east (just above the river bank) and west of the valley oak woodland were monitored annually from 2008 through 2012. The natural patch of creeping rye-grass above the bank was dominated by non-native grasses during this period, despite mowing treatments to reduce seed abundance of non-native grasses. No active weed management was conducted at the Capay Unit during 2011 or 2012 (Silveira et al. 2012). Consistent with observations at other native grassland sites, the authors hypothesize that overbank flooding during the spring may increase the distribution of native species such as creeping rye-grass at the Capay Unit. Additionally, spot herbicide treatments were recommended. Future annual maintenance at both the Capay Unit and the Rio Vista Unit will be identified during annual habitat management planning for the SRNWR (Silveira et al. 2012).

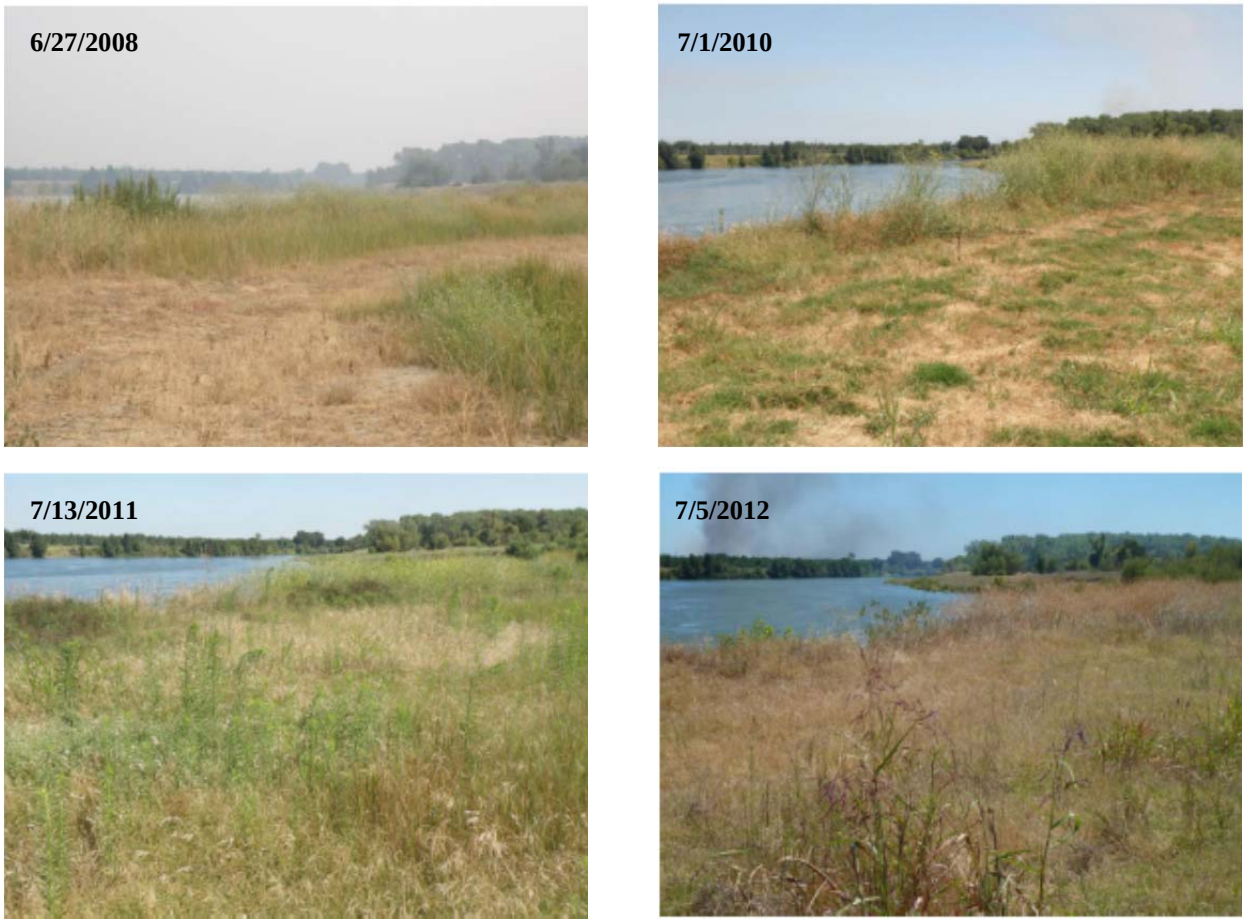

Figure 3.4-2. Capay Unit Native Grasslands Monitoring Results (2008-2012) (Silveira et al. 2012).

In 2008, a bank swallow mitigation site was established along the east bank of the Sacramento River on the M&T Chico Ranch between RM 191.9 to 192.2 (Silveira et al. 2012). The USFWS is responsible for managing the wildlife conservation easement for the bank swallow mitigation site and for monitoring bank swallow colony occupancy during the breeding season at the Capay Unit and the bank swallow mitigation site (Silveira et al. 2012).

Survey results from the annual cooperative bank swallow survey show declining trends, locally at the Capay Unit and overall for the Sacramento River along the reaches in the vicinity of the Action/Project Area (**Table 3.4-2; Figure 3.4-3**).

Silveira et al. (2012) report that active bank swallow burrows at the Capay Unit declined to zero burrows in 2012 from a high of 217 burrows during 2007. The timing of the decline in the number of bank swallow burrows coincides with the installation of toe-rock and tree revetment on the Capay Unit because only three burrows were observed in 2008, the season after installation of the rock-toe, and no burrows have been observed since 2009 (Silveira et al. 2012). Fluctuating bank swallow activity at the M&T Chico Ranch mitigation site during 2008 through 2010 is attributed to erosion and bank movement into unsuitable floodplain soil textures for bank swallow burrow construction (Silveira et al. 2012). Continued erosion at the mitigation site would expose fine sandy loam at the bank face, while continued erosion (if the rock-toe and tree revetment was removed) at the Capay Unit would expose silt loam, thus potentially providing greater amounts of suitable soil textures for bank swallow burrow construction at the Capay Unit (Silveira et al. 2012).

Table 3.4-2. Summary of Annual Cooperative Bank Swallow Survey Results.

Location	River Mile	Bank	Average Number of Bank Swallow Burrows					
			2007	2008	2009	2010	2011	2012
Capay Unit	193.2	Right	217	3	0	0	0	0
M&T Chico Ranch 2007 Mitigation Site	191.9 to 192.2	Left	108	0	23	0	109	0
Sacramento River Reach 2 and 3 Total	243 to 143		17,640	17,660	16,259	10,662	11,710	15,054
Source: Taken from USFWS 2012, as cited in Silveira et al. 2012.								

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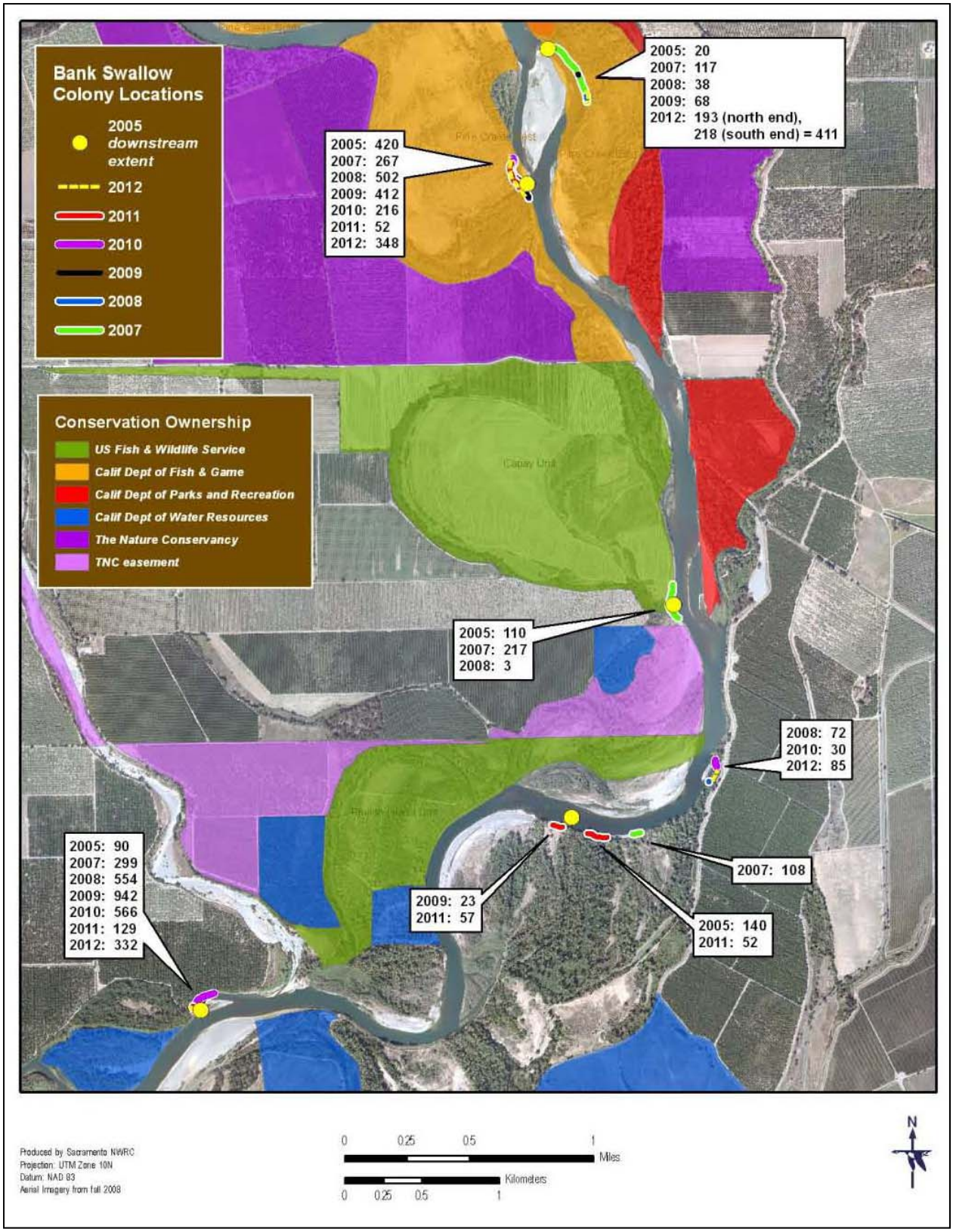

Figure 3.4-3. Bank Swallow Colonies Near the Capay and Phelan Island Units (2005-2012) (Taken from Appendix G in Silveira et al. 2012).

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M&T/LLANO SECO PUMPING PLANT RIPARIAN VEGETATION MITIGATION MONITORING

The Northern California Regional Land Trust (NCRLT) is contracted to monitor 0.35 acres of SRA on the Capay Unit and 3.46 acres of valley foothill riparian habitat at Doe Island on the Llano Seco Rancho easement property held in trust by NCRLT. Monitoring has been conducted annually from December 2009 through October 2012 and the results have been presented in four separate annual reports, which are summarized below.

Tree, shrub, and grass/sedge plantings were completed at both sites during the spring of 2009. Irrigation lines were installed at each site and were in good condition. However, a majority of the Capay Unit site was replanted during early fall 2009 due to lack of adequate moisture. Additionally, some replanting occurred at the Doe Island site (NCRLT 2012).

Plantings on the Capay Unit originally included one row of trees, one row of mixed trees and shrubs, and one row of shrubs positioned parallel to the river bank. Each tree location also included a Santa Barbara sedge plant. Due to low survivorship rates between 2007 and December 2011, many dead or missing trees or shrubs were replaced with new sandbar willow plantings prior to the 2012 monitoring efforts. Sandbar willow was selected as a replacement plant because it was growing well in similar conditions nearby. During the 2011 monitoring effort, it was noted that some western sycamores had been snapped off at the lower portion of the trunk. Wire fencing was subsequently installed as beaver barriers. During the 2012 monitoring effort, it appeared that the barriers were excluding beavers sufficiently (NCRLT 2012).

Vegetation at the Doe Island site was planted to connect a mature riparian corridor resulting from a historical river oxbow. The site includes a total of 2,058 plantings, which were completed in 14 rows, alternating overstory species (trees/large shrubs) and understory species (small shrubs/grasses) in each row (NCRLT 2012).

Monitoring results indicate that plantings at the Capay Unit exhibit a 77% overall survival rate and there is an 84% overall survival rate for the Doe Island site (NCRLT 2012). At the Capay Unit, plant vigor ratings were as follows: 0 poor, 9 fair, 50 good, 14 excellent, and 21 missing or dead out of 94 plants. Plant vigor results at the Doe Island site were: 41 poor, 129 fair, 179 good, 123 excellent, and 48 missing or dead out of 520 plants. The plant vigor results indicate that both sites are becoming established with predominantly healthy plants (NCRLT 2012).

Overall, plantings at the Capay Unit were of much smaller stature than those at the Doe Island site, which is due in part to the planting dates. However, growing conditions at the Capay Unit are less conducive due to sandy soils that may impact plant vigor and survival until plantings are fully established. NCRLT (2012) recommends that both the Capay Unit and the Doe Island sites be monitored throughout the late spring and summer to assure that irrigation lines are functioning and plants are receiving adequate water. In conclusion, NCRLT (2012) states *"From the data collected, it appears that the riparian floodplain community at the Doe Island site is currently meeting its survival goal of 80% with a current survival rate of 84%, and the shoreline*

community at the Capay Unit is meeting of its survival goal of 60% with a current survival rate of 77% and may require additional plantings."

3.4.1.4 SPECIAL-STATUS SPECIES IN THE ACTION/PROJECT AREA

Special-status species are defined as plants and animals that are legally protected under the ESA, CESA, or other statutes or regulations and species that are considered sufficiently rare by the scientific community to qualify for listing. Special-status species are defined as species that meet one of the following criteria.

- Listed as threatened or endangered under ESA
- Proposed or candidates for possible future listing as threatened or endangered under ESA
- Listed as threatened or endangered under CESA
- Candidates for listing by the State of California as threatened or endangered under CESA
- California species of special concern
- Species protected under the Bald and Golden Eagle Protection Act
- Fully protected in California under the California Fish and Game Code
- Species that meet the definitions of rare or endangered under State CEQA Guidelines Section 15380.
- Plants listed as rare under the California Native Plant Protection Act
- Plants ranked in the California Native Plant Society (CNPS) California Rare Plant Rank as 1A, 1B, or 2.

Consistent with the approach used in the Administrative Draft Butte Regional Conservation Plan (BCAG and USFWS 2011), four criteria were applied to evaluate whether special-status species have the potential to occur in the Action/Project Area and may be affected by the Proposed Project.

- **Occurrence in the Area**. The species known to occur in the Action/Project Area or could occur based on presence of habitat in the area and known occupied habitat near the Action/Project Area.
- **Potential for Listing**. The species is listed threatened or endangered under the ESA or CESA or is reasonably likely to become listed, or is fully protected under the California Fish and Game Code. Non-listed species are considered likely to become listed in the future if they meet one of the following criteria:
    - They are currently proposed for listing under ESA or are candidates for listing under ESA or CESA, or

- They are a California species of special concern or CNPS California Rare Plant Rank 1A, 1B, or 2 plant species whose populations or habitats are continuing to decline and a substantial proportion of their population is located in the Plan Area that could be substantially affected by covered activities.

- **Potential to be Affected.** The species or its habitats could be affected by the types of activities anticipated to occur as part of the proposed project.
- **Sufficient Information**. Sufficient scientific information and data are available to determine potential impacts of the proposed project on the species and to formulate conservation measures that could effectively mitigate adverse impacts.

The species addressed in this Draft EA/IS were identified with the assistance of USFWS, NMFS, and CDFW personnel during the planning and scoping portion of the project.

Additionally, several previous investigations have been conducted regarding special-status species in the Action/Project Area. Prior to this project, species having the potential to occur in the Action/Project Area were identified by querying available special-status species databases during 2006 and 2011, and a series of field surveys were conducted during 2005 and 2006. To update the 2005/2006 and 2011 information, new surveys and database queries were conducted during 2012.

For this Draft EA/IS, information regarding the suite of special-status species that could be directly or indirectly affected by the Proposed Project was obtained from various sources. The key sources of data and information used in the preparation of this section are listed below.

- A California Natural Diversity Database (CNDDB) records search for the potentially affected area, which includes portions of the following U.S. Geological Survey (USGS) 7.5-minute topographical quadrangles that overlap the affected area: Chico, Ord Ferry, Llano Seco, Nelson, Hamilton City, Glenn, Nord, Richardson Springs, and Foster Island was conducted on November 12, 2012 (Appendix F).
- A query of the USFWS Sacramento Fish and Wildlife Office list generator was conducted on October 30, 2012 to obtain an official list of Federally endangered, threatened, and proposed species that may be affected by projects in the aforementioned nine USGS quadrangles (Appendix F).
- A review of the records in the 2012 CNPS Inventory of Rare and Endangered Plants was conducted for the same USGS quadrangles on October 31, 2012 (Appendix F).
- National Resource Conservation Service Web Soil Survey Results were reviewed for areas located in the Action/Project Area (Appendix F).
- Results from field surveys previously conducted in the Action/Project Area (CDFG and USFWS 2007).

- Results of June 2012 field surveys including focused VELB habitat surveys, nesting raptor surveys and general habitat mapping (Appendix F).
- The Glenn County General Plan (Glenn County 1993).
- The Butte County General Plan 2030 (Butte County 2010).
- The Butte County Regional HCP/NCCP (in preparation; status available at www.buttehcp.com).

SPECIES AND/OR SUITABLE HABITAT WITHIN THE ACTION/PROJECT AREA

Brief descriptions of previous and most recent database reviews and field surveys for plant and wildlife species conducted in the vicinity of the Action/Project Area are summarized inn **Table 3.4-3**. Species observations from the June 2012 field surveys are shown in **Figure 3.4-4**.

Based on available information, including the USFWS (2012) species list and CNDDB (CDFG 2012) records search for the quadrangles overlapping the Action/Project Area, a comprehensive list of special-status species with the potential to occur in the Action/Project Area was developed (**Table 3.4-4)**. The findings of the literature review and field surveys are as follows:

- Because USFWS generally requires a 100-foot protective buffer for VELB around a construction area (USFWS 1999b), surveys were conducted within a 100-foot buffer around the Action/Project Area boundary (RBI 2012). Within the vicinity of the Project Area, 440 elderberry shrubs[3] were documented (see Figures 5-1a and 5-1b in Chapter 5). A total of 372 elderberry shrubs were documented within 100 feet of the Action/Project Area, and 274 shrubs were documented within the Action/Project Area boundary, defined as the centerline of the access road for this assessment. Three of these shrubs had exit holes. A portion of the Action/Project Area on the west side of the Sacramento River is within the Capay Unit of the SRNWR. Since its acquisition in 1999, the USFWS in partnership with The Nature Conservancy (TNC) has gradually restored portions of the Capay Unit with native riparian and grassland species. Of the 372 recorded elderberry shrubs documented within 100 feet of the Action/Project Area, 300 shrubs are located within riparian blue elderberry stands planted and maintained by the USFWS (RBI 2012).
- During 2005 and 2007, bank swallows nested in the Action/Project Area. Three bank swallow burrows were identified during 2008 surveys. Surveys conducted during 2009, 2010, 2011 and 2012 did not locate any bank swallow burrows at the Capay Unit.

[3] When mapped using GIS, some shrubs were found to be more than 100 feet outside the survey area, and therefore were not discussed further in the survey report (RBI 2012).

Table 3.4-3. Summary of Biological Resource Surveys Conducted Proximate to the Action/ Project Area.

Study	Dates	Methods
CNDDB Review	8/1/2005 6/15/2006 4/15/2007	Review of species occurrence data for the Ord Ferry, Foster Island, Nord, Richardson Springs, Hamilton City, Chico, Glenn, Llano Seco and Nelson USGS quadrangles
	11/6/2012	Review of species occurrence data for the Ord Ferry, Foster Island, Nord, Richardson Springs, Hamilton City, Chico, Glenn, Llano Seco and Nelson USGS quadrangles
Field Survey (Proposed Project Location)	8/10/2005	Reconnaissance-level survey of revetment Project Area.
	8/12/2005	Focused survey for VELB within 100 feet of revetment Project Area.
	10/4/2005	Focused survey for VELB within 100 feet of revetment Project Area and access road.
	6/15/2006	Focused survey for VELB within 100 feet of dredging Project Area; nesting raptor survey within 400 m of dredging Project Area where accessible; vegetation survey of the dredging Project Area; giant garter snake habitat assessment.
	6/27/2006	Vegetation survey of the revetment Project Area; nesting raptor survey within 400 m of revetment Project Area where accessible; giant garter snake habitat assessment.
	6/25-28/2012	Focused survey for VELB within 100 feet of Project Area; nesting raptor survey within 500 ft of Project Area where accessible; vegetation survey of the Project Area; giant garter snake habitat assessment.
Review of Giant Garter Snake Distribution Data	2006	General analysis of distribution of this species CNDDB (July 2006) and consultation with CDFW.
	2012	General analysis of distribution of this species CNDDB (Nov 2012) and giant garter snake habitat assessment.
Review of Fish Distribution Data	2005 and 2006	Yoshiyama et al. (1998), Hill and Weber (1999), Micheny (1989) and Micheny and Deibel (1986), Moyle (2002), Vogel and Marine (1991), NMFS (2005); general analysis of distribution via CNDDB (July 2006) and consultation with CDFW and NMFS.
	2012	Yoshiyama et al. (1998), Hill and Weber (1999), Micheny (1989) and Micheny and Deibel (1986), Moyle (2002), Vogel and Marine (1991), NMFS (2009); general analysis of distribution via CNDDB (Nov 2012) and consultation with CDFW and NMFS.
Review of USFWS and CDFW Bank Swallow Survey Data	April 2007	Review of data obtained from 1999 through 2005 from annual bank swallow surveys on the Sacramento River.
	February 2013	Review of data obtained from 1999 through 2012 from annual bank swallow surveys on the Sacramento River.

Table 3.4-4. Species with the Potential to Occur in the Action/Project Area.

Common Name / Scientific Name	Legal Status[1]		
	Federal	**State**	**Other**
PLANTS			
Ferris's Milk-Vetch (*Astragalus tener ferrisiae*)	–	–	CNPS Rank 1B.1
Adobe-Lily *(Fritillaria pluriflora)*	–	–	CNPS Rank 1B.2
Recurved Larkspur (*Delphinium recurvatum*)	–	–	CNPS Rank 1B.2
California Satintail (*Imperata brevifolia*)	–	–	CNPS Rank 2.1
Butte County Fritillary *(Fritillaria eastwoodiae)*	–	–	CNPS Rank 3.2
Parry's Rough Tarplant (*Centromadia parryi ssp. Rudis*)	–	–	CNPS Rank 4.2
INVERTEBRATES			
Valley Elderberry Longhorn Beetle (*Desmocerus califorunicus dimorphus)*	T / D[3]	–	USFS: Sensitive
REPTILES AND AMPHIBIANS			
Western Pond Turtle (*Actinemys marmorata)*	–	SSC	USFS: Sensitive
BIRDS			
Bald Eagle (*Haliaeetus leucocephalus*)[2]	D	E	USFWS: BCC
Bank Swallow (*Riparia riparia*)	–	T	–
Osprey (*Pandion haliaetus*)	–	WL	CDF: Sensitive
Swainson's Hawk (*Buteo swainsoni*)	–	T	–
Western Yellow-Billed Cuckoo (*Coccyzus americanus occidentalis*)	C	E	USFWS: BCC USFS: Sensitive
White-tailed Kite (*Elanus caeuleus*)	–	–	CDFW: CFP (Nesting)

[1] Status Explanation

E = Listed as endangered under the Federal or State ESA

T = Listed as threatened under the Federal or State ESA

C = Candidate for listing under the Federal ESA

D = Federally delisted

USFS = U.S. Forest Service

BLM = Bureau of Land Management

BCC = USFWS Birds of Conservation Concern

SC = NMFS' species of concern

SSC = State species of special concern

WL = Watch list

– = No status

CNPS = California Native Plant Society Rating

CNPS Rank 1B = Rare, threatened, or endangered in California and elsewhere

CNPS Rank 2 = Rare in California, but more common elsewhere

CNPS Rank 3 = Need more information

CNPS Rank 4 = Plants of limited distribution; a watchlist

_.1 = Seriously endangered in California (over 80% of records threatened/high degree and immediacy of threat)

_.2 = Fairly endangered in California (20-80% records threatened)

_.3 = Not very endangered in California (<20% of records threatened or no current threats known)

[2] The Post-Delisting Monitoring Plan will monitor the status of the bald eagle over a 20-year period with sampling events held once every 5 years.

[3] VELB was proposed for de-listing by USFWS in October 2012 . If this species is removed from Federal ESA protection, it is anticipated that a Post-Delisting Monitoring Plan would be implemented similar to the approach taken when bald eagle was de-listed.

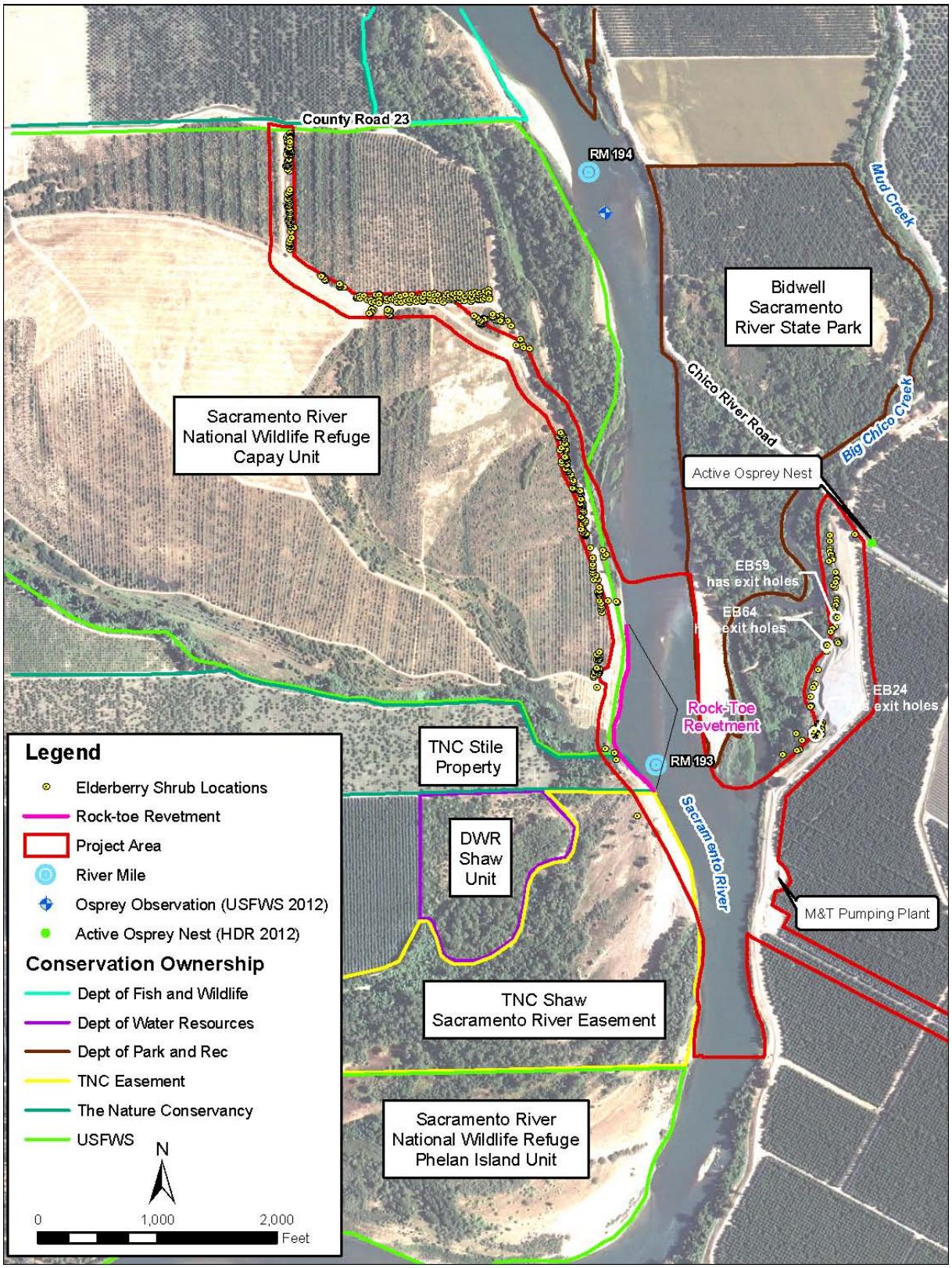

Figure 3.4-4. Special-Status Species Observed in the Vicinity of the Action/Project Area During Surveys Conducted in June 2012.

An active osprey nest was observed near the Big Chico Creek and Sacramento River confluence in 2006. In 2012, an active osprey nest was observed approximately 67 feet outside of the Action/Project Area, on top of a utility pole along River Road. Biologists attempted to document the osprey nest observed in 2006, but it was no longer present. USFWS also has documented one osprey occurrence (e.g. observation of fly-over in the vicinity of the Action/Project Area near RM 194.

- The Administrative Draft Butte Regional Conservation Plan (BCAG and USFWS 2011) identifies the survey period for determining nesting raptor species (e.g., white-tailed kite, Swainson's hawk) as March 15 to August 15. Although no observations of white-tailed kite were made during the June 2012 survey, or during previous surveys in the Action/Project Area, USFWS reports that white tailed kite are frequently observed on the Capay Unit, including as recently as March 27, 2013 (K. Moroney, USFWS, 2013, pers. comm.).
- Riparian, agricultural and grassland habitats occur within and adjacent to the Action/Project Area, which are suitable for Swainson's hawk nesting and foraging. During the June 2012 survey, Swainson's hawk were observed foraging and soaring within the Action/Project Area. Additional raptor species observed foraging or soaring within the Action/Project Area included red-tailed hawk, turkey vulture, and red-shouldered hawk. However, no nests of these species were identified within 500 feet of the Action/Project Area during the 2012 surveys.
- Suitable habitat for western yellow-billed cuckoo exists in the Action/Project Area, although there are no known occurrences of the species in the Action/Project Area.
- There are no known occurrences of special-status plant species in the Action/Project Area. However, a total of four special-status plant species and two CNPS Rank 3 and 4 plant species were identified as having the potential to occur (Table 3.4-4), and are discussed in more detail below.

Special-status fisheries resources are evaluated in Section 3.3 and in Chapter 5.

Of the six plant species (i.e., Ferris milk-vetch, adobe-lily, California satintail, recurved larkspur, Butte County fritillary and Parry's rough tarplant) with the potential to occur, only the Ferris milk-vetch is identified in the Administrative Draft Butte Regional Conservation Plan (BCAG and USFWS 2011). According to BCAG and USFWS (2011), Ferris milk-vetch is associated with vernal pool habitat, and the closest CNDDB (2012) record for this species is approximately 5 miles north of the Action/Project Area. Within the Action/Project Area, disturbance associated with the dredging and spoils disposal, and revetment maintenance would primarily occur in vegetation communities identified as disturbed/ruderal, sandbar/willow thickets and California sycamore woodlands (Figure 3.4-1). Therefore, it is unlikely that Ferris milk-vetch is present in the areas that would be affected by the Proposed Action/Project.

Regarding the other three CNPS Rank 1 and 2 plant species with the potential to occur (i.e., dobe-lily, California satintail and recurved larkspur), the closest CNDDB (2012) records of occurrence are 6, 12 and 16 miles away from the Action/Project Area, respectively. Comparison of the habitat requirements for these CNPS Rank 1 and 2 plant species vegetation community habitat types identified in the Action/Project Area during the 2012 surveys suggests that they could utilize following habitats.

- *Adobe-lily* – Potential to occur in perennial grasslands (purple needle grass grasslands), valley foothill riparian habitats (blue elderberry stands) and valley oak woodland habitats (valley oak woodlands) within the Action/Project Area.
- *California satintail* – Potential to occur in valley foothill riparian habitats (blue elderberry stands).
- *Recurved larkspur* – Potential to occur in fine alkaline soils within perennial grasslands (purple needle grass grasslands), open, grassy areas in the understory of valley foothill riparian habitats (blue elderberry stands, California sycamore woodlands, or box-elder forest) and valley oak woodland habitats (valley oak woodlands).

As discussed above and in Appendix F, 300 of the elderberry shrubs in the vicinity of the Action/Project Area are located within recently restored riparian blue elderberry stands planted and maintained by the USFWS at the Capay Unit of the SRNWR (RBI 2012). USFWS currently conducts chemical-based weed control for noxious invasive weed species and cattle graze approximately 400 acres for fuel reduction and native grass plant vigor (K. Moroney, USFWS, 2013, pers. comm.). Because the area proximate to the Capay Unit access road was previously disturbed and then replanted with rows of elderberry plants, it is unlikely that suitable habitat for Adobe-lily, California satintail or other special-status plant species is present, particularly in the recently restored habitat areas within the Action/Project Area.

Parry's rough tarplant is a CNPS Rank 4.2 species (i.e., a watchlist species) that is typically associated with vernally mesic areas in valley and foothill grassland habitats (Table 1 in Appendix E). It has been suggested that this species may occur in areas receiving spring moisture within the following vegetation communities: (1) perennial grasslands (purple needle grass grasslands); and (2) open, grassy areas in the understory of valley foothill riparian habitats (blue elderberry stands, California sycamore woodlands, or box-elder forest) and valley oak woodland habitats (valley oak woodlands). The bloom period for this species is from May through October (Table 3 in Appendix E).

CEQA and CDFW Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities (CDFG 2009) do not require surveying for CNPS Rank 3 and 4 plants. In general, CNPS Rank 3 plants (plants about which more information is

needed)[4] and Rank 4 plants (plants of limited distribution) may not warrant consideration under CEQA §15380 (CDFG 2009). However, the industry standard is to note Rank 3 and 4 plant species if they are discovered while conducting floristic surveys for CNPS Rank 1 and 2 special-status plant species, which is done to gather information about watchlist species (e.g., Parry's rough tarplant) that may be incidentally identified.

Although an April/May survey period is the early part of the bloom season for Parry's rough tarplant, no new additional surveys would need to be conductedfor the following reasons.

- CEQA does not require surveys for CNPS Rank 3 and 4 plants.
- CESA does not require surveys for CNPS Rank 3 and 4 plants.
- Review of standard special-status species databases indicated Parry's rough tarplant is not known to occur in the Action/Project Area.
- Vegetation surveys were conducted on June 15, 2006 and June 27, 2006 prior to the dry-land excavation and revetment construction activities that occurred during 2007. These surveys did not identify special-status plant species, including Parry's rough tarplant.
- A large portion of the project area is on USFWS land, on which substantial restoration efforts have occurred. Vegetation monitoring has not documented the occurrence of this species and it seems likely that USFWS staff may have observed special-status plants if they were present.
- Most construction activities occurring on land would occur in ruderal habitats (i.e., on or adjacent to access roads and the existing gravel stockpile) with the exception of equipment or personnel moving to and from the dredge. These activities likely would occur in a small, localized area of riparian scrub habitat immediately adjacent to the Sacramento River. If special-status plants are observed during an early season floristic survey, then these plants would be avoided by the construction activities.

As a conservative measure to further investigate the potential presence/absence of the four special-status species identified in Table 3.4-4, a floristic pre-construction survey would be conducted during the spring of 2013 (i.e., late April/early May). Parry's rough tarplant reportedly begins blooming during May. Natural variation in the blooming periods of individual plants and local populations could facilitate identification of the species during an April/May spring survey conducted within the Action/Project Area, if present. If Parry's rough tarplant is identified during the pre-construction survey, CDFW will be consulted to determine if additional focused surveys are be required.

[4] CDFG (2009) states that Rank 3 and 4 plants may be included on special status plant lists such as those developed by counties where they would be addressed under CEQA §15380. List 3 plants may be analyzed under CEQA §15380 if sufficient information is available to assess potential impacts to such plants.

In the event that one or more of the four special-status plant species are identified within the Action/Project Area, then CDFW and USFWS would be notified, the locations of individual plants or populations of these species will be clearly identified and these locations will be clearly identified as avoidance areas (e.g., exclusionary fencing and signage).

Terrestrial species included for detailed analysis include:

- Valley elderberry longhorn beetle
- Bank swallow
- Swainson's hawk
- Western yellow-billed cuckoo
- Osprey
- White-tailed kite
- Bald eagle
- Western pond turtle

Valley Elderberry Longhorn Beetle

The valley elderberry longhorn beetle (VELB) (*Desmocerus californicus dimorphus*) was Federally listed as a threatened species and critical habitat was designated in 1980 (45 FR 52803). Although the Action/Project Area is not located within designated critical habitat for VELB, the SRNWR was established, in part, to protect and restore VELB habitat. On October 2, 2012, USFWS issued a proposed rule to remove VELB from the Federal list of endangered and threatened wildlife and to remove the designation of critical habitat (77 FR 60237). One consideration in the proposal to delist VELB was the amount of habitat restored on the SRNWR and that VELB were colonizing restoration sites. However, because VELB are listed as a federal threatened species, it will be protected at the SRNWR as such regardless of the designation of critical habitat or of a Final Ruling to remove VELB from listing under the ESA (K. Moroney, USFWS, 2013, pers. comm.). Additional information regarding the status of the de-listing proposal is provided in Chapter 5. Because CESA does not provide protection to insects (California Fish and Game Code Sections 2062, 2067 and 2068), VELB has no State-listed status.

A California endemic species, VELB are found in scattered populations throughout its range. The species' range includes most of the California Central Valley (Barr 1991). Adult beetles feed on elderberry nectar, flowers and foliage, and are generally active from March through June (77 FR 60238; USFWS 2006). VELB mate during May, and females lay eggs on the leaves or stems of living elderberry shrubs (Barr 1991). Larvae hatch within a few days and bore into living stems that are at least 1.0 inch in diameter. The larvae remain within the elderberry stem, feeding on the pith (dead woody material) until they complete their development. When a larva is ready to pupate, it chews an exit hole to the outside of the stem and then plugs it with wood shavings. The larva then retreats into the feeding gallery and constructs a pupal chamber. The pupal stage lasts about a month, and the larvae generally metamorphose between December and April. After metamorphosing into an adult, the adults remain in the chamber for several weeks and then emerge from the chamber through the exit hole. Most records for adults occur from late-April to

mid-May (USFWS 1984; USFWS 2007). Adults live from a few days to a few weeks after emerging, during which time they mate and lay their eggs (77 FR 60240).

Elderberry shrub surveys were performed by Gallaway Consulting, Inc. on August 12, 2005, October 4, 2005, and June 15, 2006. These surveys were conducted in accordance with Conservation Guidelines for VELB (USFWS 1999). Fifty-five (55) elderberry shrubs were found within 100 feet of the action area (see Figure 3-2 in CDFG and USFWS 2007), with 22 of the shrubs containing VELB exit holes. The surveys were conducted by walking the study area, associated Valley-Foothill Riparian Forest, and adjacent upland cropland.

More recently, an assessment of VELB habitat present within 100 feet of the Action/Project Area was conducted by biologists from Robertson-Bryan, Inc. (RBI) from June 25 through 28, 2012. The assessment was conducted to the methodology described in the USFWS VELB Conservation Guidelines (USFWS 1999). A total of 274 shrubs are within 100 feet the Action/Project Area, defined as the centerline of the access road for this assessment (see Figure 5-1a and Figure 5-1b in Chapter 5). Three of the shrubs located in valley oak woodlands along Big Chico Creek, showed signs of VELB occupation (i.e., exit holes). A portion of the Action Area on the west side of the Sacramento River is within the Capay Unit of the SRNWR. Since its acquisition in 1999, the USFWS has gradually restored portions of the Capay Unit with native riparian and grassland species. Of the 440 recorded elderberry shrubs, 300 are located within non-riparian blue elderberry stands planted and maintained by the USFWS. These stands are part of a native riparian and grassland vegetation restoration project initiated and maintained by the USFWS. Although irrigation on the Capay Unit restoration areas ceased in 2010, USFWS currently conducts chemical-based weed control for noxious invasive weed species and cattle graze approximately 400 acres for fuel reduction and native grass plant vigor (K. Moroney, USFWS, 2013, pers. comm.). For detailed survey results including representative photos and field data sheets, see Appendix F.

Bank Swallow

Bank swallow (*Riparia riparia*) was designated as threatened under CESA during March 1989 (CDFG 2000). A State Recovery Plan for the bank swallow was completed and adopted by the Fish and Game Commission in 1992 (CDFW 2013a). More recently, a Bank Swallow Conservation Strategy for the Sacramento River Watershed (BSTAC 2013) was developed, which is intended to guide the preservation, protection, and restoration of habitat and natural river processes that support bank swallow populations in California.

During 2000, it was reported by CDFG (2000) that the Sacramento Valley riparian system provided habitat for over 70 percent of the remaining bank swallow population. The species is a neotropical migrant found primarily in riparian and other lowland habitats in California west of the deserts during the spring to fall period (CDFG 2007a; CDFG 2007b). In California, bank swallows rely on naturally eroding habitats for nesting within lowland river systems (CDFG 2000). Nests with an approximate depth of two to three feet are dug perpendicularly into vertical

banks along streams and coastal bluffs (CDFG 2000). Currently, bank swallows are restricted to riparian, lacustrine, and coastal locations where sandy, vertical bluffs or riverbanks are available for nesting (CDFG 2007b).

Insects are the primary food source of bank swallows, which hunt over grassland, shrubland, savannah, and open riparian areas during the breeding season, and over grassland, brushland, wetlands, and cropland during their migration (CDFG 2007a; CDFG 2007b). Moffatt et. al. (2005) identified grassland restoration as an important factor for bank swallow colony vitality, presumably due to relatively high levels of insect prey. Bank swallows may arrive in California during early March, but generally breed from April to August with peak activity occurring during mid-May through mid-June (CDFG 2007a; CDFG 2007b). Migration to South America generally begins by late July or early August and migrants usually are observed through early or mid-September (CDFG 2007a; CDFG 2007b).

CDFW (2013a) estimates that the habitat range for bank swallows in California has been reduced by 50 percent since 1900. CDFG (2007b) reported that only approximately 110 to 120 colonies remained within California. During 1999, 75 percent of the current breeding population in California occurred along banks of the Sacramento and Feather rivers in the northern Central Valley (CDFG 2007b). About 50 to 60 colonies remained along the Sacramento River and 15 to 25 colonies occurred along lower Feather River where the river meanders in a mostly natural state (CDFG 2007b). Installation of riprap to stabilize stream banks has been identified as the primary cause of nesting habitat destruction in several studies (Garrison et al. 1989, Garrison et al. 1987; Schlorff 1997). Experimental habitat creation and restoration of historical nesting sites has been partially successful along the Sacramento River (Garrison et al. 1989). Surveys conducted to date have shown a decline in the bank swallow population, and a need for more active protection and restoration of their nesting habitat (Anderson et al. 2012) (**Figure 3.4-5**).

In 2005, a bank swallow colony of approximately 110 nesting pairs was reported using the eroded bank at the existing rock-toe and tree revetment on the Capay Unit of the SRNWR. Prior to installation of the revetment in 2007, 220 nesting pairs were reported by USFWS and CDFW biologists (Kevin Foerster, pers. comm. 2007). Nesting individuals were not observed during surveys conducted by Gallaway Consulting, Inc. biologists on June 27, 2006. Additional results of the Annual Bank Swallow Survey indicate that from 1999 through 2007 estimates ranging from 50 (during 2002) to 340 (during 2001) nesting pairs were observed on the west bank of the Action/Project Area before the rock-toe and tree revetment was installed. Concurrent with installation of the revetment on the Capay Unit in 2007, bank swallow utilization of the bank for nesting no longer occurs due to lack of habitat suitability. Beginning in 2008, a mitigation site for temporary impacts was established at the M&T Chico Ranch. Monitoring at both sites from 2007 to 2012 has shown a steady decline of breeding bank swallows (Table 3.4-2), with no breeding birds observed using the rock-toe and tree revetment site from 2009 through 2012, and no breeding birds at the mitigation site in 2008, 2010 and 2012 (Silveira et al 2012).

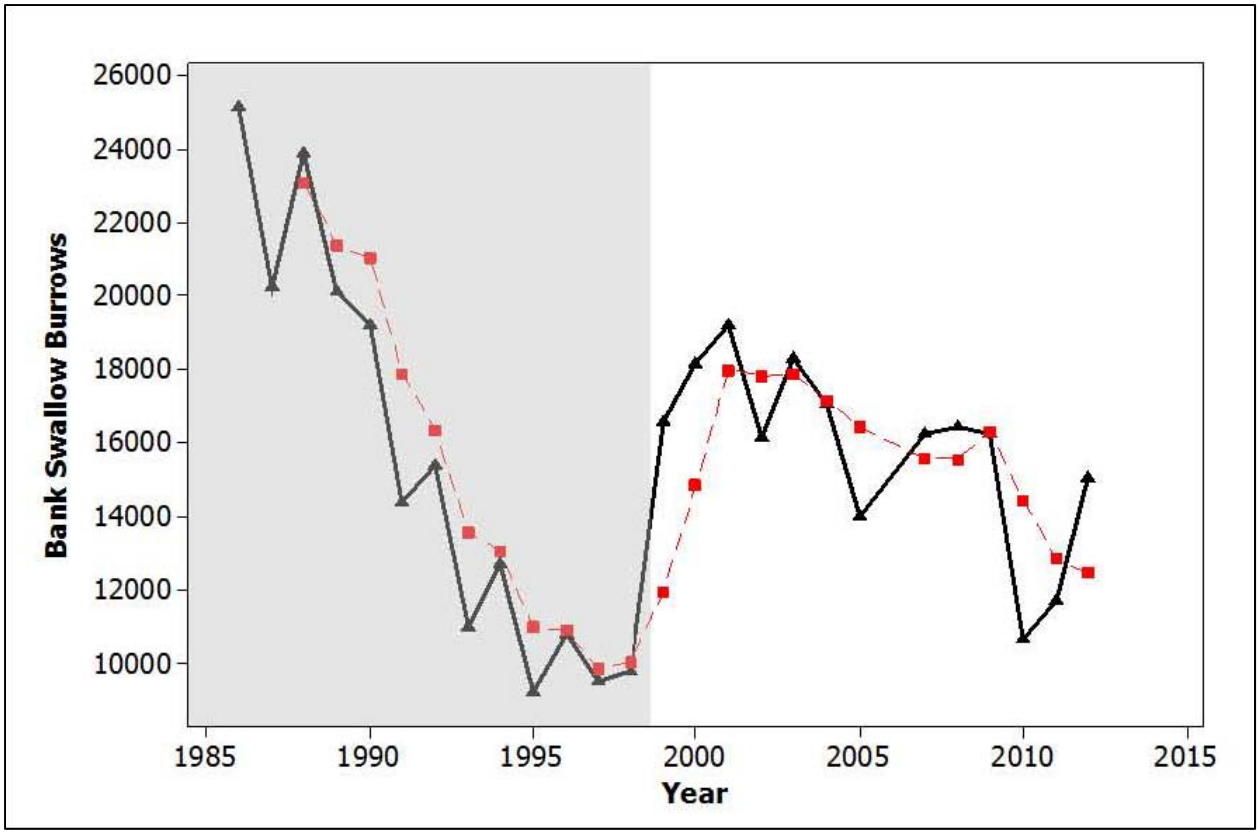

Figure 3.4-5. Bank Swallow Burrow Counts Reported for the Sacramento River between Red Bluff and Colusa (100 River Miles), from 1986 to 2012. Annual Counts are Shown in Black, and the Red Line Shows the 3-Year Moving Average. Data within the Gray Shaded Area (1986-1998) were compiled by Hight (2000) (Figure Taken from Bank Swallow Technical Advisory Committee 2013).

Swainson's Hawk

Swainson's hawk (*Buteo swainsoni*) are listed as a threatened species under CESA and are not listed under the Federal ESA. Swainson's hawks breed from southwestern Canada to northern Mexico. Nearly all North American populations of Swainson's hawks winter in South America and Mexico. However, a small number of birds regularly winter in southern Florida (Stevenson and Anderson 1994) and in the Sacramento–San Joaquin River Delta of central California (Yee et al. 1991; Herzog 1996).

Within California, Swainson's hawks begin nesting during late March and the young typically fledge by July. Nests typically are constructed in riparian habitat with the most commonly used nesting trees consisting of valley oak, Fremont cottonwood, walnuts, and large willows (CDFG 2007a; CDFG 2007b). Over 85 percent of the Swainson's hawk territories in the Central Valley are within riparian systems (CDFG 2007a; CDFG 2007b). Suitable nesting sites may also include shrubs, or utility poles ranging in heights from four to 100 feet. In a study of movements and habitat use, it was found that single trees or riparian areas were used most often for nesting (Estep 1989). Swainson's hawks migrate long distances, and are highly gregarious and largely insectivorous during migration. Birds typically return to nest sites in California from early

March to April. Migration begins during August and continues through October, however some juveniles do not migrate during their first winter.

Swainson's hawk diets consist primarily of the California vole, but may also include a variety of bird and insect species (CDFG 2007b). Suitable foraging areas for Swainson's hawks include native grasslands or lightly grazed pastures, alfalfa and other hay crops, and certain grain and row croplands (CDFG 2007b). Unsuitable foraging habitat includes crops such as vineyards, orchards, certain row crops, rice, corn and cotton crops (CDFG 2007b). Schmutz (1987) found that the species is more abundant in areas of moderate cultivation than in either grassland or areas of extensive cultivation.

The mature riparian vegetation within the Action/Project Area may provide suitable nesting habitat for Swainson's hawks. Suitable Swainson's hawk foraging habitat may also exist in the Action/Project Area on the east and west sides of the Sacramento River. CDFG and USFWS (2007) reported that, according to the CNDDB, there had been 14 known occurrences of Swainson's hawks nesting sites within 10 miles of the Action/Project Area; however, none had been active in the previous 5 years (2002-2007). The updated 2012 CNDDB records include a May 2009 entry of an observation of a female on her nest along Rock Creek about a mile north of Nord, which falls just within 10 miles (approximately 9.8 miles) of the Action/Project Area. As noted in CDFG and USFWS (2007), due to the limitations of the CNDDB, it is possible that unreported active nest sites may have occurred within the area despite the lack of recorded information.

Western Yellow-Billed Cuckoo

The western population of the Yellow-billed Cuckoo (*Coccyzus americanus*, or "cuckoo"), considered a distinct population segment by the USFWS, is a candidate for Federal listing USFWS 2001; 77 FR 69994[5]) and is currently listed as State endangered in California (Dettling and Seavy 2012).

Western yellow-billed cuckoos (*Coccyzus americanus occidentalis*) breed in large blocks of riparian habitats, particularly in woodlands with cottonwoods and willows (USFWS 2001). Dense understory foliage appears to be an important factor in nest site selection, while cottonwood trees are an important foraging habitat in areas where the species has been studied in California (USFWS 2001). Spring migration into California begins during late May and lasts until late June (Laymon 1998). Breeding season for yellow-billed cuckoos generally begins with pair formation during mid-June and lasts until mid-August. Nesting and breeding occurs shortly

[5] On November 21, 2012, USFWS continued to find that listing the western yellow-billed cuckoo is warranted but precluded (77 FR 69994). As stated in the *Annual Notice of Findings on Resubmitted Petitions Regarding Endangered and Threatened Wildlife and Plants; Review of Native Species That Are Candidates for Listing as Endangered or Threatened* (77 FR 69994), the USFWS is working on a proposed listing rule for western yellow-billed cuckoo that the agency expects to publish prior to making the next annual resubmitted petition 12-month finding.

after pair formation. Females lay one to five eggs, and both parents incubate them for nine to 11 days. Both parents feed the nestlings until they fledge at approximately seven to nine days old. The total length of the breeding cycle is short compared to other species, lasting 17 days from egg-laying to fledging. The rapid rate of development allows for the species' short stay in California. In California, western yellow-billed cuckoos return annually to nearly all of the few recently occupied breeding locations remaining in suitable condition, suggesting strong nest-site fidelity.

Fall migration begins during late August and lasts until mid-September. The species over-winters from Columbia and Venezuela, south to northern Argentina (Ehrlich et al. 1988). Migration patterns, corridors and critical stopovers are largely unknown. Like most songbirds, the yellow-billed cuckoo migrates at night.

Along the Sacramento River, nesting yellow-billed cuckoos occupied home ranges, which included 25 acres or more of riparian habitat (USFWS 2001). Another study on the same river found riparian patches averaging 99 acres occupied by yellow-billed cuckoo pairs (USFWS 2001). Estimates from a 2010 survey suggest occupancy rates of cuckoos between 10 and 34 percent, depending on home territory assumptions (37-148 acres) (Dettling and Howell 2011) Home ranges in the South Fork of the Kern River averaged about 42 acres (USFWS 2001). Nesting densities ranging from one to 15 pairs per 99 acres were estimated in a New Mexico study, and three plots in Arizona had densities of 8.2, 19.8, and 26.5 pairs per 99 acres (USFWS 2001). Nesting west of the Continental Divide occurs almost exclusively near water, and biologists have hypothesized that the species may be restricted to nesting in moist river valley bottoms in the west because of humidity requirements for successful hatching and rearing of young (USFWS 2001). Nesting peaks later (mid-June through August) than in most co-occurring bird species, and may be triggered by an abundance of the cicadas, katydids, caterpillars, or other large prey which form the bulk of the species' diet (USFWS 2001). The species is inconspicuous in its breeding habitat, except when calling to attract or to contact mates.

The breeding range of the yellow-billed cuckoo formerly included most of North America from southern Canada to the Greater Antilles and northern Mexico (USFWS 2001). During recent years, the species' distribution in the west has contracted. The northern limit of breeding in the coastal States is now in the Sacramento Valley and the northern limit of breeding in the western interior States is southern Idaho (USFWS 2001). East of the Continental Divide, the species breeds from southeastern Montana, the Dakotas, Minnesota, southern Ontario, southeastern Quebec and probably southern New Brunswick south to eastern Colorado, Texas, the Gulf coast, northeastern Mexico, the Florida Keys, the Greater Antilles and the northern Lesser Antilles (AOU 1957, 1998). The species overwinters from Columbia and Venezuela, south to northern Argentina (Ehrlich et al. 1998; AOU 1998). The extent to which yellow-billed cuckoos nesting in different regions of North America commingle during migration, or while overwintering, is unknown.

The Sacramento River represents an area where cuckoo habitat potentially has increased, and may be due in part to the restoration of about 5,000 acres of riparian habitat along the Sacramento River that occurred from 1996 to 2006 (Golet et al. 2008). Suitable habitat for the western yellow-billed cuckoo exists in the Action/Project Area, although there are no known occurrences of the species in the Action/Project Area. In 2010, two individuals were detected north of the Action/Project Area at the Pine Creek Unit (RM 198.5, UTM 588015, 4400259) and one individual was detected south of the Action/Project Area on the Phelan Island Unit (RM 191.5, UTM 588222 4392860). During the 2012 survey, there were no observations of Western yellow-billed cuckoos in the Action/Project Area or at the Pine Creek and Phelan Island sites. The nearest detection along the Sacramento River was located south of the area near Ord Ferry Road (Dettling and Seavy 2012).

Osprey

Osprey (*Pandion haliaetus*) have no Federal or State listing status. However, this species is identified as a watch list species by CDFW (see CNDDB 2012 in Appendix E).

Osprey are found in northern California near large bodies of water and rivers, generally in habitat consisting of ponderosa pine and mixed conifer forests (CDFG 2007b). They arrive on nesting grounds during mid-March to early April from southern wintering areas (CDFG 2007b). Ospreys migrate south to Central and South America during October along the California coast and the western slope of the Sierra Nevada mountain range (CDFG 2007b). They roost and nest on platforms located on large snags, dead branches, cliffs, and man-made structures in riparian and mixed hardwood-coniferous forests (CDFG 2007b). Ospreys rely on open waters, such as rivers and lakes for foraging (CDFG 2007b). However, Osprey have been documented preying on small mammals, birds, reptiles, amphibians, and invertebrates (CDFG 2007b).

The riparian habitat east of the proposed dredging area provides known roosting and nesting habitat for osprey. The timing of construction for the Proposed Action/Project construction would avoid or minimize disturbances that could be associated with construction activities near active nest sites during the nesting period (March through August).

An adult osprey was observed foraging over the Sacramento River immediately adjacent to the Action/Project Area during surveys conducted by Gallaway Consulting, Inc. in August 2005. Additionally, an active osprey nest was observed near the Big Chico Creek and Sacramento River confluence in 2006. In 2012, an active osprey nest was observed about 70 feet outside of the Action/Project Area, on top of a utility pole along River Road near the western-most corner of the Action/Project Area. A nesting pair was observed foraging within the Action/Project Area, and were observed tending the nest which contained two fledglings. Biologists attempted to document the osprey nest observed in 2006, but it was no longer present (Robertson-Bryan, Inc 2012). CNDDB records include a report of a nesting pair observed in April 2008 on the Sacramento River across from Sidds Landing, which is slightly more than 6 miles from the Project Area. Additionally, several other sightings have been reported during USFWS quarterly

surveys of the SRNWR complex. These include nesting osprey on the USFWS Pine Creek Unit at RM 195.5 and RM 198, and on the Phelan Island Unit at RM 191.

White-tailed Kite

Although the White-tailed kite (*Elanus leucurus*) has no Federal listing status, it is a fully protected species under Section 3511 of the California Fish and Game Code.

This species generally inhabits low-elevation grasslands, wetlands dominated by grasses, oak woodlands, and agricultural and riparian areas (Dunk 1995). Nests are constructed in trees that occur in isolation or in riparian areas (Erichsen 1995). Other nesting raptor species, as well as conspecifics compete for nest sites and territories, but prey abundance reportedly is the primary factor that influences their number and distribution (Dunk 1995).

Nest tree selection has not been well studied. White-tailed kites have been found nesting in isolated trees and in trees within large stands (>247 acres) (Dunk 1995). Nesting occurs in several tree species and can occur in shrubs typically including valley oak, live oak, ornamental trees, Fremont's cottonwood, and olive (CDFG 2007b; Dixon et al. 1957; Hawbecker 1942). The height of nest trees/shrubs ranges from 10 feet [e.g., *Baccharis* and *Atriplex*] (Stendell 1972) to 164 feet [e.g., *Sequoia sempervirns* and *Picea sitchensis*] (Dunk 1995). In the Central Valley, white-tailed kites have been observed nesting in valley oak, cottonwoods, and pine trees (Dunk 1995). White-tailed kites are territorial with conspecifics, and nest at relatively close distances (e.g. about 500 feet) (Dixon et al. 1957; Hawbecker 1942). Erichsen (1995) reported that white-tailed kite nests in riparian areas were typically located within 0.25 miles of one another. Nests also are reportedly usually located on the edge or riparian habitats, or in hedgerows and groups of trees, and are commonly found adjacent to natural vegetation, pasture crops (alfalfa) and sugar beets (Erichsen 1995).

White-tailed kites use a variety of habitat types for foraging and the importance of these habitats is dependent on vegetation structure and prey abundance. Lightly grazed or ungrazed grasslands/pastures support larger prey populations, and thus are considered more suitable. However, intensively cultivated areas also are used (Dunk 1995). In cultivated areas, perennial crops such as alfalfa and sugar beets tend to support higher prey densities, and white-tailed kite nest densities have been highly correlated with these two crops (Erichsen et al. 1994).

White-tailed kites typically breed from February through October with a peak ranging from May to August (CDFG 2007b). Nesting studies conducted by Hawbecker (1942) reported that White-tailed kites foraged up to 0.5 miles from the nest during the breeding season. Warner and Rudd (1975) reported that during winter and during breeding seasons, foraging from nest or perch sites extended up to 1.8 miles, but typically remained less than 0.6 miles. Foraging primarily occurred in two habitat types, riparian and irrigated cultivated land (e.g. alfalfa, tomatoes, sugar beets).

The occurrence and abundance of White-tailed kites during the breeding and non-breeding seasons are strongly affected by the dynamics of local rodent prey populations. Because rodent population cycles are often irruptive, and kite populations are sensitive to the availability of rodent prey, the suitability of an area and its occupancy by white-tailed kites may vary during certain years. Stendell (1972) found the density of voles at the onset of the breeding season affects the presence and abundance of nesting white-tailed kites. The mean number of California voles/territory was estimated at 1,483 for territories ranging from 3.9 to 53 acres in northern California (Dunk and Cooper 1994). In other studies occurring in southern California (Waian 1973; Henry 1983), no prey abundances were reported with nesting territories.

The level of human disturbance that White-tailed kites can tolerate during the breeding season is unknown. The species generally avoids areas with regular human disturbance, although a small number of pairs appear to tolerate humans and nest on the margins of rural and urban areas. Communal roosts during the non-breeding season have been disturbed by humans and caused abandonment (Dunk 1995). However, if not disturbed, the species is known to roost communally in residential areas in cities for several consecutive years (Erichsen 1995).

Riparian habitat within the Action/Project Area likely is suitable white-tailed kite nesting habitat.

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) was listed as endangered under the Federal ESA in 1978 (43 FR 6230). In 1995, the bald eagle was reclassified as threatened (60 FR 6 36000); and in 2007, the bald eagle was delisted (72 FR 7 37346). However, this species is a CDFW fully protected species and continues to be protected under the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act (MBTA).

Since the regional recovery plans were implemented in the 1980's, the population of bald eagles has increased steadily and has exceeded most recovery goals. In California, bald eagle nesting locations are located primarily in the northern two-thirds of the State, the Central Coast Range, and on Santa Catalina Island (BCAG and USFWS 2011). A total of 180 nesting territories are known to have been occupied in California during the 1990s. Bald eagles winter throughout most of California, usually in association with lakes, reservoirs, and along rivers (BCAG and USFWS 2011). In Butte County, bald eagles are considered a permanent resident (BCAG and USFWS 2011).

Bald eagles require large bodies of water, or free flowing rivers with abundant fish, and adjacent snags or other perches. Individuals have been observed swooping from hunting perches or soaring flight to pluck fish from the water and wading into shallow water to pursue fish. In flooded fields individuals occasionally pounce on displaced voles or other small mammals. Groups may feed gregariously, especially on spawning fish. Bald eagles scavenge on dead fish, water birds, and mammals, when available. Open, easily approached hunting perches and feeding areas are used most frequently. Eagles roost communally during the winter in dense, sheltered, remote conifer stands. Bald eagles reportedly breed from February through July with peak

breeding activity March to June. Bald eagles have been observed competing with, and stealing prey from ospreys. Territories have been abandoned after disturbance from logging, recreational development, and other human activities that occur near nest sites (Thelander 1973). This species does not begin nesting if human disturbance is evident.

The mature riparian vegetation along Big Chico Creek that is adjacent to the Action/Project Area provides sub-marginal nesting and wintering habitat for bald eagles. However, birds may use any of the larger trees area for roosting.

Although bald eagle were not observed during the 2012 surveys, a bald eagle nesting pair was observed on private property across from the Pine Creek Unit at RM 198 during USFWS quarterly surveys of the SRNWR complex.

Other Migratory Birds

Although there is potential for some of the special-status birds listed above to fly over various portions of the Action/Project Area, the Proposed Project will not affect birds in flight or a significant portion of the potential available foraging area for birds. In areas adjacent to riparian areas on both sides of the Sacramento River some foraging activity by species such as rufous hummingbird may occur during migration. In addition, oak titmouse, Lawrence's goldfinch, Vaux's swift, Nuttall's woodpecker, Lewis's woodpecker, and loggerhead shrike could use treed areas of the Action/Project Area for nesting.

Western Pond Turtle

The western pond turtle (WPT) (*Clemmys marmorata marmorata*) previously included two subspecies, the northwestern pond turtle (*Clemmys marmorata marmorata*) and the southwestern pond turtle (*C. m. pallida*). Both were petitioned for Federal listing as endangered or threatened in 1992. In 1993, the USFWS determined that there was insufficient information to propose listing. Recent phylogenetic research combines the two subspecies into a single species (*A. marmorata*) (Bury and Germano 2008; Spinks and Shaffer 2005). The WPT is a California species of special concern (BCAG and USFWS 2012).

WPT inhabit a variety of aquatic habitats, and are found in fresh to brackish permanent to intermittent aquatic habitats including marshes, rivers, ponds, streams, and vernal pools. WPTs also may occur in man-made habitats, such as irrigation ditches, reservoirs, and sewage and millponds. Preferred aquatic habitat is characterized by slow moving or quiet water with emergent aquatic vegetation, deep pools with undercut banks, which act as refugia. Partially submerged rocks and logs, and open mud banks and matted floating vegetation often are used for thermoregulatory basking. WPTs use aquatic habitats primarily for foraging, thermoregulation, and predator avoidance (Boyer 1965; Holland 1994; Reese and Welsh 1998a). Hatchling and young turtles (1 year) require shallow water areas (less than about 12 inches deep) dominated primarily by emergent aquatic reeds (*Juncus sp.*) and sedges (*Carex sp.*) (Holland 1991) and have been observed to avoid areas of open water lacking them (Boyer 1965; Holland 1994; Hays

et al. 1999; Reese and Welsh 1998a). Highly fluctuating flow rates associated with aquatic habitats may diminish habitat quality for WPTs (Reese and Welsh 1998b). Conversely, WPTs may leave aquatic habitat as pools dry. Holland (1994) reported overland movements of 3.1 miles, possibly resulting in turtles seeking more appropriate aquatic habitat or areas in which to aestivate for short periods.

WPTs "hibernate" in both aquatic and terrestrial habitats. Aquatic refugia consist of rocks, logs, mud, and undercut areas along banks while terrestrial hibernacula consist of burrows in leaf litter, heavy brush, or soil (Holland 1994). In woodland and sage scrub habitats along coastal streams in central California, most WPTs leave the drying creeks during late summer and return after winter floods. These turtles spend an average of 111 days in upland refugia that are an average of 164 feet from the creeks (Rathbun et al. 1992). Upland nesting sites must be dry and often have a high clay or silt component. Typically, WPTs excavate nests in open, sunny areas that on slopes no steeper than 25°.

Five records of WPT are reported within Butte County (BCAG and USFWS 2012). The backwater area near Big Chico Creek and along the shoreline on the east bank of the Sacramento River upstream of the Action/Project Area may provide suitable habitat for WPT. However, other essential habitat features (water present in active season, basking sites) are not necessarily present.

Potential WPT habitat alteration impacts were addressed in the 2007 Temporary Maintenance Project because that project involved temporary removal of backwater habitat, and a dryland gravel bar excavation on lands owned by Bidwell State Park, which could have provided habitat for the WPT to use for basking in the sun. The areas that may provide suitable WPT habitat along the east bank of the Sacramento River that were evaluated 2007 are not part of the Action/Project Area identified for the Proposed Project evaluated in this Draft EA/IS. However, the potential does exist that NWP could be present along the shore of the Sacrament River and could use habitat provided by the rock-toe and tree revetment.

SPECIES PRELIMINARILY IDENTIFIED BUT NOT CONSIDERED FOR DETAILED EVALUATION

Based on the findings of the field surveys, habitat assessments, previously completed NEPA/CEQA environmental documentation for approved projects in the area, and review of other available literature, a number of species that may generally occur in Butte and Glenn counties, and/or within the USGS quadrangles that were reviewed, are not addressed in this Draft EA/IS because: (1) they are not known to occur in the Action/Project Area; (2) no suitable habitat occurs in the Action/Project Area; and/or (3) no mechanisms exists by which they would be adversely affected by the Proposed Project. These species are listed in **Table 3.4-5**.

Notable Species Not Included for Detailed Analysis

Following review of the 2012 CNDDB records, several species have been added to the list of species considered but dismissed as they have been reported in the reviewed quadrangles, but are

also not anticipated to be found in the Action/Project Area for one or more of the above-listed reasons.

Plant species listed under the Federal ESA or CESA include: (1) Butte County meadowfoam; (2) Hoover's spurge; (3) Slender Orcutt Grass; and (4) Greene's tuctoria. The plant species identified in Table 3-4.5 are unlikely to occur in the Action/Project Area because: (1) the project area is outside the reported range of the plant; or (2) the project area does not support appropriate habitat or specific critical habitat elements (e.g., no clay soils in the area to support *California macrophylla*). The remaining plant species have low or no potential to occur.

Six wildlife species were identified as having the potential to occur in the Action/Project Area, including the California black rail, American badger, ringtail, western red bat, western mastiff bat and pallid bat. Rationale is provided below describing why these species would not be affected by the Proposed Project and, thus, are not evaluated further in this Draft EA/IS.

California Black Rail

The California black rail inhabits saltwater, brackish, and freshwater marshes, and depends on emergent wetland habitats for all stages of its life cycle (Richmond et al. 2010). In the Sierra Nevada foothills, this species is primarily found in marshes dominated by *Scirpus acutus* and/or cattails (*Typha latifolia*) (Tecklin 1999; Aigner et al. 1995). Nesting habitat is characterized by water depths of about one inch that do not fluctuate during the year, and by dense vegetation providing adequate cover (CDFG 2004). Wetlands in the Sacramento Valley that are managed for waterfowl or rice typically lack sufficient shallow water zones, and previous surveys indicated that black rails were uncommon in these habitats (Richmond et al. 2008). The California black rail breeding season reportedly extends from about March to July (Richmond et al. 2010). Project-related activities would occur outside of the breeding season, and more importantly, suitable habitat for this wetland-dependent species is not present within the Action/Project Area. Therefore, this species is not considered further in this Draft EA/IS.

Table 3.4-5. Species Preliminarily Identified but Not Considered for Detailed Evaluation.

Common Name / Scientific Name	Legal Status[1]			Rationale for Exclusion from this Draft EA/IS
	Federal	State	Other	
PLANTS				
Ahart's Paronychia (*Paronychia ahartii*)	–	–	CNPS Rank 1B.1	Unlikely to occur. There are no vernal pools or volcanic uplands in the Action/Project Area. The closest record for this species is approximately 8 miles northeast of the Action/Project Area (CNDDB 2012).
Butte County Meadowfoam (*Limnanthes floccosa ssp. californica*)	E	E	CNPS Rank 1B.1	Unlikely to occur. There are no vernal pools in the Action/Project Area. USFWS critical habitat (Unit 7H) for this species and CNDDB records (CNDDB 2012) are located approximately 8 miles northeast of the Action/Project Area.
California Beaked-Rush (*Rhynchospora californica*)	–	–	CNPS Rank 1B.1	Unlikely to occur. No appropriate habitat (marshes, seeps, wet meadows) is present in the Action/Project Area. Potential for occurrence in moist areas along Big Chico Creek, just outside of Action/Project Area. The closest record for this species is approximately 10 miles northeast of the Action/Project Area (CNDDB 2012).
Greene's Tuctoria (=Orcutt Grass) (*Tuctoria greenei*)	E	CR	CNPS Rank 1B.1	Unlikely to occur. There are no vernal pools in the Action/Project Area. The closest USFWS critical habitat for this species is approximately 13 miles southeast of the Project area. The closest record for this species is approximately 8 miles northeast of the Action/Project Area (USFWS 2012).
Red Bluff Dwarf Rush (*Juncus leiospermus var. leiospermus*)	–	–	CNPS Rank 1B.1	Unlikely to occur. Action/Project Area is below the elevation range of this species. The closest record for this species is approximately 14 miles northeast of the Action/Project Area (CNDDB 2012).
Round-Leaved Filaree *(California macrophylla)*	–	–	CNPS Rank 1B.1	Clay soils are not present in the Action/Project Area. Unlikely to occur. The closest record for this species is approximately 16 miles southeast of the Action/Project Area (CNDDB 2012).
Slender Orcutt Grass (*Orcuttia tenuis*)	T	E	CNPS Rank 1B.1	Unlikely to occur. There are no vernal pools in the Action/Project Area. The closest USFWS critical habitat for this specie species (Unit 7c) is approximately 19 miles northeast of the Action/Project Area.
Veiny Monardella (*Monardella venosa*)	–	–	CNPS Rank 1B.1	Unlikely to occur. Clay soils are not present in the Action/Project Area. There are historical records for this species within the following 7.5-minute quads in the vicinity of the Project area: Richardson Spring, and Chico. However, these populations are presumed extirpated, or the status is unknown (CNPS 2012).

Common Name / Scientific Name	Legal Status[1]			Rationale for Exclusion from this Draft EA/IS
	Federal	State	Other	
Butte County Checkerbloom (*Sidalcea robusta*)	–	–	CNPS Rank 1B.2	Unlikely to occur. Action/Project Area is below the elevation range of this species. The closest record for this species is approximately 9 miles northeast of the Action/Project Area (CNDDB 2012).
Hoover's Spurge (*Chamaesyce hooveri)*	T	–	CNPS Rank 1B.2	Unlikely to occur. There are no vernal pools in the Action/Project Area. The closest record for this species is approximately 9 miles north of the Action/Project Area (CNDDB 2012).
Pink Creamsacs (*Castilleja rubicundula ssp. Rubicundula*)	–	–	CNPS Rank 1B.2	Serpentine soils are not present in the Action/Project Area. Unlikely to occur. The closest record for this species is approximately 8 miles northeast of the Action/Project Area (CNDDB 2012).
White-Stemmed Clarkia (*Clarkia gracilis ssp. Albicaulis*)	–	–	CNPS Rank 1B.2	Unlikely to occur. Action/Project Area is below the elevation range of this species. The closest record for this species is approximately 13 miles northeast of the Action/Project Area (CNDDB 2012).
Woolly Rose-Mallow (*Hibiscus lasiocarpos var. occidentalis*)	–	–	CNPS Rank 1B.2	Unlikely to occur. This species is known to occur in marshes and swamps in the Central Valley at elevations between 0 and 396 feet (USFWS and CDFG 2012). No appropriate habitat is present in the Action/Project Area. Potential for occurrence in moist areas along Big Chico Creek, just outside of Action/Project Area. The closest record for this species is approximately 2 miles southwest of the Action/Project Area (CNDDB 2012).
Flagella-Like Atractylocarpus *Campylopodiella stenocarpa)*	–	–	CNPS Rank 2.2	Action/Project Area is below the elevation range of this species. Unlikely to occur. The closest record for this species is approximately 11 miles northeast of the Action/Project Area (CNDDB 2012).
Norris' Beard Moss (*Didymodon norrisii*)	–	–	CNPS Rank 2.2	Unlikely to occur. Action/Project Area is below the elevation range of this species. The closest record for this species is approximately 11 miles northeast of the Action/Project Area (CNDDB 2012).
Slender-Leaved Pondweed (*Stuckenia filiformis*)	–	–	CNPS Rank 2.2	Unlikely to occur. Action/Project Area is below the elevation range of this species, and no appropriate habitat (shallow water in wetlands) is present. The closest record for this species is approximately 10 miles east of the Action/Project Area (CNDDB 2012).
Brazilian Watermeal (*Wolffia brasiliensis*)	–	–	CNPS Rank 2.3	Although found in the Sacramento River and known from just upstream of Bidwell River Park (CDFW 2013), no appropriate habitat occurs in the Action/Project Area.
Watershield (*Brasenia schreberi*)	–	–	CNPS Rank 2.3	Unlikely to occur. No appropriate habitat is present in the Action/Project Area. Potential for occurrence in moist areas along Big Chico Creek, just outside of Action/Project Area. The closest record for this species is approximately 11 miles south of the Action/Project Area (CNDDB 2012).

Common Name / Scientific Name	Legal Status[1]			Rationale for Exclusion from this Draft EA/IS
	Federal	State	Other	
Adobe Navarretia (*Navarretia nigelliformis ssp. nigelliformis*)	–	–	CNPS Rank 4.2	Unlikely to occur. Action/Project Area is below the elevation range of this species. Populations presumed extant in the following Chico USGS 7.5-minute quads in the vicinity of the Project area. There are historical records for the species within the Nord USGS 7.5-minute quad. However, these populations are presumed extirpated, or the status is unknown (CNPS 2012).
Mexican Mosquito Fern (*Azolla microphylla*)	–	–	CNPS Rank 4.2	Unlikely to occur. No appropriate habitat is present in the Action/Project Area. Potential for occurrence in moist areas along Big Chico Creek, just outside of Action/Project Area.
Woolly Meadowfoam (*Limnanthes floccosa ssp. floccose*)	–	–	CNPS Rank 4.2	Unlikely to occur. There are no vernal pools in the Action/Project Area.The closest record for this species is approximately 9 miles northeast of the Action/Project Area (CNDDB 2012).
Depauperate Milk-Vetch (*Astragalus pauperculus*)	–	–	CNPS Rank 4.3	Unlikely to occur. Action/Project Area is below the elevation range of this species and no volcanic soils are present. Populations presumed extant in the following USGS 7.5-minute quads in the vicinity of the Project area: Nord, Richardson Spring, and Chico (CNPS 2012).
Big-scale balsamroot (*Balsamorhiza macrolepis)*	–	–	CNPS Rank 1B.2	Unlikely to occur. Big-scale balsamroot reportedly occurs within a narrow elevation band in the mountains bordering the northern Central Valley. In Butte County, records of this species are on the eastern side of the Sacramento Valley or in the foothills.
Sanford's arrowhead (*Sagittaria sanfordii)*	-	-	CNPS Rank 1B.2	Unlikely to occur. Appropriate habitat consisting of shallow, standing or slow-moving freshwater ponds, marshes, and ditches are not present in the Action/Project Area or potentially affected by the Proposed Action/Project.
INVERTEBRATES				
Conservancy Fairy Shrimp (*Branchinecta conservation*)	E	–	–	No vernal pools in the Action/Project Area; Action/Project Area not hydrologically connected to vernal pools.
Vernal Pool Fairy Shrimp (*Branchinecta lynchi*)	T	–	–	No vernal pools in the Action/Project Area; Action/Project Area not hydrologically connected to vernal pools.
Vernal Pool Tadpole Shrimp (*Lepidurus packardi*)	E	–	–	No vernal pools in the Action/Project Area; Action/Project Area not hydrologically connected to vernal pools.
Sacramento Anthicid Beetle *(Anthicus sacramento)*	–	–	–	No dune habitat in the Action/Project Area.
Antioch Dunes Anthicid Beetle *(Anthicus antiochensis)*	–	–	–	No dune habitat in the Action/Project Area.
REPTILES AND AMPHIBIANS				
California Red-Legged Frog (*Rana draytonii*)	T	SSC	–	No known occurrence in Central Valley; not found during surveys; Bullfrogs and predatory fish severely restrict habitat suitability.

Common Name / Scientific Name	Legal Status[1]			Rationale for Exclusion from this Draft EA/IS
	Federal	State	Other	
Giant Garter Snake (*Thamnophis gigas*)	T	T	–	No suitable habitat in the Proposed Action Area; no mechanism for take; not found during surveys; dense riparian forest and large predatory fish severely restrict habitat suitability.
Western Spadefoot Toad (*Spea hammondii*)	–	SSC	BLM: Sensitive	Not found during surveys.
BIRDS				
Northern Harrier (*Circus cyanus*)	–	SSC	–	No mechanism for take because construction would not occur during nesting and impacts to grassland habitat would be minimal.
California Black Rail (*Laterallus jamaicensis coturniculus*)	–	T	USFWS: BCC CDFW: CFP	Needs water depths of about 1 inch that do not fluctuate during the year and dense vegetation for nesting habitat. No appropriate habitat is present in the Action/ Project Area.
Western Burrowing Owl (*Athene cunicularia*)	–	SSC	USFWS: BCC	Not found during surveys.
Loggerhead Shrike (*Lanius ludovicianus*)	–	SSC	–	Not detected during surveys; no mechanism for take as construction would not occur during nesting.
Yellow-Breasted Chat (*Icteria virens*)	–	SSC (nesting)	–	No mechanism for take as construction would not occur during nesting; impacts to riparian vegetation would be minimal.
California Yellow Warbler (*Dendroica petechia brewsteri*)	–	SSC (nesting)	–	No mechanism for take as construction would not occur during nesting; impacts to riparian vegetation would be minimal.
Tricolored Blackbird (*Agelaius tricolor*)	–	SSC	USFWS: BCC	No suitable dense stands of cattails and tules, or large blocks of blackberries, nettles, or thistles in the Action/Project Area, not found during surveys.
Little Willow Flycatcher (*Empidonax traillii brewsteri*)	–	E	–	Not detected during surveys; no mechanism for take as construction would not occur during nesting and impacts to riparian vegetation would be minimal.
Sharp-Shinned Hawk (*Accipiter striatus*)	–	SCC	USFS: Sensitive	Not found in surveys; no mechanism for take as construction would not occur during nesting and impacts to suitable nesting habitat would be minimal.
Cooper's Hawk (*Accipiter cooperi*)	–	SSC	USFS: Sensitive	Not found in surveys; no mechanism for take as construction would not occur during nesting and impacts to suitable nesting habitat would be minimal.
Prairie Falcon (*Falco mexicanus*)	–	SSC	–	Not detected during survey; no mechanism for take as construction would not occur during nesting.
Lewis' Woodpecker (*Melanerpes lewis*)	–	SSC	–	No mechanism for take as construction would not occur during nesting; impacts to riparian vegetation would be minimal.
Oak titmouse (*Baeolophus inornatus*)	–	–	–	No mechanism for take as construction would not occur during nesting and impacts to riparian vegetation would be minimal.
Lawrence's goldfinch (*Carduelis lawrencei*)	–	–	–	Not found in surveys; no mechanism for take as construction would not occur during nesting and impacts to riparian vegetation would be minimal.

Common Name / Scientific Name	Legal Status[1]			Rationale for Exclusion from this Draft EA/IS
	Federal	State	Other	
Nuttall's woodpecker *(Picoides nuttallii)*	–	–	–	No mechanism for take as construction would not occur during nesting; impacts to riparian vegetation would be minimal.
MAMMALS				
American Badger (*Taxidea taxus*)	–	SSC	–	No mechanism for take because construction would occur outside of this species' active period.
California Myotis (*Myotis californicus)*	–	–	–	Known to occur in region; no mechanism for take because construction would not occur during brooding and impacts to riparian vegetation would be minimal.
Fringed Myotis (*Myotis thysanodes*)	–	–	BLM: Sensitive	Known to occur in region, although no maternity colony sites within the Action/Project Area; no mechanism for take as construction would not occur during brooding and impacts to riparian vegetation would be minimal. Species is a fall migrant.
Long-Eared Myotis (*Myotis evotis*)	–	–	BLM: Sensitive	No known occurrence within Action/Project Area; impacts to riparian vegetation would be minimal.
Long-Legged Myotis (*Myotis volans*)	–	–	–	Known to occur in region; no mechanism for take because construction would not occur during brooding and impacts to riparian vegetation would be minimal.
Pallid Bat (*Antrozous pallidus*)	–	SSC	–	No mechanism for take because construction would not occur at night when the species is active or during the spring/early summer breeding period.
Ring-tailed Cat (*Bassariscus astutus*)	–	–	CDFW: CFP	No mechanism for take because construction would not occur at night when the species is active or during the Feb-Jun breeding period.
Sierra Nevada Red Fox (*Vulpes vulpes necator*)	–	T	–	Action/Project Area is outside of the geographic and elevation range of this subspecies.
Small-Footed Myotis (*Myotis ciliolabrum*)	–	–	BLM: Sensitive	Known to occur in region; no mechanism for take because construction would not occur during brooding season, species is primarily a cave dweller and impacts to riparian vegetation would be minimal.
Townsend's Big-Eared (*Plecotus =[Corynorhinus] townsendii)*	–	SSC	USFS: Sensitive BLM: Sensitive	Potential roosting habitat would not be impacted by the Proposed Action/Project.
Western Red Bat (*Lasiurus blossevillii*)	–	SSC	–	Known to occur in region; no mechanism for take because construction would not occur during brooding and impacts to riparian vegetation would be minimal.
Western Mastiff (*Eumops perotis californicus)*	–	SSC	–	Known to occur in region; no mechanism for take because construction would not occur during brooding and impacts to riparian vegetation would be minimal.

Common Name / Scientific Name	Legal Status[1]			Rationale for Exclusion from this Draft EA/IS
	Federal	State	Other	
Yuma Myotis (*Myotis yumanensis*)	–	–	BLM: Sensitive	Known to occur in region, although no maternity colony sites within the Action/Project Area; no mechanism for take because construction would not occur during brooding and impacts to riparian vegetation would be minimal.

[1] Status Explanation

E = Listed as endangered under the Federal or State ESA
T = Listed as threatened under the Federal or State ESA
C = Candidate for listing under the Federal ESA
D = Federally delisted
USFS = U.S. Forest Service
BLM = Bureau of Land Management
BCC = USFWS Birds of Conservation Concern
CFP = Fully protected species in California
CR = State listed as rare
SC = NMFS' species of concern
SSC = State species of special concern
– = No status

CNPS = California Native Plant Society Rating

CNPS Rank 1B = Rare, threatened, or endangered in California and elsewhere
CNPS Rank 2 = Rare in California, but more common elsewhere
CNPS Rank 3 = Need more information
CNPS Rank 4 = Plants of limited distribution; a watchlist
_.1 = Seriously endangered in California (over 80% of records threatened/high degree and immediacy of threat)
_.2 = Fairly endangered in California (20-80% records threatened)
_.3 = Not very endangered in California (<20% of records threatened or no current threats known)

American Badger

Badgers require very large landscapes and are highly sensitive to habitat fragmentation and roadkill (BCAG and USFWS 2011). Generally, the home range of the badger is 395 to 2,100 acres (Sargeant and Warner 1972; Lindzey 1978; Messick and Hornocker 1981). However, larger home ranges in California have been documented in California (Technology Associates 2009).

Adult American badgers are primarily nocturnal (Sargeant and Warner 1972; Lindzey 1978), whereas juveniles appear to be active during the day (Messick and Hornocker 1981). When not actively foraging, badgers retreat to a sleeping den. Badgers typically occupy a different sleeping den every night, either digging a new burrow or using one that has been dug previously (Technology Associates 2009). Badgers mate in summer and early fall (Ahlborn 2005). Natal dens are dug in dry, sandy soil in areas with sparse overstory cover (Zeiner et al. 1990). Young disperse approximately three to four months following birth (Minta 1993).

Past surveys have not documented the occurrence of American badger burrows in the Action/Project Area and the closest record for this species is along Butte Creek, approximately 14 miles south of the Action/Project Area (CNDDB 2012). The Proposed Action/Project would not involve excavation of any steep-walled holes or trenches that could result in the inadvertent entrapment of badgers in the Action/Project Area. Although temporary fencing to protect VELB host plants (i.e., elderberry shrubs) would be placed around some areas of the project site, this would not preclude any badgers present in the area from freely moving through the area to forage. Because construction activities would occur during periods of low activity (i.e., daylight hours) and within previously disturbed habitat areas, the Proposed Project would not adversely affect the American badger. Therefore, this species is not considered further in this Draft EA/IS.

Ringtail Cat

Suitable habitat for ringtail cats consists of a mixture of forest and shrubland in close association with rocky areas or riparian habitats, usually not more than 0.6 miles from water. Limited information is available on distribution and relative abundance among habitats (Grinnell et al. 1937; Schempf and White 1977).

This non-migratory species is nocturnal and active year-round (Zeiner et al. 1990). Poglayen-Neuwall and Toweill (1988) report that breeding occurs from February to June with a peak in March through April. Dens can include a hollow tree, rock pile, a crevice in a cliff, or abandoned burrows or woodrat nests (Ingles 1965; Zeiner et al. 1990). Young reportedly are born in May and June (Walker et al. 1968). According to Poglayen-Neuwall and Toweill (1988), ringtails commonly move their young from den to den or when they are disturbed or threatened. Because ringtails are able to move their young to alternate roosts or maternity dens and roosting or denning habitat is readily available along the Sacramento River, disturbance potential would be minimal (USFWS and CDFG 2012).

There are no records of this species in the vicinity of the Action/Project Area, although the presence of riparian habitat suggests the potential for occurrence and they have been recorded in the SRNWR (USFWS 2005). Because construction activities would occur outside of the mating period, during daylight hours and within previously disturbed habitat areas, the potential to disturb ringtail that may be present in riparian habitat adjacent to the Action/Project Area is not anticipated. Therefore, this species is not considered further in this Draft EA/IS.

Western Red Bat

In California, the western red bat occurs from Shasta County to the Mexican border west of the Sierra crest. This species migrates during the spring (March-May) and autumn (September-October). In California, most individuals probably make relatively short migrations between summer and winter ranges.

Bats are nocturnal and begin flying soon after sunset. In California this species is known to roost in cottonwood and willow habitat. Western red bats are usually solitary, except when adult females are with their young, which are born from late spring to early summer (Technology Associates 2009). As for other bat species present in the region, the Sacramento River represents aquatic foraging habitat for the western red bat. The species typically begins foraging 1-2 hours after sunset and may forage throughout the night, with a second peak before sunrise. The closest occurrence for this species is approximately 0.5 miles north of the Action/Project Area along the Sacramento River (CNDDB 2012).

Life history requirements for the western red bat are very similar to those of other bat species (e.g., Yuma myotis, Townsend's big-eared bat) in the region, which were dismissed from evaluation in CDFG and USFWS (2007). The Proposed Project does not include the removal of any large trees and, thus, potential roosting habitat for western red bats would not be affected. There are no reported maternity colony sites for western red bat within the Action/Project Area and no mechanism for take because construction activities would not occur during brooding, impacts to riparian vegetation would be minimal, and work would occur during daylight hours when this species is generally not active. Therefore, this species is not considered further in this Draft EA/IS.

Western Mastiff Bat

The western mastiff bat uses open, semi-arid to arid habitats, including conifer and deciduous woodlands, coastal scrub, annual and perennial grasslands, chaparral, desert scrub, and urban area (CDFG 2012c). This species typically roosts in caves, crevices, or other rock formations. When roosting in rock crevices, this species needs vertical faces to drop off to take flight. Western mastiff bats are large, having a wingspan of more than one and a half feet, and roost in relatively small colonies so that each individual has plenty of space. Individuals are so large that they cannot launch themselves into flight and must free-fall for approximately ten feet before

beginning their ascent upward (BLM 2013). This species is non-migratory and breed during the spring (BLM 2013).

As for other bat species present in the region, the Sacramento River represents aquatic foraging habitat for the western mastiff bat. Western mastiff bats reportedly have an exceptionally long foraging period of up to 6-7 hours per night (Vaughan 1959), and nocturnal foraging range may exceed 15 miles from roost sites (Vaughan 1959). The closest occurrence for this species is about 0.5 miles north of the Action/Project Area along the Sacramento River (CNDDB 2012). Given the close proximity, it is possible that bats may forage in the vicinity of the dredging site. However, similar to the conclusions reached by CDFG and USFWS (2007) for other bat species in the region, there are no reported maternity colony sites within the Action/Project Area and no mechanism for take because construction activities would not occur during brooding, impacts to riparian vegetation would be minimal, and work would occur during daylight hours when this species is generally not active. Therefore, this species is not considered further in this Draft EA/IS.

Pallid Bat

In California, the pallid bat occurs throughout the State in a variety of habitats including low desert, oak woodland and coastal redwood forests, extending up to 3,000 m elevation in the Sierra Nevada. The bats roost in dry habitats with rocky areas for roosting including caves, crevices and mines. They are sensitive to disturbance of roosting sites (Pierson and Rainey 1998). Colonies form in the spring (March to May), and stay together until October (Barbour and Davis 1969 as cited in Pierson and Rainey 1998). Pallid bats mate in the fall or winter, and females give birth during the early summer (Orr 1954 as cited in Pierson and Rainey 1998).

The Sacramento River represents aquatic foraging habitat for this species. Although the potential exists for pallid bats to occur in the Action/Project Area because rocky areas and structures in the area may provide roosting habitat, the closest record for this species is approximately 6 miles northeast of the Action/Project Area (CNDDB 2012). Similar to the conclusions reached for other bat species in the region as described above, there are no reported maternity colony sites for pallid bats within the Action/Project Area and no mechanism for take because construction activities would not occur during brooding, impacts to riparian vegetation would be minimal, and work would occur during daylight hours when this species is generally not active. Therefore, this species is not considered further in this Draft EA/IS.

Giant Garter Snake

The giant garter snake (GGS) (*Thamnophis giga*) is listed as threatened under both the ESA and CESA. This species 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 GGS relies heavily on rice fields in the Sacramento and San Joaquin Valley, but also uses managed marsh areas in Federal and

national wildlife refuges and State wildlife areas. GGS typically are absent from larger rivers because of a 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 suitable habitat.

Primary habitat requirements consist of: (1) adequate water during the snake's active season (early-spring through mid-fall) to provide food and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season; (3) grassy banks and openings in waterside vegetation for basking; and (4) higher elevation uplands for cover and refuge from floodwaters during the snake's dormant season (winter).

GGS feed primarily on small fish, tadpoles, and frogs. The GGS inhabits small mammal burrows and other soil crevices above prevailing flood elevations throughout its winter dormancy period. GGS typically select burrows with sunny exposure along south and west facing slopes. The breeding season extends through March and April, and females give birth to live young from late July through early September. Young immediately scatter into dense cover to absorb their yolk sacs, after which they begin feeding on their own. Although growth rates are variable, young typically more than double in size within the first year. Sexual maturity occurs at an average of three years of age for males and five years of age for females (Hansen and Hansen 1990).

Habitat loss and fragmentation, flood control activities, changes in agricultural and land management practices, predation from introduced species, parasites, water pollution and continuing threats are the main causes for the decline of this species. However, when abundant cover is available, GGS may be able to persist with numerous predators that share the same habitats (Hansen 1988).

Gallaway Consulting, Inc., conducted field surveys of the Action/Project Area on June 15, 21, and 27, 2006. GGS was not considered for detailed evaluation in the 2007 Temporary Maintenance Project (CDFG and USFWS 2007) for the following reasons: (1) the project area did not contain suitable habitat for GGS; and (2) GGS were absent from larger rivers and other waterbodies that support introduced populations of large, predatory fish. In addition, the habitat types including disturbed valley-foothill riparian and upland cropland habitats, that dominate the Action/Project Area do not typically provide suitable GGS habitat.

Since 2007, review of the 2012 CNDDB report indicates that one new observation of GGS has occurred for any of the Ord Ferry 7.5-minute or surrounding 8 topographical quadrangles considered. The only new CDDB entry is located within the Glenn quadrangle (UTM 579730.7 4377430.9) approximately 9.7 miles south-west of the Action/Project Area, which was recorded on June 22, 2011 (CNDDB 2013).

Surveys conducted in 2012 did not identify suitable GGS habitat within the Action/Project Area. Consistent with previously collected information, several components of suitable GGS habitat

were identified outside of the Action/Project Area along the west bank of the Big Chico Creek near the confluence with the Sacramento River. However, this habitat area is bordered by the Sacramento River, orchards, and riparian woodlands, which are not considered to be suitable habitat for the GGS (Robertson-Bryan, Inc. 2012).

3.4.2 REGULATORY SETTING

In addition to the applicable laws, regulations and standards described in Section 3.3.2 above, the following laws and regulations apply specifically to terrestrial resources.

3.4.2.1 FEDERAL

MIGRATORY BIRD TREATY ACT AND BALD AND GOLDEN EAGLE PROTECTION ACT

The Migratory Bird Treaty Act (MBTA, 16 USC Section 703-711) and the Bald and Golden Eagle Protection Act (16 USC Section 668) protect certain species of birds from direct take. MBTA protects migrant bird species from take through setting hunting limits and seasons and protecting occupied nests and eggs. The Bald and Golden Eagle Protection Act prohibits the take or commerce of any part of these species. USFWS administers both Acts, and reviews Federal agency actions that may affect species protected by the Acts.

EXECUTIVE ORDER 11990 – PROTECTION OF WETLANDS

Executive Order 11990 requires that Federal agencies "*…avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative…*" Federal agencies are required to follow avoidance, mitigation, and preservation procedures with public input before proposing new construction in wetlands. Adherence to the conditions specified in a permit issued pursuant to Section 404 of the CWA (described in Section 3.3.2, above) would ensure compliance with Executive Order 11990.

EXECUTIVE ORDER 13112 – INVASIVE SPECIES

Executive Order 13112 requires that a Federal agency "*…not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.*" The primary purpose of this directive is to reduce the ecological and economic effects of invasive plant and animal species to agriculture, recreation and the environment.

3.4.2.2 STATE

CALIFORNIA ENDANGERED SPECIES ACT

As discussed above in Section 3.3.2.2, State agencies are subject to a general duty to "conserve" endangered and threatened species under CESA. Consistent with this duty, State agencies "*should not approve projects as proposed which would jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat essential to the continued existence of those species, if there are reasonable and prudent alternatives available consistent with conserving the species or its habitat which would prevent jeopardy*." (Fish and Game Code Section 2053.) However, "*in the event specific economic, social, or other conditions make infeasible such alternatives, individual projects may be approved if appropriate mitigation and enhancement measures are provided*." (Fish and Game Code Section 2054.)

Under CESA, CDFW is responsible for maintaining a list of endangered and threatened species (California Fish and Game Code 2070). CDFW also maintains a list of "candidate species," which are species that CDFW formally identifies as being under review for addition to the list of endangered or threatened species, and lists of "species of special concern," which serve as species "watch lists." Take of protected species incidental to otherwise lawful activities may be authorized under California Fish and Game Code Section 2081, and authorization from CDFW is provided in the form of an incidental take permit. A public agency reviewing a proposed project within its jurisdiction must determine whether any State-listed endangered or threatened species may be present in the project area and determine whether the proposed project could have a significant impact on such species. In addition, CDFW encourages informal consultation on any proposed project that may affect a candidate species.

Pursuant to CEQA (Public Resources Code Section 21104.2) State agencies must consult with CDFW when preparing environmental impact reports to assess the effects of proposed projects on the continued existence of listed species. Agencies can approve a project that affects a listed species under CEQA, however, if the agency determines that there are "overriding considerations." (CEQA Guidelines section 15093.) This opportunity under CEQA, however, must be harmonized with the need under CESA, mentioned above, to provide "appropriate mitigation and enhancement measures" pursuant to Fish and Game Code Section 2054. CDFW may also authorize "incidental take statements" or "incidental take permits" pursuant to Fish and Game Code section 2081 where CDFW determines that existing Federal ESA incidental take authorization meets the standards of CESA or where CDFW ensures that the "*impacts of the authorized take shall be minimized and fully mitigated*."

CALIFORNIA FISH AND GAME CODE

Under California Fish and Game Code Sections 1600–1616, CDFW has jurisdictional authority over fish and wildlife resources associated with rivers, streams, and lakes. Section 1602 of the California Fish and Game Code requires any person, State or local governmental agency to

provide advance written notification to CDFW prior to initiating any activity that would: (1) divert or obstruct the natural flow of, or substantially change or remove material from the bed, channel, or bank of any river, stream, or lake; or (2) result in the disposal or deposition of debris, waste, or other material into any river, stream, or lake. The definition of "lakes, rivers, and streams" includes all rivers or streams that flow at least periodically or permanently through a bed or channel with banks that support fish or other aquatic life, and watercourses with surface or subsurface flows that support or have supported riparian vegetation. Therefore, Section 1602 of the California Fish and Game Code also applies to any surface disturbing activities conducted in riparian habitat within floodplains adjacent to waterbodies.

If CDFW determines that a proposed project or activity could have substantial adverse effects on fish or wildlife, a Streambed Alteration Agreement is required. As part of this agreement, CDFW may require reasonable modifications to project-related activities that would allow for the protection of fish and wildlife resources.

The following sections of the California Fish and Game Code also apply to project-related activities.

- ***Native Plant Protection Act, Sections 1900-1913 –*** State listing of plant species began in 1977 with the passage of the Native Plant Protection Act (NPPA). Under the NPPA, CDFW has the authority to designate native plants as endangered or rare and to require permits for collecting, transporting, or selling such plants.
- ***Birds of Prey, Section 3503.5 –*** The California Fish and Game Code Section 3503.5 states that it is unlawful to take, possess, or destroy any birds in the orders of Falconiformes (hawks, eagles, and falcons) or Strigiformes (owls) or to take, possess, or destroy the nest or eggs of any such bird, except as otherwise provided by the code.
- ***Migratory Birds, Section 3513 –*** The California Fish and Game Code Section 3513 states that it is unlawful to take or possess any migratory nongame bird as designated in the MBTA or any part of such migratory nongame bird except as provided by rules and regulations adopted by the Secretary of the Interior under provisions of the MBTA.
- ***Fully Protected Species, Sections 3505, 3511, 4700, 5050, and 5515*** – California Fish and Game Code statutes also apply "fully protected" status to a number of specifically identified birds, mammals, reptiles, amphibians, and fish. These species cannot be "taken," even with an incidental take permit.

3.4.2.3 LOCAL

SACRAMENTO RIVER NATIONAL WILDLIFE REFUGE COMPREHENSIVE CONSERVATION PLAN

The USFWS SRNWR Comprehensive Conservation Plan (CCP) is a 15-year plan that describes the goals, objectives and strategies for refuge management, and provides guidance to achieve these conditions. Additionally, it is important that the SRNWR promote recruitment of fish and

wildlife habitat while considering impacts on public safety, water conveyance, and public use opportunities.

The wildlife and habitat goal of the SRNWR is to contribute to the recovery of endangered and threatened species, abundance of migratory birds, and protection of anadromous fish by providing natural diversity through the restoration and management of viable riparian habitats along the Sacramento River (USFWS 2005). Strategies used to achieve the wildlife and habitat goal include: (1) develop site assessments and restoration plans for each of the restoration sites; (2) modify privately constructed levees to restore or enhance topographical features where appropriate; (3) continue to protect and manage SRNWR lands within the 100-year floodplain to enhance habitat for migratory birds and anadromous fish; (4) evaluate the response of Federal and State endangered and threatened species to habitat restoration; (5) identify, locate, map, and conserve important native plant areas; (6) manage vegetation and habitat for desired species composition and population levels of native species; and (7) evaluate techniques for controlling target invasive plant species (USFWS 2005).

The SRNWR has identified restoration for VELB (i.e., elderberry shrub plantings in riparian habitat restoration sites), and cooperative monitoring and research as conservation strategies for endangered species objectives of the wildlife and habitat goal for the SRNWR CCP (USFWS 2005). By July 2007, the SRNWR, in conjunction with TNC and River Partners planted 117,235 elderberry shrubs on 3,182 acres of refuge restoration lands, which amounts to approximately 32 elderberry shrubs per acre (CDFG and USFWS 2007).

Another objective of the wildlife and habitat goal of the SRNWR is to address floodplain and river processes by promoting the recruitment of fish and wildlife habitat through the investigation of riverbank stabilization, refuge levees and floodplain topography for best management options. The refuge is conducting restoration activities that will provide for long-term maintenance of physical processes and conditions for erosion, over-bank flooding, sediment deposition on the floodplain, and recruitment of large woody material into the Sacramento River (USFWS 2005). However, USFWS also recognizes the need to protect the integrity of the levee system, water diversion facilities, and overflow areas that facilitate public safety and agricultural operations. As part of these investigations, the SRNWR considers impacts to public safety, agriculture and water conveyance (USFWS 2005).

The SRNWR also is involved in the development and implementation of conservation plans for migratory bird species, including the Partners in Flight North American Landbird Conservation Plan, North American Waterfowl Management Plan, United States Shorebird Conservation Plan, and the North American Waterbird Conservation Management Plan (USFWS and CDFG 2012a).

DRAFT BUTTE COUNTY ASSOCIATION OF GOVERNMENTS' BUTTE REGIONAL CONSERVATION PLAN

The Draft Butte Regional Conservation Plan (BRCP) is currently being prepared and coordinated by the Butte County Association of Governments. The BRCP will satisfy both Federal and State

requirements for a Habitat Conservation Plan (HCP) and a State Natural Community Conservation Plan (NCCP), respectively. The BRCP's planning area covers approximately the western half of Butte County. Although the BRCP includes portions of the Sacramento River within Butte County, the Butte Regional HCP/NCCP does not address activities that could affect listed fish species in the Sacramento River; such activities are addressed under other regional conservation planning efforts for the Sacramento River (e.g., Anadromous Fish Restoration Program). The Sacramento River floodplain within Butte County is included in the Butte Regional HCP/NCCP for implementing conservation measures for covered species and natural communities (BCAG and USFWS 2011).

BUTTE COUNTY GENERAL PLAN

Butte County goals and policies applicable to the Proposed Project include the following.

- Goal COS-7. Conserve and enhance habitat for protected species and sensitive biological communities.
- COS-P7.7. Construction barrier fencing shall be installed around sensitive resources on or adjacent to construction sites. Fencing shall be installed prior to construction activities and maintained throughout the construction period.
- COS-P7.8. Where sensitive on-site biological resources have been identified, construction employees operating equipment or engaged in any development-associated activities involving vegetation removal or ground disturbing activities in sensitive resource areas shall be trained by a qualified biologist and/or botanist who will provide information on the on-site biological resources (sensitive natural communities, special-status plant and wildlife habitats, nests of special-status birds, etc.), avoidance of invasive plant introduction and spread, and the penalties for not complying with biological mitigation requirements and other State and Federal regulations.
- COS-P7.9. A biologist shall be retained to conduct construction monitoring in and adjacent to all habitats for protected species when construction is taking place near such habitat areas.
- Goal AG-1. Protect, maintain, promote and enhance Butte County's agriculture uses and resources, a major source of food, employment and income in Butte County.
- Goal AG-6. Provide adequate infrastructure and services to support agriculture.
- Goal COS-8. Maintain and promote native vegetation.
- COS-P8.1. Native plant species shall be protected and planting and regeneration of native plant species shall be encouraged, wherever possible.
- COS-P8.4. Introduction or spread of invasive plant species during construction …shall be avoided by minimizing surface disturbance; seeding and mulching disturbed areas with

certified weed-free native mixes; and using native, noninvasive species in erosion control plantings.

- Goal COS-9. Protect identified special-status plant and animal species.

GLENN COUNTY GENERAL PLAN

The Glenn County General Plan includes the goal of preserving and enhancing the county's biological resources in a manner compatible with a sound local economy (Glenn County 1993). Glenn County policies applicable to the Proposed Project include the following.

- NRP-39. Approach the retention and enhancement of important habitat by preserving areas or systems which will benefit a variety of species or resources rather than focusing on individual species, resources or properties.
- NRP-41. Biological resources: Preserve natural riparian habitat, especially along Stony Creek and the Sacramento River and Butte Creek.
- NRP-44. Recognize that retention of natural areas is important to maintaining adequate populations of wildlife which is, in turn, important to the local economy.
- NRP-50. Recognize the Sacramento River corridor, the Sacramento National Wildlife Refuge, migratory deer herd areas, naturally occurring wetlands, and stream courses such as Butte and Stony creeks as areas of significant biological importance.
- NRP-61. Support efforts to improve water availability and management when the potential exists to benefit fish and wildlife in cooperation with Glenn County agricultural water users.
- NRP-62. Support the coexistence of agricultural, wildlife and wildlife land uses, and cooperation of persons involved in agriculture and wildlife habitat preservation, in areas of wildlife habitat potential.

3.4.3 ENVIRONMENTAL CONSEQUENCES

3.4.3.1 ASSESSMENT METHODOLOGY

The impact assessment methodology describes the considerations and methodologies used to evaluate the potential for short-term, construction-related impacts, in addition to long-term impacts to terrestrial resources and their habitat.

Potential impacts associated with implementation of the Proposed Action/Project that are evaluated would generally be limited to the immediate Action/Project Area and primarily include short-term construction-type impacts associated with construction vehicle access, suction dredging, spoils disposal, and maintenance of the rock-toe and tree revetment. The evaluation of potential short-term construction-related impacts is based on several considerations, including: (1) timing of project activities; (2) physical habitat disturbance and short-term changes in habitat

conditions; (3), potential for direct physical injury; (4) hazardous spills; and (5) the known or assumed presence of species and habitats within the Action/Project Area. Potential long-term impacts associated with the Proposed Action/Project (i.e., dredging and revetment maintenance) include those associated with altered habitat conditions over a long period of time that could result from deposition of spoils materials, as well as maintenance of the revetment. Altered habitat conditions include changes in the evaluated habitats and species utilization of available habitats potentially resulting from the Proposed Action/Project.

Under the No Action Alternative, potential impacts evaluated include both short-term construction-related impacts (primarily associated with removal of the revetment), and long-term impacts. The potential for long-term impacts to terrestrial resources associated with reasonably foreseeable actions that would occur under the No Action Alternative include those associated with removal of the revetment, and reduced performance of the M&T/Llano Seco Pumps Facility and subsequently re-initiating diversions in Big Chico and Butte creeks.

Based on information regarding habitat conditions and the occurrence of terrestrial species of management concern in the Action/Project Area, environmental consequences of implementing the Proposed Action/Project were evaluated based on analysis of potential direct and indirect effects. The analysis includes: (1) the composition and location of wildlife habitats within the Action/Project Area using information from previously completed environmental documentation including the 2007 Temporary Maintenance Project (CDFG and USFWS 2007), and the 2012 biological and habitat survey results (Appendices E and F); (2) the location of the project features; (3) the type and duration of construction activities; and (4) the areas affected by construction.

3.4.3.2 SIGNIFICANCE CRITERIA

The significance criteria used to evaluate impacts on terrestrial resources are based on and incorporate guidance contained in Section 1508.27 of the CEQ NEPA regulations regarding significance determinations; the mandatory findings of significance, as listed in Section 15065 of the State CEQA Guidelines (Title 14, Chapter 3 of the CCR); and criteria contained in Appendix G, "Environmental Checklist Form," of the CEQA Guidelines.

The CEQ NEPA regulations found in Title 40, Code of Federal Regulation (CFR) focus Federal agencies' attention on impacts on endangered and threatened species. Section 1508.27 of those regulations defines the word *significantly*, which comes into play in the statutory mandate under NEPA for Federal agencies to prepare Environmental Impact Statements for major Federal actions *significantly* affecting the human environment (42 U.S.C. Section 4321.). Under Section 1508.27, Federal agencies, in determining whether a major Federal action significantly affects the human environment, should consider both the *context* and the *intensity* of the effects at issue. Context relates to the setting for the proposed action (i.e., whether it is regional or local in scale). Intensity "*refers to the severity of impact*." Among the factors to be considered in assessing intensity are "[t]he degree to which the action may adversely affect an endangered or threatened

species or its habitat that has been determined to be critical under the Endangered Species Act of 1973."

In enacting CEQA, the Legislature found and declared that it was the policy of the State, among other things, to "[p]*revent the elimination of fish or wildlife species due to man's activities*" and "insure that fish and wildlife populations do not drop below self-perpetuating levels" (Public Resources Code Section 21001[c]). Under CEQA Guidelines Section 15065, which echoes this policy statement, impacts are significant under CEQA if a proposed project would result in any of the conditions listed below.

- Substantially reduce the habitat of a fish or wildlife species.
- Cause a fish or wildlife population to drop below self-sustaining levels.
- Threaten to eliminate a plant or animal community.
- Substantially reduce the number or restrict the range of an endangered, rare or threatened species.

Significance criteria for use in assessing terrestrial resources in this Draft EA/IS were also developed based on Appendix G of the CEQA Guidelines. The sample Initial Study Checklist found in that appendix identifies questions lead agencies should generally ask with respect to a proposed project's potential impacts on biological resources. These questions are often used to give rise to significance thresholds. Based on that approach, the Proposed Project would be considered to have an adverse effect under NEPA and a significant impact under CEQA on terrestrial resources if it would contribute to any one of the following.

- 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 CDFW or USFWS.
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the CDFW or USFWS.
- Have a substantial adverse effect on Federally protected wetlands as defined by Section 404 of the CWA (including, but not limited to marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.
- 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.
- Conflict with the provisions of an adopted HCP, NCCP, or other approved local, regional, or State habitat conservation plan.
- Conflict with any local policies or ordinances protecting biological resources.

These significance criteria were utilized to evaluate the potential effects of the Proposed Project on terrestrial resources.

3.4.3.3 IMPACT ANALYSIS

Summarized below are: (1) the activities (e.g., dredging, spoils disposal, revetment removal) associated with the Proposed Action/Project or the No Action Alternative that have the potential to impact wildlife and botanical resources; (2) the mechanisms (e.g., turbidity, hazardous spills, physical habitat alteration) by which these activities have the potential to affect wildlife and their habitat; (3) how (e.g., behaviorally, physiologically) these phenomena can potentially impact wildlife and botanical resources; and (4) the measures that are incorporated into the Proposed Action/Project to avoid and/or minimize potential impacts. Detailed descriptions of the activities and impact avoidance and minimization measures (i.e., project environmental commitments) associated with the Proposed Action/Project are provided in Chapter 2 of this Draft EA/IS.

NO ACTION ALTERNATIVE RELATIVE TO EXISTING CONDITIONS (NEPA ANALYSIS)

The No Action Alternative includes the actions, practices, and land uses that would be assumed to occur without implementation of the Proposed Action/Project, and for purposes of this evaluation, includes removing the existing rock-toe and tree revetment. Because the existing 1,520-foot long rock-toe and tree revetment on the west bank of the Sacramento River in the Action/Project Area was originally anticipated to be a temporary structure, it also is anticipated that the revetment would be removed under the No Action Alternative. Following revetment removal, it is probable that erosion of the west bank would continue to occur and the Sacramento River would continue to migrate to the west. Additionally, under the No Action Alternative, sediment deposited in the vicinity of the M&T/Llano Seco Pumps Facility would not be removed from the Sacramento River.

Consequently, the No Action Alternative would be expected to result in continued deposition of sediment proximate to the intake, and the continued downstream extension of deposited materials in the Sacramento River. This would result in the fish screen criteria not being met at the M&T/Llano Seco Pumps Facility intake screen and could result in a loss of the ability of the pumping facility to continue to divert sufficient quantities of water to maintain agricultural and refuge water supplies. Therefore, if diversions at the M&T/Llano Seco Pumps Facility intake were severely restricted or could no longer be made, then historical diversions from both Butte and Big Chico creeks could be re-initiated to compensate for the loss of diversion from the Sacramento River.

The potential effects associated with the No Action Alternative on terrestrial resources are discussed below.

Removal of the Temporary Rock-toe and Tree Revetment

The No Action Alternative includes removal of the rock-toe and tree revetment that was installed in 2007. As described in Chapter 2, this would entail removal of the approximately 9,120 tons of rock, several tiebacks, and tree clusters that were created from about 390 almond trees. Revetment removal activities would be anticipated to utilize similar access and staging areas, equipment and materials, personnel, and project commitments[6] as were used in the construction and placement of the revetment in 2007. Rock-toe and tree revetment removal activities relevant to the potential for affecting special-status terrestrial species are summarized below.

It is anticipated that rock and vegetation would be removed from the Sacramento River using a dragline with a 120-foot reach, and removed from the revetment working along the top of the approximately 15-foot high bank. Excavation activities for removing rock tiebacks would be conducted with a dragline. Removed material would be dumped on a 20-foot wide working area, and then loaded onto a dump truck for removal from the site.

Removal of the revetment is anticipated to occur over a five week period, and could potentially result in short-term construction-related impacts and long-term habitat alteration, as discussed below.

Construction-Related Impacts

The evaluation of potential short-term construction-related impacts is based on several considerations including physical habitat disturbance, potential for direct physical injury to individuals, hazardous materials and chemical spills, and the disruption of habitat utilization by special-status species in the Action/Project Area.

Physical Habitat Disturbance

Activities associated with removing the existing rock-toe and tree revetment, as well as access, staging, storage, and disposal areas have the potential to disturb the physical habitat in and around the project site above those levels generally found under Existing Conditions.

Activities associated with revetment removal, as well as access, staging, storage, and disposal areas have the potential to contribute sediment and increase erosion on bank areas around and downstream of the construction area above those levels generally found under Existing

[6] As discussed in Chapter 2, it is not typically a standard practice to identify mitigation measures for a No Action Alternative. However, the environmental commitments to implement standard construction-related impact avoidance and minimization measures as part of revetment removal were agreed to and approved by the Lead Agencies in 2007. Therefore, for analytical purposes in this EA/IS, it is assumed that the standard construction-related impact avoidance and minimization measures presented in Section 2.2.3 would apply, if the No Action Alternative described in this EA/IS was selected for implementation by the Lead Agencies.

Conditions. The increase in sediment introduced to the Sacramento River could potentially impact wetlands and riparian habitat on the river banks downstream of the Action/Project Area.

In addition, due to the movement of traffic between the construction staging areas, and storage and disposal areas, as well as from general construction activity, the potential exists for dirt and dust to accumulate on access roads and enter the Sacramento River as sediment throughout the construction period. Further, dust generated during removal of the revetment could impact elderberry shrub and riparian plant growth adjacent to the revetment site and along the access road.

Construction traffic, vehicle and equipment staging, and temporary storage of removed rock prior to transport from the site to the disposal area would result in physical disturbance and compaction of the soil surface. This compaction, in turn, could result in the inability of plants to become established in equipment staging areas until disking or other soil rehabilitation is completed. However, because the access road and staging area are presently a maintained, compacted gravel road, potential impacts are anticipated to be minimal and localized.

To address these potential disturbance-related impacts, construction-related Environmental Commitments (e.g., WQ-2 and AQ-2) are incorporated into revetment removal activities to minimize water quality impacts, as well as the generation of dust that could affect elderberry shrubs and riparian plants (see Chapter 2).

Potential for Physical Injury

During construction, the potential for physical injury of botanical and wildlife species exists. This can occur through direct contact with construction equipment or personnel or by the removal of rock-toe material from the river to the access, staging, storage, and disposal areas. However, the likelihood of direct physical harm occurring is considered low because it would be expected that any individuals potentially present would vacate the immediate area in response to short-term increases in noise and disturbance during construction activities, and relocate subsequent to construction. Additionally, for public safety, the USFWS Refuge staff would implement a temporoary public access closure in areas of the Capay Unit affected by construction.

Depending on the timing of when revetment removal would occur (i.e., if funding procurement dictates implementation would occur two or more years into the future), additional pre-construction surveys may need to be conducted prior to the onset of construction. The results of site assessments and biological surveys are often considered valid by the USFWS and/or CDFW for a period of two years, unless determined otherwise on a case-by-case basis. After two years, new surveys may be required, if deemed necessary by the appropriate USFWS and/or CDFW office. If special-status species are detected at that time, impact avoidance measures may need to be implemented to minimize the potential to harm relatively immobile individuals (e.g., nesting birds or turtles). As discussed in Chapter 2, ***Environmental Commitments TR-2*** and ***TR-4*** will minimize the potential for physical injury.

Hazardous Materials and Chemical Spills

Hazardous materials and chemicals in the form of gasoline, engine oil, lubricants, or other fluids used during construction activities could potentially leak from machinery or spill in the project area. Accidental discharge of hazardous materials and chemicals could potentially affect wildlife that may be present in the immediate vicinity and downstream of the construction area by increasing physiological stress, altering primary and secondary production, causing avoidance behavior, and causing direct mortality. Additionally, these substances can remove habitat by exposing individual plants, including emergent aquatic vegetation that provides high habitat value, to lethal concentrations of chemicals. As discussed in Chapter 2, ***Environmental Commitments HAZ-1, WQ-1*** and ***WQ-2*** will minimize the potential for physical injury.

Disrupt Habitat Utilization of Special-Status Terrestrial Species in the Action/Project Area

During construction, habitat typically utilized by ospreys, bald eagles, and other migratory bird species for foraging and nesting may become temporarily degraded. Increases in ambient noise and turbidity adjacent to the revetment may result in physical disturbance of the aquatic habitat and result in decreased foraging habitat suitability for piscivorous bird species.

During revetment removal, the potential exists for noise generated by excavation activities to affect wildlife species in the vicinity of the construction activities. Specifically, noise generated by construction activities could alter foraging, nesting, and mating behaviors of some special-status species. However, construction-related activities associated with revetment removal would generally occur outside of the peak nesting season for migratory birds and bank swallows.

Additionally, construction-related activities have the potential to affect elderberry shrubs in the area by directly impacting individual shrubs or by increasing dust and reducing the viability of individual shrubs. Potential impacts on elderberry shrubs could result in reduced habitat suitability for VELB.

Terrestrial Habitat Modification Impacts

In addition to the potential for short-term construction-related impacts associated with removal of the revetment changes of both intermediate and long-term duration in physical habitat conditions could potentially occur in the vicinity of the existing revetment. Specifically, implementation of the No Action Alternative would result in continued erosion of the west bank of the Sacramento River, which would occur as a result of flood flows and, to a lesser extent, wave wash associated with boat traffic through the area. The western bank would continue to migrate in a westerly direction. On a short-term basis over the next few years, the continued erosion of the bank would initially result in the continued exposure of loose sand substrates and the predominance of relatively high bank slopes, as shown in Figure 3.3-1 of the Fisheries and Aquatic Resources section titled *Aquatic Habitat Modification Impacts.* The relatively high bank slopes and continued exposure may provide habitat suitable for re-establishment of a bank swallow colony in the immediate area.

Restoration efforts on the Capay Unit encompassed 135.7 acres of Mixed Riparian Forest, 54.8 acres of Cottonwood Riparian Forest, 23.4 acres of Valley Oak Riparian Forest, 103 acres of Valley Oak Woodland, 80.4 acres of Elderberry Savanna, and 172.5 acres of Grassland (TNC 2005). As the Sacramento River continues to migrate west over a longer term, eventually, these restored areas would be affected, and individual trees and/or shrubs from these vegetation community types could become unstable near the edge of the river, potentially being recruited into the Sacramento River as IWM.

Valley-Foothill Riparian Habitat

Riparian habitats are considered to be one of the most ecologically productive and diverse terrestrial environments (NMFS 2003). Vegetation in riparian areas influences channel processes by stabilizing bank lines through root reinforcement, providing a source of IWM, and by retaining sediment during high-flow events. Additionally, riparian habitat provides high quality habitat for a variety of wildlife species in the form of provides food, water, migration and dispersal corridors, and escape, nesting, and thermal cover, while providing energy sources for aquatic organisms by producing organic input (e.g., leaf litter) and terrestrial organisms that fall into the water and are preyed upon by fish.

Prior to construction of the rock-toe and tree revetment, riparian vegetation was sparse on the west bank of the Sacramento River in the Action/Project Area. For the most part, vegetation above the eroding bank consisted of grasses, which did not provide high quality wildlife habitat. The exception was the riparian vegetation associated with the estimated 250 linear feet of riparian habitat bordering the Sacramento River in the downstream portion of the Action/Project Area. At this location, the riparian forest was characterized as a tall overstory of deciduous broadleaf trees comprised primarily of valley oak. Other native riparian forest species include Fremont cottonwood, box elder, Oregon ash, and western sycamore. Understory species in the Action/Project Area riparian forest community include poison oak, wild blackberry (*Rubus spp.*), wild grape, elderberry and saplings of various tree species (CDFG and USFWS 2007).

Since construction of the rock-toe and tree revetment in 2007, voluntary recruitment of riparian vegetation has occurred in the revetment area. Monitoring conducted during November 2011 demonstrates the recruitment of woody riparian vegetation. Woody vegetation (primarily willows) has become established on top of the rock-toe, at the base of the bank, and on the lower angle portions of the bank above the rock-toe. According to Tetra Tech (2012a), significant numbers of riparian plants have volunteered onto both the top of the rock revetment and onto the reduced-angle lower bank slope above the contact with the revetment. The large woody material piles anchored on the top of the rock-toe appear to be sites of preferential establishment of boxelders, sycamore and willows (see Figure 3.3-2 in the Fisheries and Aquatic Resources Impact Assessment section titled *Overhanging Shade Cover*, above), probably because of their effects on local flow velocities (Tetra Tech 2012a). However, because riparian habitat requires about 25 years to reach its full value (USFWS and CDFW 2013), this volunteer woody vegetation is not yet mature riparian forest that provides very high quality habitat for wildlife.

Under the No Action Alternative, removal of the rock-toe and tree revetment would result in the removal of volunteer woody vegetation that has become established, along with the habitat value it currently provides. Removal of the revetment would immediately result in conditions similar to those that existed prior to installation of the revetment in 2007. Because the localized area on top of the bank would be disturbed during the removal of the revetment by operation of the dragline, it is expected that this area would provide minimal overhanging shade/cover immediately after revetment removal. Because the tree clusters in the revetment provide organic substrate and low velocities with resultant opportunities for riparian vegetation establishment, as well as reduced bank erosion, it is likely that removal of the revetment would result in slowed near-term riparian habitat recruitment and ongoing erosion of newly established riparian habitat, relative to the existence of the revetment. This localized area would not be expected to provide overhanging shade/cover for several years until the bank has eroded and become more proximate to the stands of existing and restored riparian vegetation on the Capay Unit. As the river moves west, conditions also may change along the east bank of the Sacramento River. It is anticipated that increased sediment deposition along the east bank could result in increased recruitment of riparian habitat along this area of shoreline. Willows and cottonwoods have, and may continue to recruit on the east bank shoreline as the east bank expands westerly with increased sediment deposition.

In the absence of the rock-toe revetment, it is also expected that the Sacramento River would resume its westward migration in the vicinity of the Capay Unit. As previously described, it is assumed that future erosion rates and hydrologic conditions would be similar to those observed in the past, rates could range from about 20 to 60 feet per year (near-term), or an additional erosion of 100 feet and 500 feet could occur over a subsequent five-year period (CDFG and USFWS 2007). Near-term over one to a few years, Valley Oak Woodland and Valley Oak Riparian Forest would be the first habitat types to be affected by westward migration of the river because these communities are within about 60 feet of the west bank of the river.

Therefore, removal of the rock-toe and tree revetment, as part of the No Action Alternative, would be expected to provide an overall decrease in the amount of near-term riparian vegetation, particularly in consideration of the fact that the riparian vegetation that has become and will continue to become established in the bank immediately above the rock-toe matures over time.

Over the long-term, however, it is anticipated that re-establishment of large-scale ecological processes (e.g., river meander) would allow additional riparian species to become established and the long-term natural processes of riparian establishment and erosion into the river to occur, particularly with respect to the restoration activities that have occurred on the Capay Unit. Communities within 100 to 500 feet of the river that could be affected over the long-term include Valley Oak Woodland, Valley Oak Riparian Forest, Grasslands, and potentially Mixed Riparian Forest habitats. However, the development of complex riparian habitats on the Capay Unit over time is expected to provide additional linkages to riparian habitat communities along the

Sacramento River, and would not be expected to adversely affect riparian movement corridors used by wildlife.

Bank Slope

Prior to construction of the rock-toe and tree revetment during 2007, the average slope of the west bank of the Sacramento River within the 1,520-foot revetment area was very steep with a slope of about 1:1 (CDFG and USFWS 2007). During the 2007 construction, no grading was used to change the bank slope. Rather, the stone toe was placed in the river to result in a 10:1 cross grade, which significantly reduced the slope of the west bank within the Action/Project Area.

Removal of the rock-toe and tree revetment can be expected to initially result in a bank slope similar to that which existed prior to installation of the rock-toe and tree revetment in 2007. The change in bank slope from Existing Conditions (10:1 cross grade) to a very steep slope (approximately 1:1) is expected to affect bank swallow habitat suitability. Specifically, restoration of the 1:1 slope is expected to provide suitable habitat for nesting bank swallows which had abandoned the site after installation of the revetment during 2007. Nesting bank swallows require these steep slopes in order to escape predation during nesting and rearing and would be expected to recolonize the site after revetment removal. Therefore, implementation of the No Action Alternative represents a beneficial effect on bank swallows.

Summary of Potential Effects Associated with Rock-Toe and Tree Revetment Removal

In summary, construction-related activities associated with removal of the rock-toe and tree revetment as part of the No Action Alternative would not be expected to substantively adversely affect special-status wildlife and their habitat as a result of implementation of construction-related impact avoidance and minimization measures (see construction-related Environmental Commitments in Chapter 2). However, habitat alteration, at the time of revetment removal, would result in adverse effects on riparian habitat. However, removal of the rock-toe and tree revetment would be expected to restore habitat previously utilized by nesting bank swallows.

Re-initiation of Diversions in Butte and Big Chico Creeks

As described in Chapter 1 of this Draft EA/IS, USFWS, CDFW, M&T Chico Ranch, and Llano Seco Rancho entered into the 1996 Agreement for relocation of the M&T/Llano Seco Pumps Facility from Big Chico Creek to the Sacramento River to enhance instream conditions for fisheries resources. As part of the agreement, M&T Chico Ranch and Llano Seco Rancho agreed to implement a bypass at the Parrott-Phelan Diversion Dam on Butte Creek of up to 40 cfs of their Butte Creek water right entitlement for the period of October 1 through June 30. If diversions at the M&T/Llano Seco Pumps Facility were restricted or could no longer be made, then historical diversions from both Big Chico Creek could be re-initiated and diversions from Butte Creek could be increased to compensate for the loss of diversion from the Sacramento River. If this were to occur, it is unlikely that such action would adversely affect terrestrial

resources along the Sacramento River, although terrestrial species that use riparian habitat areas adjacent to Big Chico and Butte creeks could potentially be affected as a result of riparian habitat modification associated with potential changes in the lateral extent of water available for riparian habitat due to flow-related changes within these two creeks.

The Parrott-Phelan Diversion Dam is the upper-most diversion on Butte Creek and diverts water year-round, although most diversions operate during April through September (NMFS 2009b). Under the No Action Alternative, flows in Butte Creek dedicated under the 1996 Agreement likely would be reduced by up to 40 cfs from October through June, which could potentially impact wetlands and riparian habitat adjacent to Butte Creek downstream from the point of diversion at the Parrott-Phelan Diversion Dam to the confluence with the Sacramento River – a distance of about 60 miles (Schild and Cundiff-Gee 1996). Specifically, reduced flows could alter the interaction between surface water and groundwater, as well as hyporheic flow on the margins of the creek, which could reduce the lateral extent of water available for riparian habitat. The approximately 0.75 miles of riparian habitat downstream of the Phelan-Parrott diversion pumps on Big Chico Creek could experience similar effects.

As described in Chapter 1, the M&T/Llano Seco Pumps Facility currently provides a reliable water supply to farmland, refuge land, and wildlife management areas, which include the eastern portion of the Llano Seco Rancho that is under conservation easement and is served by the M&T/Llano Seco Pumps Facility. The facility also provides Sacramento River water to wetlands and associated habitats owned or managed by USFWS, CDFW and Llano Seco Rancho, which provides wetland habitat for waterfowl, shorebirds, and other wetland-dependent and Federally listed species (**Figure 3.4-6**). In addition, rice fields owned by CDFW are flooded annually during the fall, providing an energy supply for waterfowl and irrigated pasture provides habitat for sandhill crane and other species (for additional detail, see Section 1.1).

Figure 3.4-6. Llano Seco Rancho under Existing Conditions (Source: Llano Seco Rancho 2013).

Under the No Action Alternative, M&T Chico Ranch would continue to take delivery of their water rights for crop irrigation purposes. However, the available Butte Creek water supply would be sufficient to irrigate only a small portion of farmland, which would reduce crop production, or could necessitate land fallowing, resulting in economic damage to the ranches. A low rainfall year in the Butte Creek Watershed would be especially critical to both farmland and managed wetlands.

California's Central Valley supports approximately 60 percent of the ducks and geese wintering in the Pacific Flyway (Ducks Unlimited 2013; Schild and Cundiff-Gee 1996), yet nearly 95 percent of the Central Valley's historic wetlands have been lost (Gilmer et al. 1982). Of the wetlands remaining, two-thirds are privately owned and managed for the purpose of providing wintering waterfowl habitat and duck hunting opportunities (Heitmeyer et al. 1989). The remaining one-third consists of State wildlife areas and national fish and wildlife refuges (Central Valley Habitat Joint Venture 1990). CDFW and USFWS manage the State and Federal wildlife and refuge areas to benefit many threatened and endangered species. In addition, these areas support millions of migrating waterfowl that are dependent upon this area during their winter migration through the Central Valley. Specifically, ducks, geese, swans and hundreds of other wetland species are dependent upon Central Valley wetlands for their winter food supplies (Schild and Cundiff-Gee 1996).

Since the early 1990s, about 4,500 acres on the Llano Seco Rancho historically farmed as rice and irrigated pasture have been restored to wetland and upland habitats that are now part of theUSFWS – North Central Valley Wildlife Management Area, and the CDFW Upper Butte Basin Wildlife Area (California Rangeland Conservation Coalition 2013). These areas are comprised of riparian vegetation and sloughs, grasslands, seasonal and perennial marsh habitats, Great Valley oak riparian forests, Great Valley mixed riparian forests, Great Valley cottonwood riparian forests and open water habitats. Under Existing Conditions, the M&T/Llano Seco Pumps Facility provides a reliable water supply to these areas, which serve as habitat for many local and migratory wildlife species, including wintering sandhill cranes and geese that forage in shortgrass pasture lands, and giant garter snakes and nesting waterfowl that are found in and around semi-permanent wetlands (California Rangeland Conservation Coalition 2013).

The Upper Butte Basin Wildlife Area, which is currently managed by CDFW and includes the Llano Seco Unit, is one area that would be adversely affected by reduced water supply deliveries under the No Action Alternative. The Upper Butte Basin Wildlife Area was created to protect and restore some of the historical wetlands in the Butte Basin, and CDFW (2013) reports that it is still considered one of the premier wetland habitat complexes in North America. Beginning in about mid-August, the wildlife management area provides important wintering habitat for many species of waterfowl in California. From late September through March, large numbers of sandhill cranes can be found throughout the areas and adjacent farmland (CDFW 2013). When waterfowl numbers begin increasing in September, peregrine falcons, which prey on waterfowl,

soon appear in the area. Bald eagles arrive later in the winter and also prey on the many waterfowl using the area (CDFW 2013). By mid-September, the area can host more than 250,000 waterfowl, and peak counts often exceed 500,000 birds during December (Cordes 2001).

Under the No Action Alternative, the available Butte Creek water supply would not be sufficient to maintain the existing managed wetlands. Because alternative sources of water supply have not been identified for USFWS and CDFW wetland management and restoration purposes, it is expected that the USFWS and CDFW will limit delivery of Llano Seco's available supplies, as was the practice prior to relocation of the M&T/Llano Seco Pumps Facility (Jones and Stokes 1996). Because of the limited water supply conditions that occurred before the 1997 relocation, combined with the need to provide water to important wetland and wildlife areas while also protecting listed fisheries resources, Schild and Cundiff-Gee (1996) report that approximately 80 percent of the wetland areas were functioning at 60 percent efficiency. Presented a different way, the habitat needed to support the millions of migrating ducks, geese, swans and other wetland dependent species, was not functioning at its maximum potential because of an inadequate and unreliable water supply at critical times of the year (Schild and Cundiff-Gee 1996).

In summary, a reduction of pumping under the No Action Alternative would jeopardize the water supply provided to these areas, and would consequently result in reduced habitat availability and suitability for the wildlife species that currently benefit from using these areas.

PROPOSED ACTION/PROJECT RELATIVE TO EXISTING CONDITIONS (CEQA ANALYSIS)

The Proposed Action/Project includes dredging in the vicinity of the M&T/Llano Seco Pumps Facility intake and disposal of dredged spoils, and continued maintenance and monitoring of the rock-toe and tree revetment. The impact mechanisms associated with each of these activities and potential effects on terrestrial special-status species and their habitats are discussed below.

Activities and Impact Mechanisms

Dredging and Spoils Disposal

Activities associated with dredging and spoils disposal have the potential to affect terrestrial special-status species and their habitat nearby and downstream of the activity areas.

Due to the location of sediment deposition in the Sacramento River, the "dryland" bar dredging method previously used for the 2001 and 2007 gravel excavation operations is not a viable option for the current proposed dredging activities. Therefore, the Proposed Action/Project consists of a modified approach that would utilize a cutterhead suction dredge with a rotating cutter apparatus surrounding the intake end of the suction pipe. The removal, transport, and placement of dredged sediments are the primary components of the dredging process (BCDC 1998).

Two areas will be utilized for material staging and assembly of the dredge pipeline system on the east bank of the river, including a gravel parking lot at the M&T/Llano Seco Pumps Facility and an area within the vicinity of the existing spoils location. Both sites are currently disturbed.

A suction dredge pipeline will extend from the rear of the dredge barge and will float in the river such that is will be visible above the waterline from the barge to the shore on the east bank of the Sacramento River. A flexible flanged pipeline would reach from the cutterhead, along the length of the barge, to the east bank of the Sacramento River. Additional piping would be added to this portion of the pipeline system as the barge advances so that the sections of pipeline onshore remain stationary and are not be pulled along with the movement of the dredge barge. Polyethylene pipe would be connected to the floating pipe for placement on the riverbank and would extend from the riverbank to the spoils disposal/containment area (see Figure 2-1). Placement of the polyethylene pipe onshore would contain a minimum number of bends to ensure adequate flow of materials, and would be placed to avoid sensitive environmental resources (e.g., riparian habitat and elderberry shrubs) identified during the 2012 terrestrial resource surveys.

The dredged material would be pumped to Containment Area #1, and then disposed of at the existing stockpile located upstream from the dredge site, approximately 1,500 feet to the east on the M&T Chico Ranch property (see Figure 2-1). Containment Area #2 will be available for overflow. Dredged material from the Sacramento River would be dispersed evenly over the storage area. After the spoils have been pumped into Containment Area #1, a bulldozer would push the materials into a trap belt loader that would transport the material by conveyor belt to the top of the existing stockpile. The bulldozer also would be used to spread the gravel material at the top of the stockpile.

Activities associated with spoils disposal would occur in previously disturbed areas (e.g., on the existing gravel stockpile), the flexible flanged pipeline would be routed to avoid sensitive biological resources (e.g., riparian vegetation, elderberry shrubs) and dredged material would be transported to the disposal site via a closed pipeline.

Based on description of the dredge, dredge vessel, and daily activities (e.g., re-fueling) associated with dredging summarized above and provided in Section 2.2.1, potential impacts to terrestrial resources associated with spoils disposal primarily include noise-related impacts. To a lesser extent, other potential terrestrial resource impacts could occur as a result of: (1) sediment removal and containment; (2) spoils disposal; and (3) equipment access, staging, and egress.

Noise

Dredging will involve equipment and activities that will create noise, thereby temporarily altering habitat suitability conditions. The following activities are described to provide context regarding sources and potential impacts of noise.

Under the Proposed Action/Project, dredging activities would produce sounds from the cutterhead and suction pipe, engine noise from the 550 hp deck-mounted motor, sediment slurry travelling through the suction and discharge pipe, hydraulic placement of the anchoring spuds, skiff boat operation (50 hp and 100 hp), operation of the trap belt loader, and the self-contained generator in the light plant used to illuminate the dredge barge and the suction dredge line at night for navigational safety purposes. Activities on land that could generate noise include equipment staging and operation of the bulldozer during spoils deposition and movement.

Noise emanating from dredge operations, as well as staging and spoils disposal could cause a temporary disruption of feeding, nesting, and mating behavior. However, when foraging, it is likely that that individuals disturbed by construction-related noise would forage in other areas while dredging operations are taking place. Nesting and mating behavior could be affected, especially during the onset of the nesting season because recently constructed nests are more likely to be abandoned than nests with young near fledging. The June 14 through October 28 construction period would avoid the early season and generally would avoid much of the peak nesting season for avian special-status species in the Action/Project Area. However, because nesting sites can be disturbed up to 0.5 miles away, a pre-construction survey would be conducted immediately before project activities commence (see ***Environmental Commitment TR-4*** described in Chapter 2, Section 2.2.3 – Environmental Commitments and Mitigation Measures). If nesting raptors are observed, CDFW will be contacted to determine the potential significance of any anticipated impact, and whether impact avoidance measures are necessary. Raptor nesting surveys need to be conducted within 30 days prior to the start of construction, and again if construction stops and is reinitiated during the nesting season. They also need to be conducted annually prior to the initiation of construction, if project construction extends into another year. Depending on the timing of when revetment maintenance and a second dredge cycle may become necessary, and following consultation with CDFW and USFWS, an additional nesting raptors survey may need to be conducted if these activities occur two or more years in the future.

Sedimentation and Turbidity

As described in Section 3.3, suction dredging could result in short-term turbidity increases in the vicinity of the cutterhead, which could have direct physiological effects on aquatic prey species (i.e., fish). However, most dredging projects are not expected to produce total suspended solids concentrations in the range documented to cause significant adverse effects to sensitive aquatic biological organisms (Anchor 2003, as cited in USACE 2011). The in-water construction work window of July 1 – October 15, in combination with BMPs and other protective measures (see Chapter 2), also are anticipated to minimize the potential to adversely affect fisheries and aquatic resources in the Sacramento River. Therefore, the potential for reductions in available aquatic prey species for piscivorous birds is relatively low.

Hazardous Materials and Chemical Spills

Construction activities associated with dredging have the potential to adversely affect terrestrial species and their habitats through the inadvertent discharge of toxic substances. Toxic substances generally used at construction sites include gasoline, lubricants, and other petroleum-based products, all of which could potentially impact wildlife habitat as a result of spills or leaks from machinery. These substances can impact wildlife directly through exposure to lethal concentrations or remove habitat by exposing individual plants, including emergent aquatic vegetation that provides high habitat value, to lethal concentrations of chemicals. Additionally, exposure to sub-lethal concentrations could potentially disrupt growth, reduce reproductive success, or disorient individuals, which could reduce feeding success or predator avoidance.

As described in Section 2.2.3, a HMCSPRP (see ***Environmental Commitment WQ-1***) would be implemented as part of the Proposed Action/Project to minimize the potential for spills and avoid potentially significant impacts and the potential for adverse environmental impacts that could occur as a result of a hazardous material spill or leak (see ***Environmental Commitment HAZ-1***). Further, it is anticipated that the HMCSPRP would require: (1) cleaning up all spills immediately according to the spill prevention and countermeasure plan, and notifying CDFW and the Central Valley RWQCB immediately of spills and cleanup procedures; and (2) providing staging and storage areas for equipment, materials, fuels, lubricants, solvents, and other possible contaminants away from sensitive habitats (e.g., riparian habitat).

Physical Habitat Modification

Lighting generated on-site to illuminate the dredge barge and in-river portion of the suction dredge line as a navigational safety measure during non-daylight hours may be a temporarily, localized disruption to wildlife activities, particularly for nocturnal species and for animals using the adjacent riparian habitat as a movement corridor. In-river dredging and removal of deposited sediment is not anticipated to appreciably alter habitat characteristics for terrestrial species potentially utilizing the Action/Project Area. In addition, dredging-related activities, including the use of construction access, staging, storage and disposal areas, will not include removal of aquatic or riparian vegetation or permanent modification of physical habitat conditions (e.g., bank slope, substrate, etc.) in the Action/Project Area. Although the potential exists for elderberry shrubs, particulary those on the east bank of the Sacramento River and proximate to the containment areas, to be directly and indirectly affected by construction-related activities, protective measures would be implemented to minimize these impacts (see ***Environmental Commitment TR-1***). The possibility exists for long-term habitat modification of the Sacramento River region by the removal of gravel and sediment from the river, therefore depriving the river system of material to create new shoreline or gravel bars from the naturally meandering river. However, the amount of material removed from the Sacramento River under the Proposed Action/Project is small, relative to the amount of gravel remaining in this reach of the river for mobilization. Therefore, the potential for permanent alteration to physical wildlife habitat in the Action/Project Area would be minimal.

Bank Revetment Monitoring and Maintenance

As described in Chapter 2, the Proposed Action/Project would extend monitoring and maintenance of the rock-toe and tree revetment until a long-term solution is developed and completed. Monitoring conducted during April 2010 and November 2011 indicated that the revetment is performing as designed, and maintenance activities associated with the revetment are not anticipated to occur frequently. Maintenance could include making repairs to stabilize the area, repairing areas of localized scour and erosion, dispersing large build-ups of debris to eliminate eddy currents, and/or re-anchoring or replacing woody material and brush structures if they become rotted, disintegrated, or washed out due to high flow events. If the toe zone requires maintenance, then rock would be imported to the site by truck, dumped on a working area along the top of the bank, and placed in the water at the base of the bank with a dragline. Although maintenance would be conducted from shore, in-river maintenance activities would be restricted to the construction window extending from July 1 through October 15. Trees and brush would be placed in the revetment area and would be cabled to the boulder anchors and each other using appropriate machinery, if needed.

Construction-related activities associated with revetment maintenance include physical habitat disturbance, potential for physical injury, hazardous materials and chemical spills, short-term changes in habitat conditions, and the disruption of habitat utilization by special-status species. Replacement of the rock or brush, as needed, on the revetment would incorporate project commitments, including impact avoidance/minimization measures, consistent with those described for the 2007 Temporary Maintenance Project (CDFG and USFWS 2007). As previously described, these Environmental Commitments include BMPs (e.g., a SWPPP, complying with the RWQCB Section 401 Permit conditions), a HMCSPRP to minimize the potential for chemical spills, and standard construction practices to avoid direct physical harm and repair disturbed areas (see Chapter 2).

Impact Determinations

The Proposed Action/Project is intended to maintain water diversions (e.g., for agricultural and conservation purposes) while protecting fish and wildlife beneficial uses of the Sacramento River; therefore, the Proposed Action/Project would not conflict with the BRCP's overall Planning Goals and Conservation objectives and/or with the preliminary conservation objectives for the plan, if approved.

The foregoing section described the possible mechanisms of potential impact associated with specific construction-related activities. For each terrestrial species of focused evaluation, this section includes evaluations and significance determinations of the potential impacts that would be anticipated to result from the above-described activities associated with the Proposed Action/Project, relative to Existing Conditions.

TR-1. *Potential for the Proposed Action/Project to impact sensitive habitat.*

Valley Riverine Aquatic Habitat

The Proposed Action/Project would remove up to approximately 100,000 cubic yards of material from the dredging area per each of the two dredge cycles. Although the gravel bar dredged during the fall of 2007 included areas of seasonally exposed channel bed, which can provide nesting, foraging, and basking habitat for multiple species, the current area where sediment has deposited in the Sacramento River is entirely submerged beneath four to five feet of water at all times.

Figure 2-1 illustrates the area of Valley Riverine Aquatic habitat that has been identified within the Action/Project Area. Valley Riverine Aquatic habitat is potentially used by yellow-billed cuckoos, bald eagles, ospreys, and Swainson's hawks for foraging. However, because the dredge field is always submerged, these species do not directly utilize the elements of the habitat proposed for removal (i.e., gravel substrate). Therefore, potential impacts on foraging could result from temporary decreased habitat utilization by forage fish species (discussed in the Fisheries and Aquatic Resources Impact Assessment, above). Additionally, slough and backwater habitat near the mouth of Big Chico Creek could potentially provide habitat for western pond turtle. However, neither the dredge field nor the Action/Project Area extends into Big Chico Creek and, thus, no potential basking habitat would be disturbed.

Therefore, based on limited utilization of Valley Riverine Aquatic habitat by wildlife, as well as removal of only submerged aquatic habitat elements, potential impacts on Valley Riverine Aquatic habitat would be less than significant because the Proposed Action/Project would not have a significant impact on Federal wetlands, riparian habitat or other sensitive natural communities in the Action/Project Area.

Valley-Foothill Riparian Habitat

No Valley-Foothill Riparian habitat is anticipated to be purposely removed with implementation of the Proposed Action/Project. To the extent practicable, riparian vegetation will be avoided during dredging and spoils disposal activities. Most construction site access, staging, spoils disposal and egress activities would occur on ruderal/disturbed habitat areas, although the suction dredge pipeline route would require temporary surface placement through a limited area of sandbar willow thicket habitat and valley oak woodland. Revetment maintenance would occur in the CNPS California sycamore woodlands habitat alliance. To the extent practicable, the suction dredge pipe will be placed in such a manner that minimizes disturbance to established riparian vegetation. If removal of riparian vegetation is unavoidable, discussions will be held between CDFW and the dredge/construction contractor. If impacts to established vegetation (2 to 3+ years) are unavoidable, restoration will involve removing and setting aside impacted plants and surrounding soil for replanting at the site(s) of their removal upon completion of the dredging operation (see ***Environmental Commitments TR-3 and TR-5***).

Because Valley-Foothill Riparian habitat would be avoided, and impact avoidance measures would be identified in coordination with CDFW prior to removal of any riparian habitat, potential impacts on Valley-Foothill Riparian habitat are considered less than significant because the Proposed Action/Project would not have a significant impact on Federally protected wetlands or riparian habitat.

Grassland Habitat

The Proposed Action/Project could potentially remove Grassland habitat where it occurs adjacent to and within the proposed staging and storage area, and within the rock-toe and tree revetment work area. To the extent possible, Grassland habitat would be avoided. However, recognizing that the temporary loss of grassland to provide access/staging for heavy machinery for bank revetment could temporarily reduce habitat value within the site, impact avoidance and minimization measures (see ***Environmental Commitments TR-3 and TR-5***) are incorporated into the Proposed Action/Project. As described in ***Environmental Commitment TR-3***, site-specific Grassland habitat revegetation methods, maintenance and monitoring will be identified and developed in coordination with CDFW and USFWS prior to removal or disturbance of Grassland habitat. Therefore, potential impacts on Grassland habitat are considered less than significant because the Proposed Action/Project would not have a significant impact on this sensitive natural community (i.e., Grassland habitat).

Disturbed/Ruderal Habitat

Distrubed/Ruderal habitat areas within the Action/Project Area exist on the access road, containment areas and on the spoils site located on the M&T Chico Ranch property, and the southernmost extent of the rock-toe and tree revetment (Figure 2-1; Figure 3.4-1). Construction vehicles and personnel would utilize these areas to gain access to the site, as potential preparation and mobilization/demobilization areas, and as the spoils storage site. There would be no change to the quality of habitat along the access roads. The spoils stockpile would increase in height, but would not reduce the already low habitat value of the area. Therefore, no additional measures to prevent further degradation of the spoils area or access roads are incorporated into the Proposed Action/Project. Potential impacts on Disturbed/Ruderal habitat are considered less than significant.

TR-2. *Potential for the Proposed Action/Project to impact Valley Elderberry Longhorn Beetle.*

Project activities with the greatest potential to affect elderberry shrubs would be associated with: (1) the placement and removal of the suction dredge line that would run from the dredge barge to Containment Area #1; and (2) the placement and removal of two dewatering pipelines that would run from Containment Area #2 to the stilling well at the M&T/Llano Seco pumping plant (see Figure 5-2 in Chapter 5). Other activities related to spoils disposal would occur on the existing access road leading from the M&T/Llano Seco pumping plant to the existing stockpile, at existing staging areas and at the existing spoils stockpile.

A detailed evaluation of potential site-specific impacts to VELB and its host plant (i.e., elderberry shrubs) within the Action/Project Area is provided in Section 5.7.2.1 of Chapter 5.

As a summary, there are numerous elderberry shrubs within the Action/Project Area that are located within close proximity (1 to 75 feet) to access roads, and the shrubs potentially could be adversely affected by dust associated with construction traffic and inadvertent contact with construction equipment. Seventy-five elderberry shrubs could potentially be affected by spoils deposition-related activities. It would not be possible for the pipeline routes to entirely avoid a 100-foot buffer area, and a total of 38 elderberry shrubs are present within 100 feet of the anticipated location of the suction dredge line and the dewatering pipeline. Six elderberry shrubs are present within 20 feet of the suction dredge line. The extent to which the three shrubs in the vicinity of the rock-toe and tree revetment could be affected is dependent upon the location and degree of maintenance that would be required (see Figure 5-1b). Indirect effects to VELB could result from increased fugitive dust due to movement of vehicles and heavy equipment at the project site and on the access road to the existing spoils stockpile.

Although the potential exists for elderberry shrubs to be directly and indirectly affected by construction-related activities, the protective measures identified in the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999) would be implemented as part of the Proposed Action/Project to minimize or avoid potential adverse effects to VELB and its host plant. Exclusionary fencing (***Environmental Commitment TR-1***), dust control measures (***Environmental Commitment AQ-2***) and environmental awareness training (***Environmental Commitment TR-2***) for contractor personnel will be implemented to minimize and avoid potential impacts to VELB and its habitat, unless this species becomes de-listed prior to project implementation.

Overall, construction-related activities associated with dredging, spoils deposition, and site access could result in potential direct and indirect impacts to elderberry shrubs. However, implementation of the ***Environmental Commitments TR-1*** and ***TR-2*** and ***Environmental Commitment AQ-2*** described in Section 2.2.3 would minimize or avoid potential adverse effects to VELB and its habitat. The Proposed Action/Project would not have a substantial adverse effect on VELB through habitat modification, nor would it involve the intentional removal of riparian vegetation or elderberry shrubs that could substantially interfere with the movement of VELB through the area. Therefore, construction-related impacts to VELB and its habitat due to implementation of the Proposed Action/Project would be less than significant.

TR-3. *Potential for the Proposed Action/Project to impact Bank Swallow.*

Bank swallows utilize communal nesting sites during their nesting season (April to August), and are restricted to cliff sites with a nearly vertical profile along actively meandering rivers within the Sacramento Valley.

The west bank of the Sacramento River within the Action/Project Area is considered suitable habitat for bank swallow and potential impacts associated with dredging activities include

nesting activity disruption due to noise and other constructionrelated activities. Although the upper area of the west bank between the top of the revetment and the top of the bank may provide suitable habitat and potentially allow for bank swallow recolonization, bank swallows have not been recorded nesting in the revetment area adjacent to the proposed dredging area since shortly after the habitat modifications in 2007 were completed. No bank swallow habitat exists on the east bank of the Sacramento River within the Action/Project Area.

Bank swallow habitat previously (pre-2007) existed on the west bank of the Sacramento River in the Action/Project Area. A bank swallow colony of approximately 110 nesting pairs were reported using the eroding bank at the existing rock-toe and tree revetment location during 2005, and 220 pairs were reported in 2007 prior to installation of the existing revetment (K. Foerster, USFWS, 2007, pers. comm.). Nesting individuals were not observed during 2006 surveys conducted by biologists from Gallaway Consulting, Inc. (CDFG and USFWS 2007). However, impacts to potential bank swallow habitat will be minimized during construction activities through the implementation of construction BMPs and avoidance, to the extent feasible, of potential bank swallow habitat areas (see ***Environmental Commitment TR-6***).

Because bank swallows have not used the site on the west bank of the Sacramento River (where the rock-toe and tree revetment was installed in 2007) for four years, this habitat is presently unoccupied and considered unsuitable for bank swallow nesting under Existing Conditions. Within the Action/Project Area, no bank swallow habitat exists on the east bank of the Sacramento River where dredging operations would occur. Thus, it is also unlikely that noise-related disturbance associated with dredging operations or revetment maintenance would affect bank swallow nesting behavior because there are presently no communal nesting sites in the Action/Project Area. Relative to Existing Conditions, dredging operations and revetment maintenance under the Proposed Action/Project would not have a substantial adverse effect on bank swallows or their habitat, nor would these activities result in substantial inference to the movement of the species through the Action/Project Area. Overall, the Proposed Action/Project, relative to Existing Conditions, would have a less than significant impact on bank swallows.

TR-4. *Potential for the Proposed Action/Project to impact Osprey.*

Potential project-related impacts on ospreys could occur as a result of nesting and foraging habitat alteration or disruptions in habitat use (e.g., nest abandonment) resulting from construction-related noise and activity. Specifically, nest abandonment or early fledging could result if construction occurs near active nests. Suitable nesting and foraging habitat occurs within, and immediately adjacent to the Action/Project Area. Recently (intermittently, during the past several years), ospreys have been observed nesting and foraging within and adjacent to the Action/Project Area. Additionally, one known active nest was observed just outside of the Action/Project Area during 2012.

No riparian osprey nesting habitat removal is anticipated to occur under the Proposed Action/Project. The temporary alteration of foraging habitat resulting from dredging is unlikely

to have a long-term effect on ospreys because the aquatic habitat perturbation would be temporary. As a precautionary measure incorporated into the project, a pre-construction survey would be conducted immediately before project activities commence. Environmental awareness training (see ***Environmental Commitment TR-2***) also will include the address of this species. If nesting raptors are observed (see ***Environmental Commitment TR-4)***, CDFW and USFWS will be contacted to determine the potential significance of any anticipated impact, and whether impact avoidance measures are necessary. Raptor nesting surveys need to be conducted within 15 days prior to the start of construction, and again if construction stops for 15 days or longer and is reinitiated during the nesting season. They also need to be conducted annually prior to the initiation of construction, if project construction extends into another year.

Depending on the timing of when revetment maintenance and a second dredge cycle may become necessary, and following consultation with CDFW and USFWS, an additional nesting raptors survey may need to be conducted if these activities occur two or more years in the future. No long-term habitat alteration is anticipated because riparian habitat and potential nest trees are not anticipated to be removed as part of the dredging operations or revetment maintenance.

Overall, the Proposed Action/Project would not have a substantial adverse effect on osprey or its habitat, nor would dredging operations and revetment maintenance substantially interfere with the movement of this species through the Action/Project Area. Therefore, potential impacts to osprey resulting from implementation of the Proposed Action/Project would be less than significant.

TR-5. *Potential for the Proposed Action/Project to impact Western Yellow-Billed Cuckoo.*

Suitable habitat for western yellow-billed cuckoo exists in the vicinity of the Action/Project Area, although there are no known occurrences of the species in the Action/Project Area. During 2010, two individuals were reported north of the Action/Project Area at the Pine Creek Unit and south of the project on the Phelan Island Unit. Although presence is assumed in Butte and Glenn counties, there were no observations in 2012 during an extensive survey of the Sacramento River (Dettling and Howell 2011).

Western yellow-billed cuckoos reportedly only are in California during mid-summer. Spring migration into California begins during late May and lasts until late June (California Partners in Flight Website 2007), and the breeding season generally begins with pair formation during mid-June and lasts until mid-August. Fall migration begins during late August and lasts until mid-September (Ehrlich et al. 1988). Therefore, western yellow-billed cuckoos are restricted to the mid-summer period for breeding, presumably due to a seasonal peak in large insect abundance (USFWS Website 2006a).

The western yellow-billed cuckoo typically utilizes large areas of riparian vegetation (greater than 25 acres and a minimum width of 300 feet) for foraging and nesting activities. Prior to construction of the rock-toe and tree revetment, riparian vegetation was sparse on the west bank of the Sacramento River in the Action/Project Area. The exception was the riparian vegetation

associated with the estimated 250 linear feet of riparian habitat bordering the Sacramento River in the downstream portion of the Action/Project Area. The riparian habitat on the west bank of the Sacramento River is approximately 250 feet wide, and totaled less than 25 acres. Therefore, the riparian habitat on the west bank of the Sacramento River is not considered suitable for western yellow-billed cuckoo nesting activities (CDFG and USFWS 2007a). Although suitable habitat exists on the Capay Unit, western yellow-billed cuckoos have not been detected and, thus, are not likely to be present at the revetment site location; therefore, maintenance in this area would not be expected to have an adverse effect on the western yellow-billed cuckoo nesting.

Potential noise-related impacts on western yellow-billed cuckoos from dredging, spoils disposal, revetment maintenance and construction vehicle access could include short-term disruption of foraging habitat use in the Action/Project Area, as well as nest abandonment or early fledging in suitable habitat areas adjacent to the Action/Project Area (e.g., riparian habitat along Big Chico Creek). However, because nesting cuckoos are not likely to be present during dredging operations, it is unlikely that construction activities would impact nesting individuals. Long-term habitat alteration is not anticipated because dense riparian habitat is not expected to be removed as a result of implementation of the Proposed Action/Project. As a precautionary measure, the environmental awareness training (see ***Environmental Commitment TR-2***) to be conducted prior to construction will include the address of this species. Depending on the timing of when revetment maintenance and a second dredge cycle may become necessary, USFWS will be contacted to request updated species presence/absence information from the annual yellow-billed cuckoo survey effort along the Sacramento and Feather rivers, particularly if maintenance and dredging activities occur two or more years in the future. If nests or western yellow-billed cuckoos are observed by the monitoring biologist or the construction contractor over the course of activities, then CDFW and USFWS will be contacted to determine the potential significance of any anticipated impact, and whether impact avoidance measures are necessary.

Overall, the Proposed Action/Project would not have a substantial adverse effect on western yellow-billed cuckoos or their habitat, nor would dredging operations and revetment maintenance substantially interfere with the movement of this species through the Action/Project Area. Therefore, potential impacts on western yellow-billed cuckoo resulting from implementation of the Proposed Action/Project would be less than significant.

TR-6. *Potential for the Proposed Action/Project to impact Swainson's Hawk.*

Suitable nesting and foraging habitat occurs within, and immediately adjacent to the Action/Project Area in the form of mature riparian trees and agricultural lands, respectively. CNDDB results for the 2007 Temporary Maintenance Project (CDFG and USFWS 2007) reported 14 known occurrences of Swainson's hawk nesting sites within 10 miles of the Action/Project Area; however, none had been active in the previous 5 years. The updated 2012 CNDDB report for the Ord Ferry 7.5-minute and 8 surrounding topographical quadrangles includes an entry dated May 2009 of an observation of a female on her nest along Rock Creek about a mile north of Nord, which falls just within 10 miles (approximately 9.8 miles) of the

Action/Project Area. No nests were identified within 500 feet of the Action/Project Area during the 2012 nesting raptor survey (Appendix F). Two Swainson's hawk were observed in flight over the Capay Unit during the 2012 survey, but no nests were observed (Appendix F).

Potential project-related impacts to Swainson's hawks could occur as a result of construction-related noise and activity. Specifically, construction vehicle access, dredging, spoils disposal, and revetment maintenance could result in noise-related disturbance to foraging habitat use in the Action/Project Area, as well as nest abandonment or early fledging in suitable habitat areas adjacent to the Action/Project Area (e.g., riparian habitat along Big Chico Creek).

Because the Swainson's hawk nesting season reportedly occurs from March through August and construction activities would generally occur from July through mid-October, noise or other construction-related effects on Swainson's hawk should be minimal because no nests are present in the Action/Project Area and the anticipated construction schedule would avoid most months of the breeding season. Additionally, the temporary loss of foraging habitat also is unlikely to affect nesting Swainson's hawks that may be present in adjacent areas. However, because the potential exists for this species to take up year-round residency, a temporary loss of foraging habitat could potentially occur. Long-term habitat alteration is not anticipated to occur as a result of implementation of the Proposed Action/Project because no large trees or riparian vegetation is expected to be deliberately removed.

Measures to avoid or minimize potential noise-related impacts to Swainson's hawks also would be implemented. Specifically, a nesting raptor pre-construction survey would be conducted, as discussed above for osprey. The environmental awareness training (see ***Environmental Commitment TR-2***) also will include the address of this species. If nesting Swainson's hawks are observed during the nesting raptor survey, or by the monitoring biologist over the course of the project activities, CDFW will be contacted to determine the potential significance of any anticipated impact, and whether impact avoidance measures are necessary. Nesting raptor surveys need to be conducted within 15 days prior to the start of construction, and again if a lapse in project-related construction work of 15 days or longer occurs during the nesting season (see ***Environmental Commitment TR-4***). They also need to be conducted annually prior to the initiation of construction, if project construction extends into another year. Depending on the timing of revetment maintenance and a second dredge cycle, CDFW and USFWS would be contacted to determine whether an additional survey would be required if project-related activities occur two or more years in the future.

Overall, dredging operations and revetment maintenance would not substantially interfere with the movement of Swainson's hawk through the Action/Project Area, and the Proposed Action/Project would not have a substantial adverse effect on Swainson's hawk or its habitat in the Action/Project Area. Therefore, potential impacts to Swainson's hawk resulting from implementation of the Proposed Action/Project would be less than significant.

TR-7. *Potential for the Proposed Action/Project to impact White-Tailed Kite.*

The Proposed Action/Project has the potential to impact white-tailed kites as a result of nesting and foraging habitat alteration, or disruptions in habitat use (e.g., nest abandonment, early fledging) resulting from construction-related noise and activity within suitable habitat.

Potential noise-related impacts on white-tailed kites from dredging, spoils disposal, revetment maintenance and construction vehicle access could include short-term disruption of foraging habitat use in the Action/Project Area, as well as nest abandonment or early fledging in suitable habitat areas adjacent to the Action/Project Area (e.g., riparian habitat along Big Chico Creek). The temporary disruption of nesting and foraging habitat use associated with dredging activities and revetment maintenance is unlikely to substantively impact white-tailed kites because no known nest sites exist in the Action/Project Area. However, construction-related noise and activity could potentially cause nest abandonment if kites were nesting in close proximity to construction activities prior to or during the nesting period. The temporary alteration of foraging habitat resulting from dredging noise would be localized, and is unlikely to have a long-term effect on white-tailed kite because the aquatic habitat perturbation would be temporary. No long-term habitat alteration is anticipated because riparian habitat and potential nest trees are not anticipated to be removed as part of the dredging operations or revetment maintenance.

Environmental awareness training (see ***Environmental Commitment TR-2***) will include the address of white-tailed kite. If nests or individual white-tailed kites are observed by the monitoring biologist or the construction contractor over the course of activities, then CDFW and USFWS will be contacted. As another precautionary measure, a pre-construction survey would be conducted immediately before project activities commence (see ***Environmental Commitment TR-4***). Any nesting activities would be reported to USFWS and CDFW to determine the potential significance of any anticipated impact, and whether impact avoidance measures are necessary. Nesting raptor surveys need to be conducted within 15 days prior to the start of construction, and again if a lapse in project-related construction work of 15 days or longer occursduring the nesting season. They also need to be conducted annually prior to the initiation of construction, if project construction extends into another year. Depending on the timing of revetment maintenance and a second dredge cycle, CDFW and USFWS would be contacted to determine whether an additional survey would be required if project-related activities occur two or more years in the future.

Overall, the Proposed Action/Project would not have a substantial adverse effect on white-tailed kite or its habitat, nor would dredging operations and revetment maintenance substantially interfere with the movement of this species through the Action/Project Area. Therefore, potential impacts to white-tailed kite resulting from implementation of the Proposed Action/Project would be less than significant.

TR-8. *Potential for the Proposed Action/Project to impact Bald Eagle.*

Bald eagles have the potential to be present in or around the action area during the late fall and winter months when northern populations enter the Sacramento River basin to reside for the winter (CDFG Website 2007c). Because the bald eagle breeding season extends from February through July in California, with northward migration occurring prior to September (USFWS 2004a), noise or other construction-related effects on bald eagles should be minimal because the anticipated construction schedule would avoid most months of the breeding season.

Although the potential exists for construction-related noise to cause roosting and perching site abandonment later in the season (i.e., July), the riparian habitat in the Action/Project Area is not considered high quality nesting and wintering habitat based on reported bald eagle habitat requirements and general habitat utilization (USFWS 2004a). In fact, it is likely that the riparian habitat within the Action/Project Area contains only low quality bald eagle nesting habitat. Therefore, it is likely that potential noise-related impacts associated with dredging or revetment maintenance activities would be minimal. As a precautionary measure, a nesting raptor pre-construction survey would be conducted (see ***Environmental Commitment TR-4***). Nesting activities would be reported to USFWS and CDFW to determine the potential significance of any anticipated impact,, and whether impact avoidance measures are necessary. Nesting raptor surveys need to be conducted within 15 days prior to the start of construction, and again if construction stops for 15 days or more and is reinitiated during the nesting season. They also need to be conducted annually prior to the initiation of construction, if project construction extends into another year. Depending on the timing of revetment maintenance and a second dredge cycle, CDFW and USFWS would be contacted to determine whether an additional nesting raptors survey would be required if project-related activities occur two or more years in the future.

Overall, the Proposed Action/Project would not have a substantial adverse effect on bald eagle or its habitat, nor would dredging operations and revetment maintenance substantially interfere with the movement of this species through the Action/Project Area. Therefore, potential impacts to bald eagles resulting from implementation of the Proposed Action/Project would be less than significant.

TR-9. *Potential for the Proposed Action/Project to impact Western Pond Turtle.*

In-stream and streamside gravel removal activities conceivably could impact WPT via direct mortality and habitat modification. Direct mortality could potentially occur by crushing active or estivating individuals. However, construction would occur during the summer months, which typically is before the onset of overwintering estivation and, thus, it is unlikely that estivation burrows would be affected. Additionally, the project site in the vicinity of the M&T/Llano Seco pumping plant was previously determined to have a low potential to support western pond turtles (CDFG et al. 1996). As a conservative measure however, an environmental awareness training (***Environmental Commitment TR-2***) and a pre-construction survey for WPT would be

conducted at the onset of construction (see ***Environmental Commitment TR-4***), as described in Section 2.2.3. Therefore, it is unlikely that direct WPT mortality associated with the Proposed Action/Project would occur.

Indirect impacts on WPT associated with dredging activities also could occur as a result of habitat alteration. Specifically, removing basking sites (e.g., logs, snags, and rocks) could potentially impact WPT because loss of basking sites could alter thermoregulatory behavior and reduce available foraging habitat, short-term cover sites, and longer-term refugia ("hibernation" sites). However, most of the dredged material will be removed from deeper faster moving water than is typically utilized for basking by WPT.

Toxic substances used at construction sites, including gasoline, lubricants, and other petroleum-based products, could enter the Sacramento River as a result of spills or leaks from machinery. These substances can kill aquatic organisms through exposure to lethal concentrations or exposure to non-lethal levels that cause physiological stress and increased susceptibility to other sources of mortality. However, implementation of BMPs and a HMCSPRP (see ***Environmental Commitment HAZ-1***) would avoid or minimize impacts associated with chemical spills.

Overall, construction-related activities associated with dredging, spoils deposition and containment, site access, and revetment maintenance could potentially result in impacts to western pond turtle. However, because the protective measures described above would be implemented as part of the Proposed Action/Project to avoid and/or minimize potential impacts to western pond turtle, the Proposed Action/Project would result in a less than significant impact.

PROPOSED ACTION/PROJECT RELATIVE TO THE NO ACTION ALTERNATIVE (NEPA ANALYSIS)

The previous sections examined project-related activities, impact mechanisms, and potential effects on terrestrial special-status species for the No Action Alternative and the Proposed Action/Project, both relative to Existing Conditions. This section, composed to comply with NEPA, presents those considerations under the Proposed Action/Project, relative to the No Action Alternative.

Construction-Related Impacts

Under the Proposed Action/Project relative to Existing Conditions, short-term construction-related impacts associated with dredging and revetment maintenance were found to be less-than-significant for all of the terrestrial special-status species. Neither dredging nor revetment maintenance activities would occur under the No Action Alternative. Therefore, comparison of short-term impacts associated with dredging and revetment maintenance construction-related activities under the Proposed Action/Project, relative to the No Action Alternative, is analogous to the comparison of the Proposed Action/Project relative to Existing Conditions. Consequently, it is expected that short-term construction-related substantive adverse effects would not occur for any of the terrestrial special-status species under the Proposed Action/Project, relative to the No Action Alternative.

Under the No Action Alternative, the existing rock-toe and tree revetment would be removed. Revetment removal activities would occur over a five week period and would be anticipated to utilize similar access and staging areas, equipment and materials, personnel, and project commitments (including impact avoidance and minimization measures) as were used in the construction and placement of the revetment in 2007. In consideration of the impact avoidance and minimization measures, it is expected that construction-related activities associated with rock-toe and tree revetment removal would not substantially affect terrestrial special-status species or their habitats. Thus, the simple maintenance of the rock-toe and tree revetment under the Proposed Action/Project, compared to removal of the revetment under the No Action Alternative would not be expected to result in substantial construction-related effects, either beneficial or adverse, to any of the terrestrial special-status species or their habitats.

Terrestrial Habitat Modification Impacts

To evaluate potential terrestrial habitat modification impacts associated with the Proposed Action/Project relative to the No Action Alternative, habitat changes with each scenario must first be considered. The No Action Alternative, relative to Existing Conditions, would result in physical habitat modification, both immediately at the time of revetment removal and extending into the future, which would be expected to result in potential positive effects on terrestrial special-status species and their habitats through the re-establishment of large scale ecological processes (e.g., river meander).

Terrestrial habitat modification associated with the No Action Alternative would include continued erosion of the west bank of the Sacramento River. The continued erosion of the bank would result in the continued exposure of loose sand substrates and the predominance of relatively high bank slopes. For bank swallows specifically, re-establishment of the eroding bank represents an immediate and long-term potential increase in the availability of suitable habitat on the Sacramento River.

However, removal of the rock-toe and tree revetment, as part of the No Action Alternative, would be expected to provide an overall decrease in the amount of riparian vegetation, particularly in consideration of the fact that the riparian vegetation that has become, and will continue to become, established in the bank immediately above the rock-toe matures over time. Potential adverse effects to riparian habitat and associated terrestrial species using these areas could be realized immediately at the time of revetment removal, and extending up to several years into the future. However, as previously discussed, these potential near-term impacts could be offset in the future as the migrating river bank approaches areas of more mature vegetation in the restored habitat areas on the Capay Unit, which could then serve as SRA habitat and potential sources of IWM.

The Proposed Action/Project would involve temporary habitat modification to dredged areas, but would not result in long-term effects to terrestrial resources. If maintenance-related repairs are required under the Proposed Action/Project, work would be conducted in a manner that would

return the rock-toe and tree revetment to the condition in which it was originally designed and constructed. Therefore, substantive adverse effects to terrestrial resources associated with habitat modification would not occur under the Proposed Action/Project.

Although the existing riparian habitat on, and above, the existing revetment is not mature riparian forest providing the highest quality habitat to terrestrial species, the long-term effects of riparian habitat under the No Action Alternative would be expected to result in re-establishment of large-scale ecological processes (e.g., river meander) would allow additional riparian species to become established and the long-term natural processes of riparian establishment and erosion into the river to occur, particularly with respect to the restoration activities that have occurred on the Capay Unit. Communities within 100 to 500 feet of the river that could be affected over the long-term include Valley Oak Woodland, Valley Oak Riparian Forest, Grasslands, and potentially Mixed Riparian Forest habitats. However, the development of complex riparian habitats on the Capay Unit over time is expected to provide additional linkages to riparian habitat communities along the Sacramento River, and would not be expected to adversely affect riparian movement corridors used by wildlife.

These potential effects to the species of focused evaluation, with the exception of bank swallows, could be realized immediately at the time of revetment removal, but more substantively into the future. Under the No Action Alternative, an additional consequence would be that a larger amount of SRA habitat and IWM would be recruited into the Sacramento River over time. The resultant habitat modification occurring under the No Action Alternative as a result of increasing the amount of eroding bank along the Sacramento River could be beneficial to bank swallows by providing an additional potential source of suitable habitat along the river.

The substantive adverse effects to certain terrestrial species of focused evaluation associated with habitat modification would not occur under the Proposed Action/Project. However, over the long-term, the Proposed Action/Project may not represent net beneficial effects regarding SRA habitat and IWM, due to the continued erosion and migration of the west bank and recruitment of the tree plantings associated with restoration of the Capay Unit.

Re-initiation of Diversions in Butte and Big Chico Creeks

Following revetment removal, it is probable that erosion of the west bank would continue to occur and the Sacramento River would continue to migrate to the west. Consequently, the No Action Alternative would be expected to result in continued deposition of sediment proximate to the M&T/Llano Seco Pumps Facility intake, and the continued downstream extension of deposited materials in the Sacramento River. This would result in the fish screen criteria not being met at the M&T/Llano Seco Pumps Facility intake screen, and carries the possibility of requiring cessation of diversions from the existing intake structure on the Sacramento River and re-initiation of diversion in Big Chico Creek and increased diversions from Butte Creek.

If diversions from the Sacramento River ceased and historical diversions from both Big Chico and Butte creeks were to be re-initiated or increased, respectively, substantive adverse effects to

special-status wildlife species and their habitats would be expected to occur. Under the No Action Alternative, M&T Chico Ranch would continue to take delivery of their water rights for crop irrigation purposes from historical diversions, although the available Butte Creek water supply would be sufficient to irrigate only a small portion of farmland. Additionally, the available Butte Creek water supply would not be sufficient to maintain the existing managed wetlands and associated habitats, including wetlands owned or managed by USFWS, CDFW and the Llano Seco Rancho that provide wetland habitat for waterfowl, shorebirds, and other wetland-dependent and special-status species. Because alternative sources of water supply have not been identified for USFWS and CDFW wetland management and restoration purposes, it is expected that the USFWS and CDFW will limit delivery of Llano Seco's available supplies, as was the practice prior to relocation of the M&T/Llano Seco Pumps Facility (Jones and Stokes 1996). Consequently, the No Action Alternative would jeopardize the water supply provided to these areas, and would result in reduced habitat availability and suitability for the wildlife species that currently benefit from using these areas.

Also, if historical diversions in Big Chico Creek were to be re-initiated and if diversions from Butte Creek were to be increased, substantive adverse effects to special-status wildlife species and their habitats at and downstream from the water diversion locations at Big Chico and Butte creeks could occur. Specifically, increasing diversions at the Parrott-Phelan Dam in Butte Creek and re-initiation of pumping at the Phelan-Parrott diversion pumps on Big Chico Creek would be expected to result in flow-related impacts downstream of the point of diversion to the confluence with the Sacramento River. This potentially could include reduced habitat availability and suitability for downstream riparian vegetation and wetland habitat areas potentially used by special-status species.

3.4.4 ENVIRONMENTAL COMMITMENTS

As previously discussed, special-status wildlife and their habitats in and proximately downstream of the Action/Project Area would have the potential to be affected by construction-related activities, for both the Proposed Action/Project and the No Action Alternative. However, BMPs and other protective measures are incorporated into the project description, including environmental commitments developed for fisheries and aquatic resources, and environmental commitments for water quality, the benefits of which also serve as impact avoidance and minimization measures for terrestrial resources (see Section 2.2.3 in Chapter 2).

In addition to the previously described measures developed for other resource topics, additional measures specifically developed to avoid, minimize, or mitigate potential impacts to terrestrial special-status species and their habitats have been developed and are incorporated into the Proposed Project (see Chapter 2, Section 2.2.3 – Environmental Commitmtnes and Mitigation Measures). These measures are fully detailed in the Mitigation Monitoring and Reporting Program (Appendix I), and are summarized below.

- ***Environmental Commitment TR-1:*** *Avoid and minimize potential adverse effects to Valley Elderberry Longhorn Beetle and its habitat.*
- ***Environmental Commitment TR-2:*** *Prepare and implement an environmental awareness training program for project personnel.*
- ***Environmental Commitment TR-3:*** *Maintain existing project conditions to the extent feasible.*
- ***Environmental Commitment TR-4:*** *Avoid and minimize potential adverse effects to terrestrial resources.*
- ***Environmental Commitment TR-5:*** *Avoid and minimize potential adverse effects to terrestrial resources resulting from the spread of non-native weeds.*
- ***Environmental Commitment TR-6:*** *Avoid and minimize potential adverse effects to bank swallow habitat.*

3.5 RECREATION AND NAVIGATION SAFETY

3.5.1 AFFECTED ENVIRONMENT/ENVIRONMENTAL SETTING

3.5.1.1 SACRAMENTO RIVER

The Sacramento River corridor is a recreation resource for the northern California region and hosts a wide range of recreation uses, including walking/hiking, angling, camping, hunting, horseback riding, picnicking, sports activities, boating (motorized and non-motorized), and wildlife viewing. There are many Federal, State, local, and commercial facilities along the river corridor that provide access to the river and riverbanks and support these recreational activities. Facilities along the river include boat launches, trail accesses, fishing accesses, RV parks, wildlife areas, undeveloped open space areas, parks, marinas, and trails. Facilities are primarily located from Keswick Dam south to the Bidwell-Sacramento River State Park near Chico, California. South of Chico, recreational facilities are more widely spaced and generally fewer in number (SRWP 2012a).

The Sacramento River near the project area has several recreation facilities and public access points administered by the State of California, including CDFW and the California Department of Parks and Recreation, and Butte and Glenn counties. In addition, there are also several private access sites in the area. The Sacramento River and its tributaries provide many recreational opportunities, including popular water-dependent activities such as swimming, boating, sight-seeing, and fishing. Boating activities predominantly take place in summer months, and fishing is a year-round activity. Additionally, wildlife refuges along the Sacramento River provide fishing, hunting, and wildlife viewing opportunities.

3.5.1.2 CAPAY UNIT OF THE SACRAMENTO RIVER NATIONAL WILDLIFE REFUGE

The SRNWR is located in the Sacramento Valley of North-Central California and currently meanders along 77 miles of the Sacramento River between Red Bluff and Princeton. Its many units are located along both sides of the river and serve to protect and provide a variety of riparian habitat for birds, fish and other wildlife (USFWS 2005). The SRNWR also provides a wide range of environmental education programs and promotes high quality wildlife-dependent recreational opportunities for hunting, fishing, wildlife observation and photography, and environmental education (USFWS 2005).

The Capay Unit of the SRNWR encompasses 666 acres and is located between RM 194 and 193, approximately 5 miles south of Hamilton City (USFWS 2005; USFWS 2012). The Capay Unit is designated as day use only area, and is open to the public from two hours before sunrise to 1.5 hours after sunset (USFWS 2012). Bicycles are permitted from May 15 through August 15, and hunting is allowed only in designated areas from August 15 to May 31. Camping is allowed only on gravel bars for up to seven days during a 30 day period, and is prohibited on other refuge lands (USFWS 2012).

USFWS (K. Moroney, USFWS 2012, pers comm.) reports that public use at the Capay Unit is approximately 7,500 visitors per year, with more than half of all visits occurring during October and November (**Table 3.5-1**).

Table 3.5-1. Public Use at the SRNWR Capay Unit During 2012.

Month	Number of Vehicles
October	6,792
November	2,316
December	860
January	580
February	194
March	400
April	800
May	341
June	300
July	855
August	800
September	800
Total	15,038
***Adjusted Total**	7519
* The total number of vehicles counted on the auto counter is divided by 2, which is to account for non-visitation use of the road by agricultural and road maintenance workers.	

3.5.2 REGULATORY SETTING

The following section describes applicable laws, regulations, and standards of recreation and navigation safety associated with the Proposed Project.

3.5.2.1 TITLE 33, CODE OF FEDERAL REGULATIONS, NAVIGATION AND NAVIGABLE WATERWAYS

Title 33 of the Code of Federal Regulations governs navigation and navigable waters within the United States. Part 83 contains the Navigation Rules, which are divided into two parts – Inland and International Rules. Inland Rules apply to vessels operating inside the line of demarcation, while International Rules apply outside that line. Demarcation lines are printed on most navigational charts and are listed in the Navigation Rules. The Navigation Rules contain information about Federal laws and equipment carriage requirements for commercial and recreational vessels of the United States. The U.S. Coast Guard may impose a civil penalty for failure to comply with equipment requirements, report a boating accident, comply with other Federal regulations, or comply with the Navigation Rules.

3.5.2.2 CALIFORNIA CODE OF REGULATIONS – TITLE 14 DEPARTMENT OF BOATING AND WATERWAYS, WATERWAY MARKING SYSTEM, SECTION 7000

The Department of Boating and Waterways has established boating laws. California Code of Regulations Title 14, Article 6, Waterway Marking System, Section 7000, states "*Pursuant to the authority vested in it by Section 659, Harbors and Navigation Code, the Department adopts rules and regulations for a uniform system for marking the State's waters; such rules and regulations to establish, (a) a system of regulatory markers for use on all waters of the State to meet needs not provided for by the U.S. Coast Guard system of navigational aids, and (b) a system of navigational aids for use on the waters of the State not marked by the U.S. Coast Guard and/or not determined to be United States navigable waters; provided that such rules and regulations shall not be in conflict with the markings prescribed by the U.S. Coast Guard*."

- A waterway marker is any device designed to be placed in, on or near the water to convey an official message to a boat operator on matters that may affect health, safety, or well-being.
- Special markers are not primarily intended to assist navigation, but are used to indicate a special area or feature (e.g., dredging). Aids used to mark these areas or systems will be all yellow.

3.5.2.3 CALIFORNIA PUBLIC RESOURCES CODE, SECTION 6301

Under the State of California sovereign interests, the CSLC has jurisdiction over the bed of the Sacramento River and material removed from the riverbed pursuant to California Public

Resources Code Sections 600 et seq. and Title 2, division 3, Sections 1900 et seq. of the California Code of Regulations.

Both the 2001 and 2007 dry-land excavations, which involved heavy equipment accessing the excavation site from the shore along the east bank of the Sacramento River, did not require a State Lands Lease, as provided for in Section 6327 of the Public Resources Code (see Section 1.5.2 in Chapter 1). Since the previous dry-land excavations in 2001 and 2007, the sedimentation patterns in the Sacramento River have changed and future removal of the material is no longer feasible as a dry-land excavation. Because the Proposed Project would involve in-river dredging operations, it is anticipated that a dredging lease will be required from the CSLC pursuant to Section 6301 of the Public Resources Code:

> "*The commission has exclusive jurisdiction over all ungranted tidelands and submerged lands owned by the State, and of the beds of navigable rivers, streams, lakes, bays, estuaries, inlets, and straits, including tidelands and submerged lands or any interest there, whether within or beyond the boundaries of the State as established by law, which have been or may be acquired by the State (a) by quitclaim, cession, grant, contract, or otherwise from the United State or any agency thereof, or 9b) by any other means. All jurisdiction and authority remaining in the State as to tidelands and submerged lands as to which grants have been or may be made is vested in the commission.*
>
> *The commission shall exclusively administer and control all such lands, and may lease or otherwise dispose of such lands, as provided by law, upon such terms and for such consideration, if any, as are determined by it.*
>
> *The provisions of this section do not apply to land of the classes described in Section 6403, as added by Chapter 227 of the Statues of 1947."*

3.5.2.4 CALIFORNIA CIVIL CODE, SECTION 830

The State's ownership of tidelands, submerged lands and beds of navigable waterways includes lands lying below the ordinary high water mark of tidal waterways and below the ordinary low water mark of non-tidal waterways. The area between the ordinary high and low water marks on non-tidal waterways is subject to a "public trust easement" which is also under the jurisdiction of the CSLC. In regard to public access to State sovereign lands, the CSLC has indicated that the Proposed Project lies in areas that are subject to the public navigational easement. This easement provides that members of the public have the right to navigate and exercise the incidences of navigation in a lawful manner on State waters that are capable of being physically navigated by oar or motor-propelled small craft. Such uses may include, but not be limited to, boating, rafting, sailing, rowing, fishing, and other water-related public uses.

3.5.2.5 SACRAMENTO RIVER NATIONAL WILDLIFE REFUGE COMPREHENSIVE CONSERVATION PLAN

The USFWS SRNWR CCP describes the goals, objectives and strategies for refuge management, and provides guidance to achieve these conditions. Refuge management strategies with respect to recreation and visitor services include the following.

- Provide visitors of all ages and abilities with quality wildlife dependent recreation (hunting, wildlife observation, photography, environmental education, and interpretation), and volunteer opportunities to enhance public appreciation, understanding, and enjoyment of fish, wildlife, habitats, and cultural resources.
- Adequately protect and maintain all natural and cultural resources, staff and visitors, equipment, facilities, and other property on the refuges.

3.5.3 ENVIRONMENTAL CONSEQUENCES

3.5.3.1 ASSESSMENT METHODOLOGY

Potential impacts to recreation resources were qualitatively evaluated based on the potential for Proposed Project to temporarily or permanently limit, impede, or result in the loss of recreational resources in the Action/Project Area. Impact considerations included the following.

- Recreational activities (e.g., boating, fishing, water-oriented activities) in the Sacramento River.
- Recreational activities (e.g., hunting, fishing, wildlife observation and photography, and environmental education on the Capay Unit of the SRNWR (USFWS 2012 Visitor Services Map)).

3.5.3.2 SIGNIFICANCE CRITERIA

The significance criteria used to evaluate potential impacts on recreation and navigation were based on and incorporate guidance contained in Section 1508.27 of the CEQ NEPA regulations regarding significance determinations; the mandatory findings of significance, as listed in Section 15065 of the State CEQA Guidelines (Title 14, Chapter 3 of the CCR); and criteria derived from Appendix G of the State CEQA Guidelines (for additional detail, see Section 3.3.3.2).

For the purposes of this analysis, the Proposed Project would be considered to have an adverse effect under NEPA and a significant impact under CEQA on recreation and navigation if it would contribute to any one of the following within the Action/Project Area.

- 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.

- Include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment.
- Result in a substantial loss of recreational opportunities.
- Substantially increase the risk of injury to recreationists in or adjacent to the project area.

3.5.3.3 IMPACT ANALYSIS

The evaluations below describe the types of recreation and navigation effects that could occur as a result of the Proposed Project under the following three scenarios.

- No Action Alternative Compared to Existing Conditions (NEPA Analysis)
- Proposed Action/Project Compared to Existing Conditions (CEQA Analysis)
- Proposed Action/Project Compared to the No Action Alternative (NEPA Analysis)

Following the presentation of technical information, a conclusion is made at the end of each analytical comparison regarding whether the scenario evaluated, relative to the basis of comparison, would have an adverse effect under NEPA or a significant impact under CEQA, as appropriate.

NO ACTION ALTERNATIVE RELATIVE TO EXISTING CONDITIONS (NEPA ANALYSIS)

Removal of the Temporary Rock-toe and Tree Bank Revetment

R-1. *Potential for increased recreational and navigation safety hazards associated with bank revetment removal activities resulting in reduced recreational opportunities in the Sacramento River.*

Under the No Action Alternative, the rock-toe and tree revetment would be removed from 1,520 feet of shoreline along the west bank of the Sacramento River. Revetment removal activities would involve the use of a variety of heavy equipment, as described in Chapter 2. Recreational uses such as fishing and boating within the Sacramento River would not be affected because revetment removal activities would be conducted from the shore.

Temporary, construction-related disruptions to recreational activities (e.g., fishing from shore) on the Capay Unit of the SRNWR would occur under the No Action Alternative. The Capay Unit is open to the public and provides recreational opportunities, including deer, turkey, dove, and quail hunting, as well as fishing, hiking and wildlife observation. Visitors to the Capay Unit may encounter heavy equipment traffic on County Road 23 as they travel to the refuge. During construction activities associated with revetment removal, it is anticipated that the refuge area in proximity to the areas used for access, construction equipment staging, and materials stockpiling and adjacent areas (approximately 100-foot radius) would be temporarily closed to public access. Areas outside of the construction staging areas would remain open for recreational uses.

Revetment removal under the No Action Alternative would occur during a 5-week period between July 1 and October 15.

Following revetment removal, it is anticipated that erosion of the west bank would continue to occur and the Sacramento River would continue to migrate to the west. Although a portion of the bank along the Capay Unit of the SRNWR would be subject to erosion and possibly decreased stability, resulting in a safety hazard, it is anticipated that signs would be posted at the trailhead and near the site to notify refuge users of potential hazards (e.g., steep banks, unstable areas). Signage, trail management, and brochure updates are all common practices on SRNWR Units, as walking trails may be affected by erosion occurring over time along the Sacramento River.

When construction activities are conducted in areas subject to recreational use, public safety is always a primary concern. Although revetment removal activities could result in temporary disruptions to recreational opportunities, timing of removal activities and safety precautions (e.g., signage on the refuge – see ***Environmental Commitment REC-4***) would minimize potential disturbances. Construction activities would result in the short-term loss of recreational opportunities available at the Capay Unit. However, other similar recreation facilities and opportunities are available within a reasonable distance from the Action/Project Area. Although the Proposed Action/Project would result in a short-term loss of recreational opportunities, no long-term loss of recreational opportunities is anticipated. Impacts are considered to be less than significant, and no mitigation is required. Therefore, revetment removal activities under the No Action Alternative would not be expected to substantially affect or restrict recreation-related opportunities within the Action/Project Area.

PROPOSED ACTION/PROJECT RELATIVE TO EXISTING CONDITIONS (CEQA ANALYSIS)

In-river Dredging and Spoils Disposal

R-2*. Potential for increased recreational and navigation safety hazards associated with dredging operations resulting in reduced recreational opportunities in and along the Sacramento River.*

Under the Proposed Action/Project, dredging operations would affect the area immediately upstream, adjacent to, and downstream of the M&T/Llano Seco Pumps Facility. The entire dredging component (i.e., equipment mobilization and site set up, dredging, spoils disposal and demobilization) would be implemented during a 137-day period extending from June 14 through October 28. The in-river work period is identified as July 1 through October 15. Because of its ability to work in confined areas and near navigation, a swinging ladder cutterhead suction dredge barge would be utilized. Based upon production capacity limitations of the dredge and the amount of material to be removed, it is anticipated that 107 days of dredging, which would occur 10 hours per day, 7 days per week. Equipment maintenance and non-dredging work would be performed about two hours each day, such that crews could be working up to 12 hours per day. Although the suction dredge barge and the floating dredge pipeline would partially obstruct

recreational opportunities (i.e., navigational access along the east side of the Sacramento River immediately upstream of the M&T/Llano Seco Pumps Facility, this would be a relatively short-term effect occurring during the duration of in-river dredging operations (July 1 through October 15). Despite the presence of the dredge barge in the Sacramento River, adequate passage for other motorized and non-motorized boats would be available on the west side of the Sacramento River.

While in the Sacramento River (during both the 10-hour dredge operation period and the 14-hour non-working period), the suction dredge barge and the floating dredge pipeline represent an obstacle to watercraft navigation. To address this potential impact, several precautionary measures have been incorporated into the Proposed Action/Project and include public noticing (see ***Environmental Commitments REC-1, REC-2*** and ***REC-4***), placement of warning buoys, installation of lighting on the dredge barge and in-river section of the pipeline (see ***Environmental Commitment REC-3***), among others. These measures would be in place prior to and during the dredging operations that would occur in the Sacramento River.

Noticing

Notices alerting recreationalists to the dredge activities would be posted at local boat launch facilities. Beginning two weeks prior to the proposed dredging and throughout the duration of the in-river activity (i.e., June 15 through October 15), notices will be posted at boat launch facilities along the Sacramento River within Glenn and Butte counties. Facilities with motor boat access (e.g., boat launches) where notices will be posted are provided in **Table 3.5-2**.

Table 3.5-2. Public Motor Boat Access Points in Glenn and Butte Counties.

Facility	Location	County
Irvine Finch River Access	RM 200	Glenn
Gianella Landing	RM 199	Glenn
Pine Creek Day Use Area (Landing)	RM 196.5	Butte
Scotty's Boat Landing	RM 196	Butte
Bidwell-Sacramento River State Park	RM 193	Glenn/Butte
Ord Bend Park	RM 184	Glenn
Capay Unit Parking Lots, SRNWR	RM 194	Glenn
Butte City Launch Facility	RM 169	Glenn
Source: www.sacramentoriver.org		

A draft of the public notice to be posted at the boat launch facilities is provided in Appendix I – Draft Mitigation Monitoring and Reporting Plan. Although the final public notice is subject to Lead Agency review and approval, which will be determined upon certification of the FONSI and MND, the type of information (e.g., dredge timing, general location) will remain the same.

Additionally, an informative notice advising the public of the proposed dredge activities will be published in local newspapers, consistent with the NOP, NOA, and other public notices for the Proposed Action/Project. Newspaper notices will be published approximately one week prior to the commencement of in-river activities. As a supplemental public outreach measure, information regarding the proposed dredge activities may be shared through the SRCAF listserv.

Signage

Navigation buoys and beacons are placed along navigable waters as guides to mark safe water and hidden dangers, as well as to assist boat operators in determining their position in relation to land. The navigational aids used on the majority of American waterways are part of the U.S. Aids to Navigation System (U.S. Coast Guard 2012). Waterways within the State of California, including the Sacramento River, are marked utilizing the California Uniform State Waterway Marking System (California Department of Boating and Waterways 2012). These waterway marking systems employ buoys and signs with distinctive standard shapes to show regulatory or advisory information.

Navigation aids assist vessel operators in verifying their position and cautioning them of dangers and impediments. Common signs and buoys include port- and starboard-hand buoys, safe water buoys, preferred channel buoys, and special marks (e.g., traffic separation, anchorage areas, dredging, fishnet areas, etc.). Each navigation aid has specific identifying characteristics, including color, lettering, and lighting elements.

Consistent with both the U.S. Coast Guard and the California Department of Boating and Waterways marking systems, two special marked buoys will be utilized to alert boaters and other recreationalists of the general location of the dredge boat and the dredging activities. The buoys will be yellow, and will be placed upstream and downstream of the affected area two days prior to and throughout the duration of dredging operations to caution local water craft of the potential in-river hazard. Although special marked buoys are not required to be illuminated, a lighted warning buoy would be utilized in order to increase visibility of the dredge barge (California Department of Boating and Waterways 2012).

Safety Precautions

To support a safe dredge operation, signage and warning buoys would be placed both upriver and downriver from the active dredge area notifying boaters, fishermen and other water users of the dredge operation, as described above. Additional precautionary safety measures would be implemented to minimize the creation of navigation hazards and potential disturbances to recreationalists resulting from the Proposed Action/Project, as described below.

Dredge Technique

During the public review of the 2011 Draft Subsequent IS/MND, concerns were raised regarding the potential recreation and navigation safety hazards associated with the use of anchoring cables

extending across the Sacramento River from the dredge barge to D-6 dozers acting as anchors on the shore. For Proposed Action/Project, a swinging ladder cutterhead suction dredge would be used to avoid the need for barge-to-land steel anchor cables that are typically used in conventional dredge operations. Although the swinging ladder cutterhead suction dredge removes boating and navigation hazards associated with anchor cables across the river, it does have limitations associated with production capacity. Therefore, due to reduced production capacity associated with using a smaller dredge, the dredging process would be slower, resulting in the dredge barge being present in the Sacramento River for a longer timeframe. To accommodate the production capacity limitations, while being mindful of the need to protect sensitive listed fish species in the Sacramento River, the 107-day in-river work period was identified in coordination with CDFW and NMFS.

Other In-River Equipment

As described in Section 2.2.1, In-river Dredging and Spoils Disposal Operations, a suction pipeline used to convey dredged materials from the river bottom to Containment Area #1 would extend from the dredge barge to the shore and from the shore to the containment area. The suction dredge pipeline, extending from the rear of the barge, would be supported by large orange buoys and float in the river such that the section of pipe from the barge to the shore on the east bank of the Sacramento River would be visible above the waterline. The portion of the floating pipeline from the swinging ladder cutterhead suction dredge to the riverbank would be a flexible flanged system. It may be necessary for cables (or ropes) to be used to attach the floating pipeline to a stationary anchor, which will be adjacent to the dredge pipe and should not create a separate obstruction in the river. The anchor would rest on the riverbed and would be used to prevent the floating pipeline from moving in front of the dredge barge or downstream with the river current. Additional piping would be added to this portion of the pipeline system as the barge advances. Polyethylene pipe connected to the floating pipe would be placed on the riverbank and would remain stationary, extending from the riverbank to a containment area. Placement of the polyethylene pipe would contain a minimum number of bends to ensure adequate flow of materials, and would be placed to avoid sensitive environmental resources and receptors. Construction personnel will warn the public (e.g., boaters, recreationists) to stay away if they approach within 100 feet of construction equipment (e.g., dredge barge, floating suction dredge pipeline).

In-river operations would also be supported by two motorized work boats. One skiff boat would advance the non-motorized dredge to the next section in the river, and one work boat would be used to support general operations.

As discussed above, it is anticipated that in-river dredge operations would be conducted for 10 hours per day, seven days per week. During non-operational periods, the barge, flexible pipe, and auxiliary boats would be anchored and sufficiently illuminated during non-daylight hours to maintain high visibility for boaters and other water users. The dredge boat will be anchored as

close to shore as practicable at night to allow traffic to pass freely. In addition, a night watchman would remain at the project site during non-working hours to respond to any unforeseen issues.

Lighting

The U.S. Coast Guard Inland Navigation Rules specify lighting requirements for watercraft, which vary due to vessel size, location, and conditions (e.g., during fog, when anchored), among other considerations. Under Federal Navigation Regulations, recreational vessels are required to display navigation lights between sunset and sunrise (33 CFR 83).

Consistent with these regulations, lights will be used to illuminate the location of the dredge boat and the portion of the pipeline in the river between dusk and dawn. Under Rule 27 of the Inland Navigation Rules, vessels restricted in their ability to maneuver, such as boats engaging in dredging activities, must display three all-round lights in a vertical line where they can best be seen, in a red ball, white diamond, red ball pattern, as shown in **Figure 3.5-1**. When making way through the water, a masthead light or lights, sidelights and a stern light should be also be displayed.

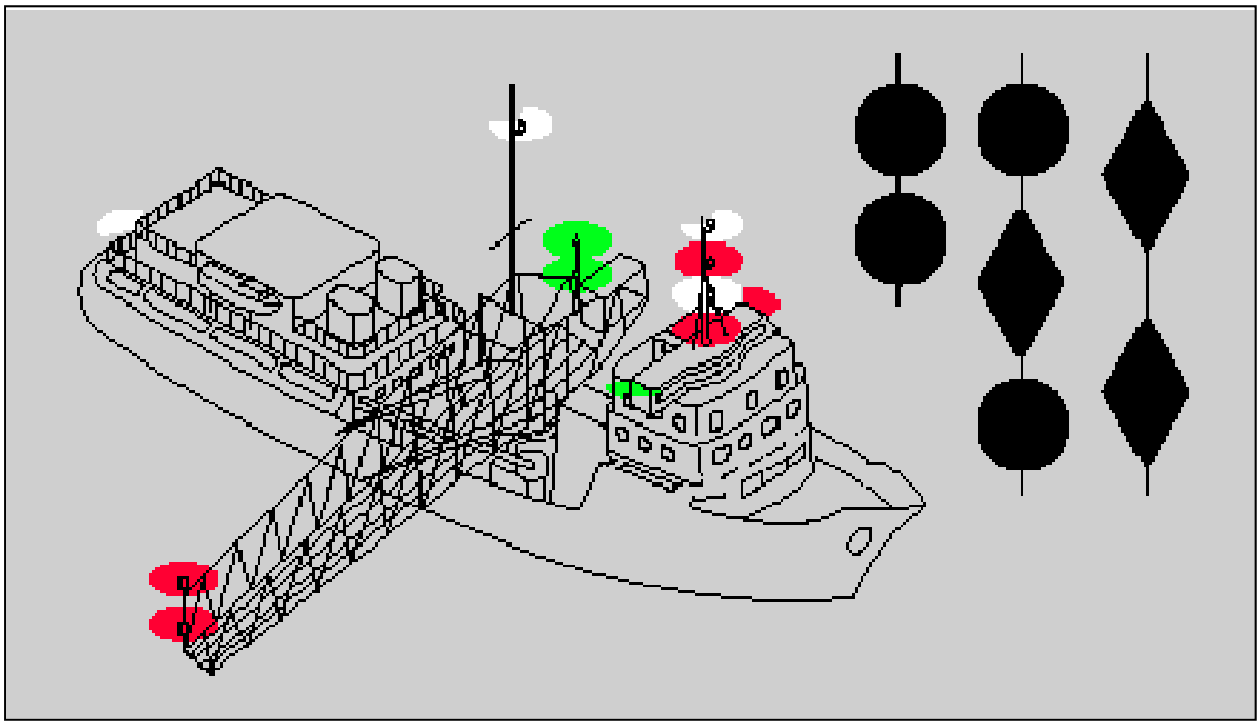

Figure 3.5-1. Lighting Displays for the Suction Dredge Barge when Working and at Anchor (Inland Navigation Rules, Rule 27d).

Additionally, vessels engaged in dredging or underwater operations must also utilize the following lighting elements when an obstruction exists and when at anchor:

- Two all-round red lights or two balls in a vertical line to indicate the side on which the obstruction exists.
- Two all-round green lights or two diamonds in a vertical line to indicate the side on which another vessel may pass.

As with any in-river construction project, dredging activities may temporarily impede recreational opportunities and boat passage on the Sacramento River immediately surrounding the M&T/Llano Seco Pumps Facility; however, this would be a relatively short-term effect occurring during the 107-day in-river dredging period. In addition, although recreational uses of the Capay Unit of the SNRWR such as hiking and sight-seeing could be affected by dredging operations (e.g., reduced visual interest at the site), these impacts would be relatively minor due to the timing and duration of the activities. Dredging operations would take place during late summer and early fall months when recreation use at the Capay Unit is typically low.

Other public use areas upstream and downstream of the anticipated dredging area would provide other similar recreation opportunities.

Although the Proposed Action/Project would result in a short-term loss of recreational opportunities, no long-term loss of recreational opportunities is anticipated. With the implementation of ***Environmental Commitments REC-1*** through ***REC-4***, potential short-term impacts to recreational opportunities due to the presence of construction and dredging equipment as a result of the Proposed Action/Project would be less than significant.

Bank Revetment Monitoring and Maintenance

R-3. *Potential for increased recreational and navigation safety hazards associated with bank revetment monitoring and maintenance resulting in reduced recreational opportunities in and along the Sacramento River.*

The Proposed Action/Project includes the persistence of the revetment installed during the fall of 2007, as well as any required maintenance activities while the revetment is in place until the long-term solution is completed. Monitoring conducted to date indicates that the revetment is performing as designed and, thus, maintenance activities are not anticipated to occur frequently. Maintenance of the revetment would be conducted from the land side of the bank on top of the revetment. Types of maintenance activities would include inspection, minor repairs to stabilize the area, and possibly adding rock or re-anchoring or replacing woody material and brush structures if they become rotted, disintegrated, or washed out due to high flow events.

Under the Proposed Action/Project, maintenance activities such as rock and vegetation placement within the revetment would not impede recreation activities within this reach of the Sacramento River. Recreational uses such as fishing and boating within the Sacramento River would not be affected because revetment removal activities would be conducted from the shore.

The Capay Unit of the SRNWR is open to the public and provides public recreational opportunities. Revetment maintenance would be conducted within a 7-day period, and several measures would be implemented to reduce impacts to public uses of the area. Visitors to the Capay Unit may encounter heavy equipment traffic on County Road 23 as they travel to the refuge. During revetment maintenance, the refuge area in proximity to the areas used for access, construction equipment staging, materials stockpiling and adjacent areas (approximately 100-foot radius) would be temporarily closed to public access. Areas outside of the construction staging areas would remain open for recreational uses.

The Proposed Action/Project would not involve or require any new permanent facilities. However, the presence of construction or other heavy machinery necessary to conduct revetment maintenance would result in the need to alert recreationists to the presence of modified conditions in the area. USFWS would place signs in the vicinity of the access and staging areas notifying refuge visitors of the maintenance activities (e.g., altered bank conditions, presence and operation of construction equipment).

Although maintenance of the revetment could cause short-term, temporary interruptions of recreational opportunities in the area of the revetment, maintenance of the revetment is anticipated to occur infrequently and would not cause a substantial disruption in recreational activities. No long-term loss of recreational opportunities is anticipated. Therefore, revetment monitoring and maintenance would result in less than significant impacts to recreation and navigation safety.

PROPOSED ACTION/PROJECT RELATIVE TO THE NO ACTION ALTERNATIVE (NEPA ANALYSIS)

For additional NEPA analysis purposes, this section presents those considerations under the Proposed Action/Project, relative to the No Action Alternative.

In-river Dredging and Spoils Disposal

R-4. *Potential for increased recreational and navigation safety hazards associated with dredging operations resulting in reduced recreational opportunities in and along the Sacramento River.*

Under the Proposed Action/Project, dredging would occur in the area immediately upstream, adjacent to, and downstream of the M&T/Llano Seco Pumps Facility. Under the No Action Alternative, no dredging would occur. With respect to dredging, comparison of the Proposed Action/Project relative to the No Action Alternative is similar to the comparison of the Proposed Action/Project relative to Existing Conditions. Potential impacts associated with dredging and spoils disposal under the Proposed Action/Project would be short-term in nature and similar to those previously discussed. For the reasons described in the previous analyses, and in consideration of the impact avoidance and minimization measures that would be implemented as part of the Proposed Action/Project, potential impacts to recreation and navigation safety would be less than significant.

Bank Revetment Monitoring and Maintenance

R-5. *Potential for increased recreational and navigation safety hazards associated with bank revetment monitoring and maintenance resulting in reduced recreational opportunities in and along the Sacramento River.*

Under the Proposed Action/Project, rock-toe and tree revetment maintenance could cause short-term, temporary interruptions of recreational opportunities on the Capay Unit in proximity to the areas used for access, construction equipment staging, and materials stockpiling and adjacent areas (approximately 100-foot radius); however, maintenance of the revetment is anticipated to occur infrequently and would not cause a substantial disruption in recreational activities. Additionally, areas outside of the construction staging areas would remain open for recreational uses.

Under the No Action Alternative, recreational uses (e.g., fishing and boating) within the Sacramento River are not anticipated to be adversely affected during revetment removal. However, temporary, construction-related disruptions to recreational activities on the Capay Unit of the SRNWR would occur.

Under both the Proposed Action/Project and No Action Alternative, the presence of construction equipment would result in the short-term loss of recreational opportunities available at the Capay Unit. However, these effects would be temporary and would not last longer than the construction period. Because revetment maintenance activities would generally require less time and equipment than that which would be required to completely remove the revetment, it is anticipated that potential impacts to recreation and navigation safety under the Proposed Action/Project would be less than those under the No Action Alternative.

3.5.4 ENVIRONMENTAL COMMITMENTS

By implementing BMPs and the measures incorporated into the Proposed Project (see Section 2.2.3) and detailed in the Mitigation Monitoring and Reporting Program (Appendix I), potential impacts to recreation and navigation would be reduced and are adequate to avoid potentially adverse effects under NEPA and significant impacts under CEQA. These measures are summarized below.

- ***Environmental Commitment REC-1:*** *Post notices at area public boat launch facilities.*
- ***Environmental Commitment REC-2:*** *Publish notice for planned dredge activities in local newspapers.*
- ***Environmental Commitment REC-3:*** *Utilize U.S. Coast Guard standard lighting elements on suction dredge boat and associated in-river equipment.*
- ***Environmental Commitment REC-4:*** *Install warning signs upstream and downstream of dredging construction site on the Sacramento River and along public access trails on the Capay Unit.*

3.6 HYDROLOGY AND WATER QUALITY

3.6.1 AFFECTED ENVIRONMENT/ENVIRONMENTAL SETTING

The Proposed Project would be located on the Sacramento River about 5 miles southwest of Chico in the general area extending between RM 194 and RM 192. The Sacramento River is the largest river in California, originating in the Cascade and Siskiyou mountains of northern California and terminating in the Sacramento-San Joaquin Delta (Delta). Several major tributaries, including the upper Sacramento, Pit, Feather, Yuba, and American Rivers, contribute to flow in the Sacramento River. Flow also is contributed to the Sacramento River by a large number of smaller tributaries, including Cottonwood, Battle, Butte, Mill, Deer, and Thomas Creeks.

3.6.1.1 HYDROLOGY

SACRAMENTO RIVER

Base flow levels in the Sacramento River are controlled by releases from Shasta Dam and, to a lesser extent, from Oroville Dam. These releases are adjusted to meet downstream requirements for water supply; Delta water quality, fish, and wildlife habitat maintenance; flood control; and other beneficial uses in accordance with numerous legal and regulatory requirements. In spite of upstream regulation, however, flow conditions in the Sacramento River follow a well defined seasonal pattern. DWR and the U.S. Geological Survey (USGS) measure flows in the Sacramento River at several locations, including the Hamilton City gaging station, which is located about 8 miles upstream of the Action/Project Area.

Tetra Tech (2011) developed updated mean daily flow-duration (**Figure 3.6-1**) and flood-frequency (**Figure 3.6-2**) curves for the Sacramento River at the Hamilton City gage for those water years in which a complete data set is available (1946 through 1955 and 1957 through 1980 from the USGS data, and 1997 through 2000 and 2010 and 2011 from the CDEC data. Based on the flow-duration curve, the median flow (flow that is equaled or exceeded 50 percent of the time) at the Hamilton City gage is about 8,560 cfs, and the 10- and 90-percent exceedence flows are 22,430 and 5,425 cfs, respectively (Tetra Tech 2011).

Data used to update the flood-frequency curve for the post-Shasta Dam (1946-2011) period at the Hamilton City gage (Figure 3.6-2) included the provisional peak discharge of 102,528 cfs that was recorded on March 21, 2011 (Tetra Tech 2011). These curves indicate that the 1.5- and 2-year recurrence interval peak discharges are about 70,900 and 90,000 cfs, respectively. Bankfull discharge in this reach of the Sacramento River is approximately 90,000 cfs, comparable to the 2-year peak (Tetra Tech 2011).

When the provisional 2011 peak discharge is included in the data set, the 50- and 100-year peak flow events are 237,800 and 275,900 cfs, respectively (USACE 2008 as cited in Tetra Tech 2011).

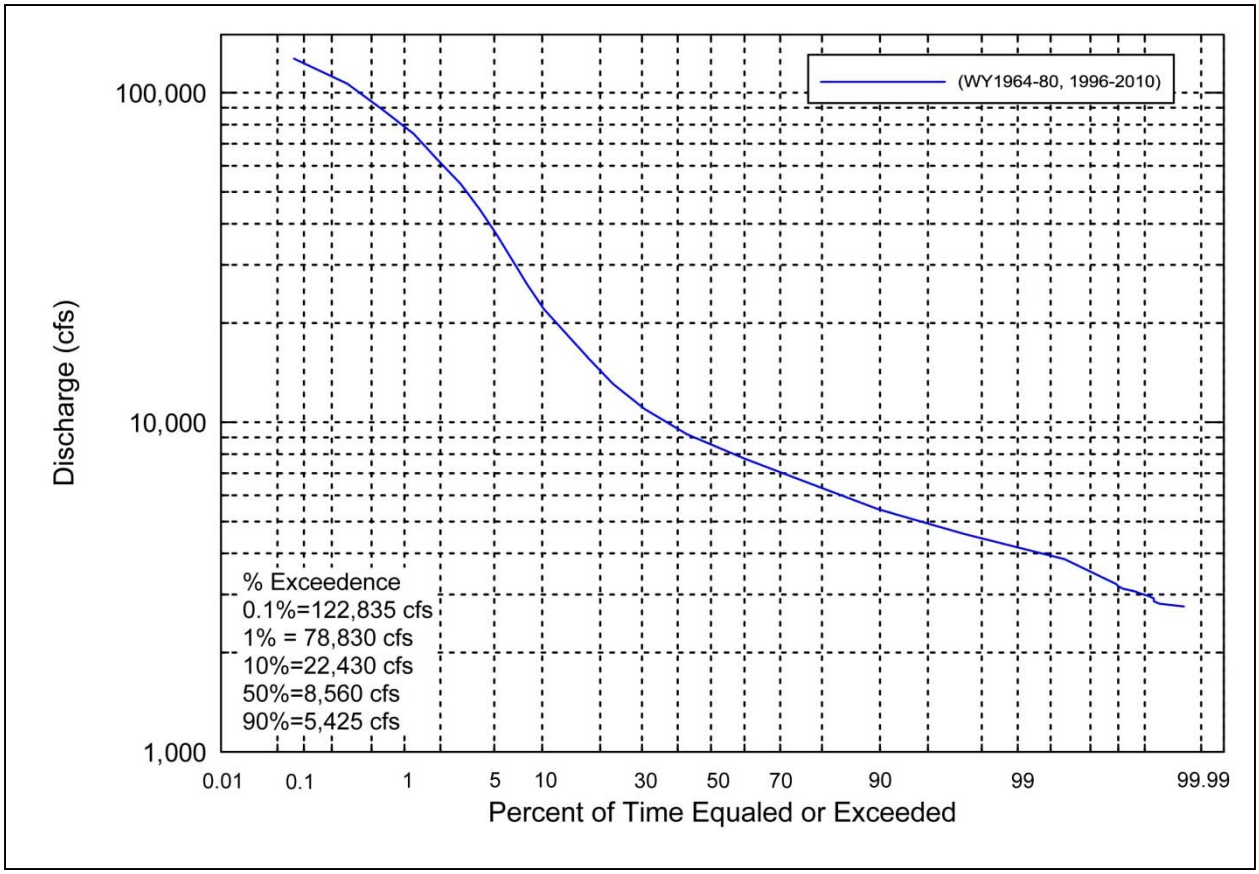

Figure 3.6-1. Sacramento River at the Hamilton City Gage Mean Daily Flow-duration Curve for the Post-Shasta Dam Period (1946-2011) (Tetra Tech 2011).

According to Stillwater Sciences (2001), the gravel bar located at RM 193 opposite Bidwell State Park is thought to have first formed during the 1964 flood. Since then, the bar has continued to grow, and between 1995 and 2001, the gravel bar migrated approximately 1,700 feet downstream to its current location (Tetra Tech 2011). Relatively high-magnitude flood peaks and large flow volumes occurred in 1974, 1997, 1998 and 2006, and the formation and migration of the existing gravel bar is likely related to the occurrence of these high-magnitude flows (Tetra Tech 2011).

Hydrographic and topographic surveys of the Sacramento River between RM 192 and RM 193.5 were conducted in December 2005, May 2006, January 2010 and June 2011 to monitor geomorphic changes in the reach, including aggradation of the bed, bank erosion and lateral migration. Because of the significant lateral erosion of the west bank that occurred during January 2006 (peak discharge ~ 136,000 cfs at Hamilton City), the May 2006 survey is being used as the baseline for comparison of the later surveys (Tetra Tech 2012).

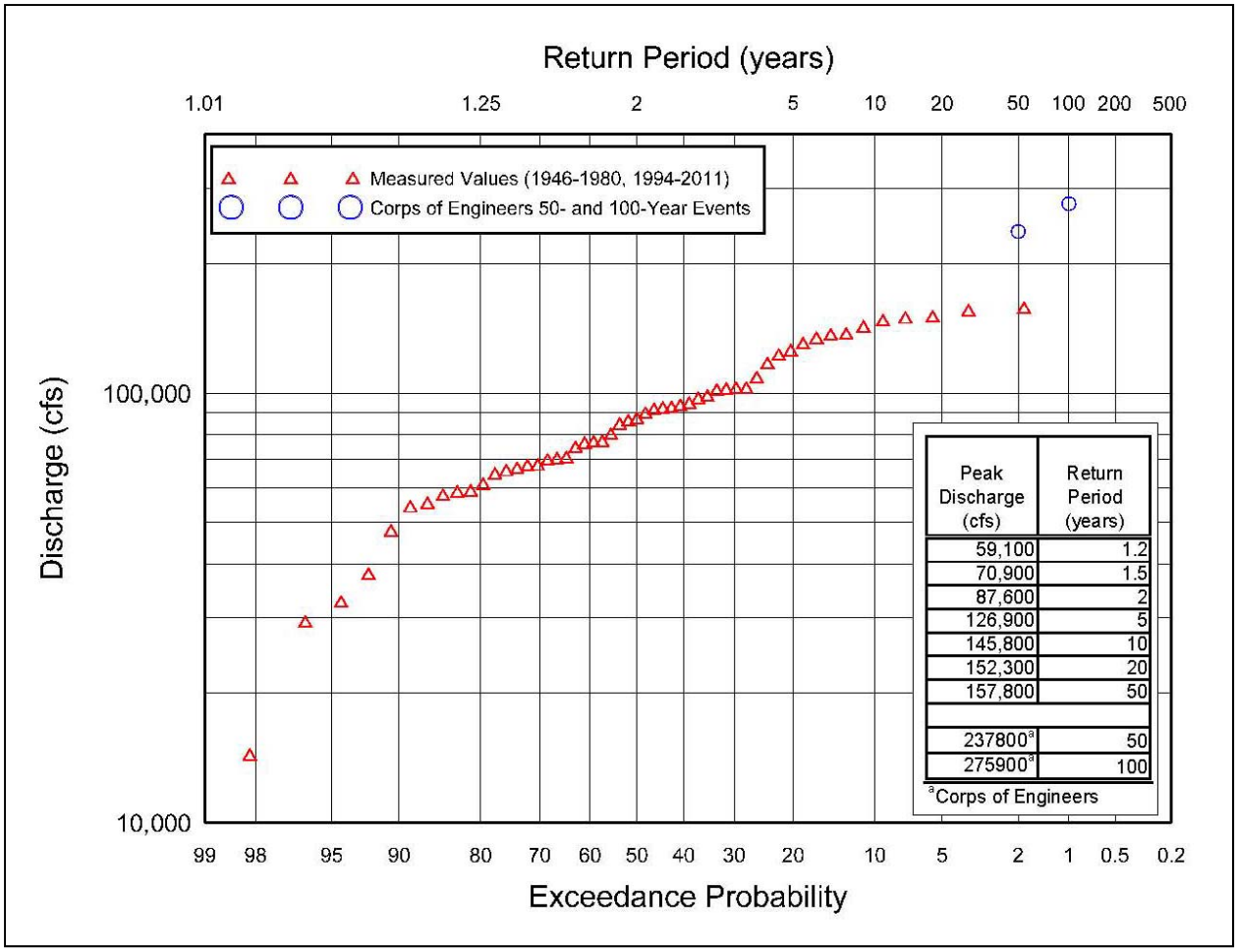

Figure 3.6-2. Sacramento River at the Hamilton City Gage Flood-frequency Curve for the Post-Shasta Dam Period (1946-2011) (Tetra Tech 2011).

Comparison of 2006 and 2010 survey results indicates that substantial aggradation (4 to 10 feet) occurred in the vicinity of the M&T/Llano Seco Pumps Facility (Tetra Tech 2012). Although some of the deposited material was removed following high Sacramento River flows in early 2011 (peak flow at Hamilton City ~ 102,500 cfs), a substantial amount (~54,400 cubic yards)remained. The 2012 survey results indicate that additional aggradation occurred in the vicinity of the pump intake after the 2011 survey (**Figure 3.6-3**), likely due to the lack of significant peak flows during the 2012 spring runoff period (peak flow at Hamilton City was about 44,000 cfs) (Tetra Tech 2012).

Overall, the survey results indicate that there was net accumulation of about 61,300 cubic yards of material in this reach of the Sacramento River between 2006 and 2012 (**Figure 3.6-4**). Between 2011 and 2012, a relatively small amount of deposition (net gain of about 6,700 cubic yards) occurred in the vicinity of the M&T/Llano Seco Pumps Facility fish screens and pump inlets.

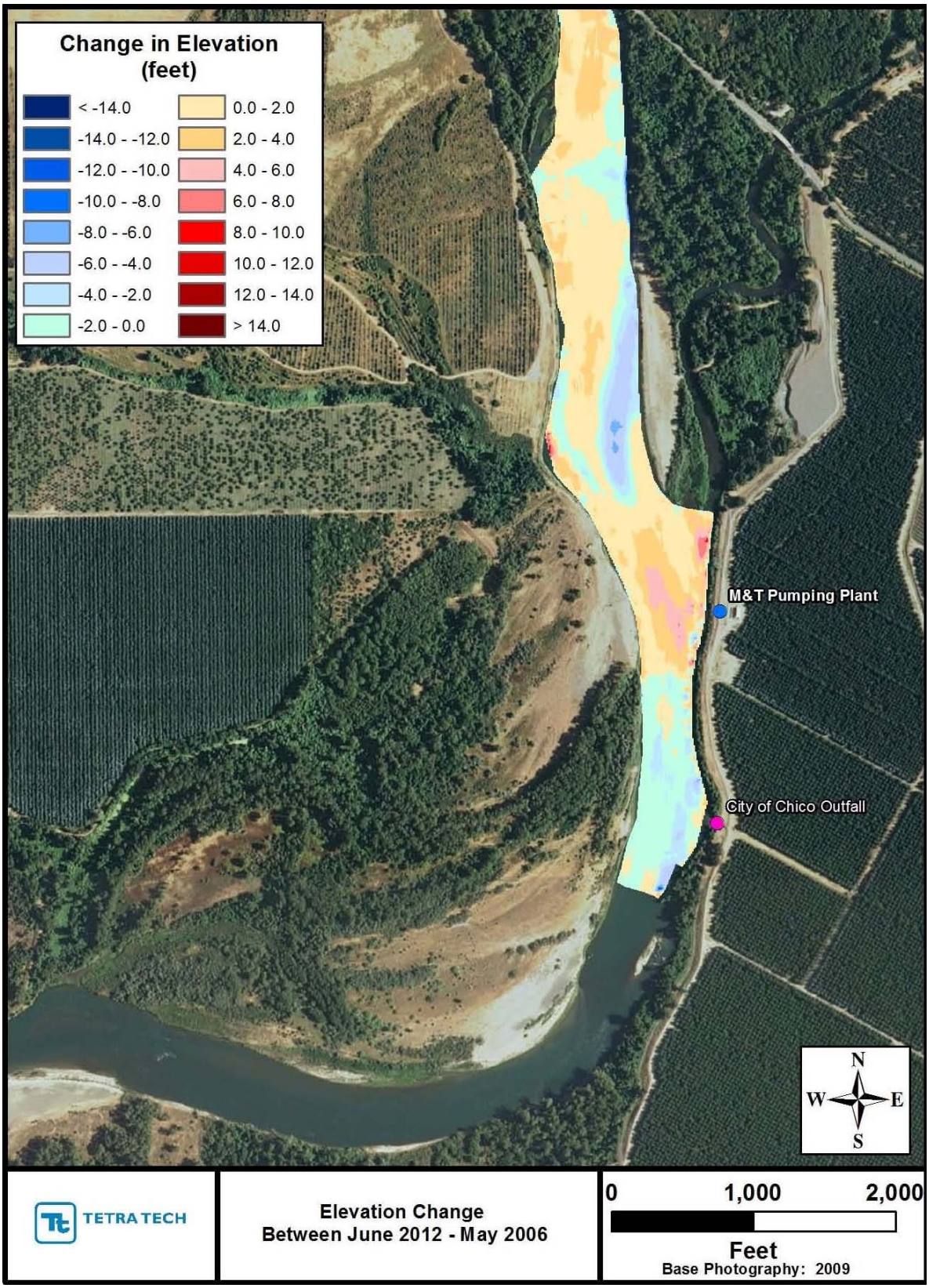

Figure 3.6-3. Elevation Changes in the M&T/Llano Seco Reach of the Sacramento River Between the June 2011 and May 2006 Bathymetric Surveys (Tetra Tech 2012).

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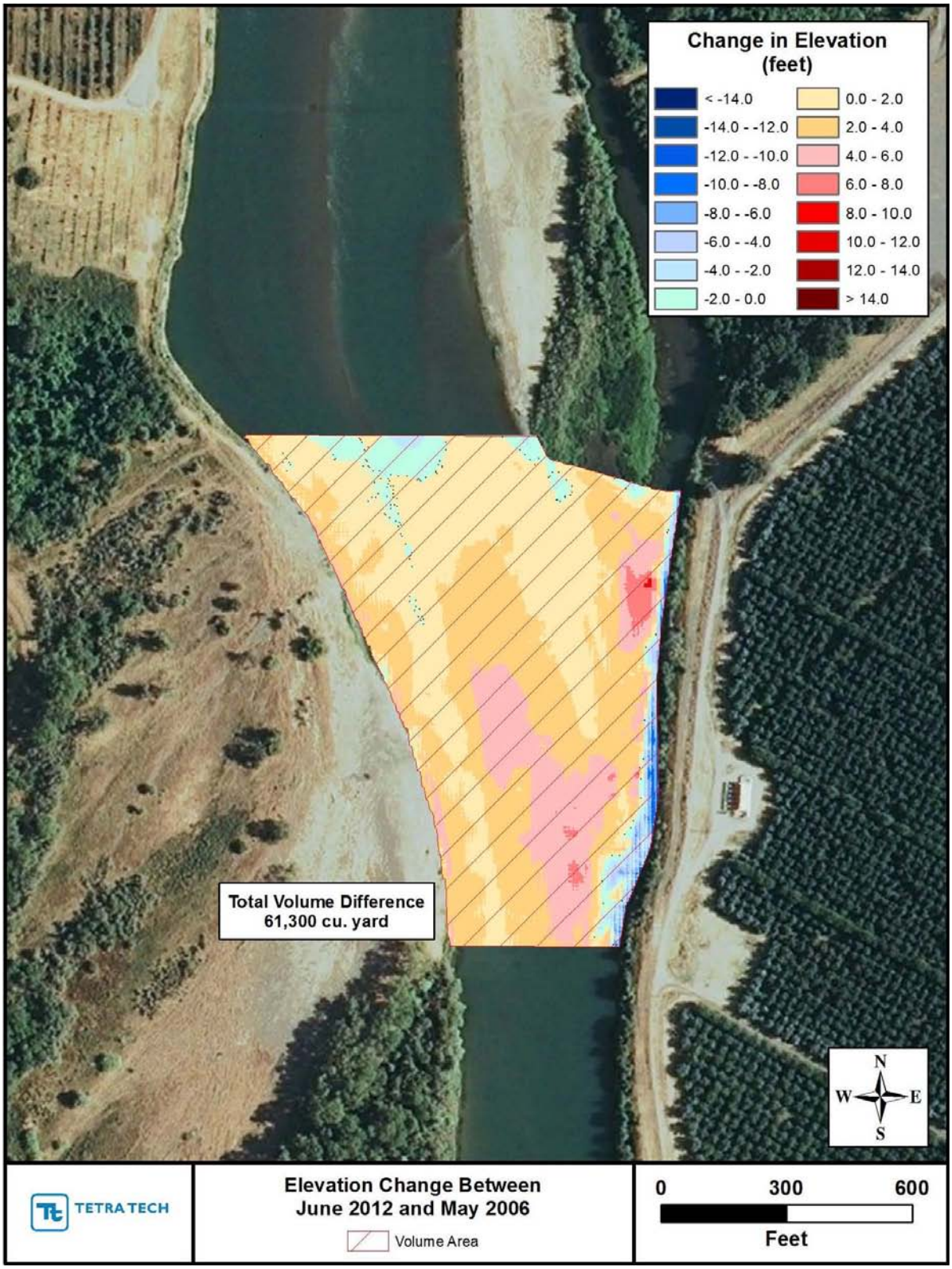

Figure 3.6-4. Volumetric Calculation of the Deposition in the 600- by 1,200-foot Segment in the Vicinity of the Fish Screens and Pump Inlets Between the June 2012 and May 2006 Surveys (Tetra Tech 2012).

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In general, Tetra Tech (2012) suggests that deposition tends to occur in the vicinity of the M&T/Llano Seco Pumps Facility pump intake and fish screens during years with relatively low peak flows, and this material is then eroded during the higher-flow years. Similar behavior occurs at the location of the City's old outfall (~300 ft downstream of the M&T/Llano Seco Pumps Facility), where aggradation that occurred in 2010 was removed by the 2011 high flows, and the depth of scour probably depends on the magnitude of the high flows. Tetra Tech (2012) also reports that the same general trend is observed on the upper part of the migrating bar, with aggradation occurring during the lower peak flow years (2005, 2010) and scour in the higher peak flow years (2006, 2011). The 2012 survey shows aggradation near the east bank and localized aggradation of up to 1.2 feet in the main channel in this area, but the overall bed topography in the 2012 survey was very similar to that in the 2011 survey. Comparative cross sections indicate that there has been little or no filling in the area that was dredged in 2007. The 2012 survey also shows up to 2.5 feet of degradation along the west bank opposite the dredged area, compared to the 2011 survey; likely due to scour along the base of the rock-toe revetment (Tetra Tech 2012).

Based on the response of the system over the past five bathymetric surveys, it appears that hydraulic conditions within the M&T/Llano Seco reach of the Sacramento River exhibit a cyclic behavior in which key portions of the site, particularly the vicinity of the pump intake and fish screens experience aggradation during years with less than bankfull flows, and scour of the aggraded material during flows at and above bankfull. Tetra Tech (2012) hypothesizes that the scour is due to the formation of a helical flow cell along the riprap that lines the east bank of the Sacramento River in the vicinity of the fish screens and pump inlets. Further study is required to confirm this hypothesis.

BIG CHICO CREEK

Big Chico Creek flows into the Sacramento River in the Action/Project Area, immediately upstream of the M&T/Llano Seco Pumps Facility. Base flows in Big Chico Creek during the summer (i.e., June-October) typically range from 20 to 25 cfs above Five-Mile (east Chico) Diversion (NMFS 2009b). Most of this base flow is lost to infiltration in the region of Big Chico Creek's outwash fan (i.e., generally, the City of Chico) and, thus, surface flows do not extend downstream of Rose Avenue (west Chico) by late summer during most years (USFWS 1995 as cited in NMFS 2009b). Potential flood flows are believed to be higher than recorded historical occurrences in the downstream portion of the Big Chico Creek because channel capacities in the western portion of Butte County are limited, preventing at least a portion of the high flows from actually reaching the mouth (City of Chico 2010).

Similar to other areas of the Sacramento Valley, flooding concerns associated with Big Chico Creek and its tributaries have been recognized since the early 1940s and local flood control projects, including an interbasin transfer of floodwater from Big Chico Creek to Mud Creek, were initiated (Ginney 2001). Hydraulic design of the lower portion of the Big Chico-Mud Creek flood control project was based on two sets of flow conditions, including: (1) a flow of 12,000

cfs in Big Chico Creek at its confluence with the Sacramento River, and a flow of 210,000 cfs in the Sacramento River at Ord Ferry (which corresponded to a river stage elevation of 137.0 feet at the confluence of Big Chico Creek and the Sacramento River and a flow recurrence interval of 50 years); and (2) the assumption, based on analysis of recorded floods, that peak discharge at the mouth of Big Chico Creek precede peak Sacramento River discharges by 8-20 hours (Ginney 2001). During the 1950 and 1960s, local flood control structures were either enlarged in-place or set back and enlarged to control significant increases in discharge (Ginney 2001; USACE 1961).

Ginney (2001) states that all stormwater runoff from the City of Chico that does not flow into Little Chico Creek or Comanche Creek ends up flowing in either Big Chico or Mud Creeks to the Sacramento River confluence area. Straightened channels, coupled with the increased flow from Big Chico Creek, now funneled through Mud Creek, have caused a decrease in channel sinuosity, an increase in channel slope, and increased shear stress on the bed and banks of these creeks (Ginney 2001). Further, urbanization over time has likely altered changes in the flood hydrographs of Mud and Big Chico Creeks, primarily through increasing peak flows and changing the timing and duration of the flood hydrograph (Ginney 2001). According to the City of Chico's 2030 General Plan Update Draft EIR (City of Chico 2010), inadequate channel capacity continues to exacerbate flooding potential near the Sacramento River, with overflow inundating a 100-year floodplain area that extends about two miles east of the Sacramento River boundaries (City of Chico 2010). In the western portion of Butte County, elevated Sacramento River flood stage creates a backwater in the creeks and tributaries (e.g., Big Chico Creek, Lindo Channel, Channel Slough), which may delay runoff from entering the river. More recent flood control projects on Big Chico Creek and other channels have helped to reduce the amount of runoff that flows through the City of Chico, reducing potential flooding problems (City of Chico 2010).

Mussetter Engineering, Inc (2005) evaluated flows from Big Chico Creek to aid in evaluating the hydraulic and sediment-transport effects on the Sacramento River. Their evaluation showed that flows from the mouth of Big Chico Creek are directed towards the left side of the gravel bar, and probably prevent the bar from attaching directly to the east bank upstream from the M&T/Llano Seco intake pump. An evaluation was also conducted to determine if backwater effects associated with Big Chico Creek were occurring in the vicinity of the gravel bar, and if so, whether these effects impact the location, geometry, and stability of the gravel bar. Comparison of the timing of peak flows recorded at the Big Chico Creek gage that is located about 11 miles upstream from the mouth on the northeast side of the City of Chico with the timing of peak flows in the Sacramento River indicates little correlation, primarily because of the relative size of the drainage basins and the effects of upstream flow regulation on the Sacramento River.

The analysis by Mussetter Engineering, Inc. (2005) indicated that the discharge in Big Chico Creek is typically in the range of 1,000 cfs to 1,500 cfs when the discharge in the Sacramento River is in the range of bankfull (85,000 cfs to 95,000 cfs). The 2-D model was used to evaluate the effects of a 1,500 cfs inflow from Big Chico Creek on flow patterns in the Sacramento River

when the river discharge is at 90,000 cfs. The results of the analysis suggest that Big Chico Creek flows have very little effect on the water-surface profile through the M&T study reach, and the computed depths and velocities in the vicinity of the M&T intake (Mussetter Engineering, Inc. 2005).

Low flows and high water temperatures reportedly are the most limiting factors in Big Chico Creek for spring- run Chinook salmon and steelhead (DWR 2009). Some evidence suggests that water temperatures in the Big Chico Creek summer holding reach for adult spring-run Chinook salmon, from Iron Canyon to Higgins Hole, may approach elevated levels in late summer, particularly during drier water years (USFWS 1995, as cited in DWR 2005). DWR (2005) report that water quality in Big Chico Creek is impaired by cadmium, mercury, and other metals from mine drainage from the upper watershed and by runoff from the urban area. The urban area runoff typically consists of residual petroleum compounds, pesticides, solid pollutants, and other waste products that enter Big Chico Creek via storm drains (Resources Agency 1989, as cited in DWR 2005).

BUTTE CREEK

Butte Creek originates in the Lassen National Forest and travels through the northwestern region of Butte County and enters the floor of the Central Valley near Chico, California. Where Butte Creek enters the valley near Chico, it then travels approximately 45 miles before flowing into the Sacramento River (Butte Creek Watershed Conservancy 1998).

The Parrott-Phelan Dam is the upper-most agricultural and wildlife enhancement diversion on Butte Creek. After widespread agricultural development in the valley in the early part of the 20th Century, the need for irrigation water increased. The Parrott-Phelan Diversion Dam was constructed, and a low-gradient bypass channel was constructed to convey water through the City of Chico and the surrounding agricultural region. The bypass channel flows through low-density residential areas before entering Comanche Creek. West of Chico, approximately 6.5 miles from the Parrott-Phelan Diversion Dam, the north bank of Comanche Creek is located on the M&T Chico Ranch and water can be diverted from the creek to irrigate the ranch. Comanche Creek reaches that the Parrrott-Phelan Canal approximately two miles past Crouch Avenue. At the intersection of Comanche Creek and this canal, water can be diverted south through the Parrott Canal (onto Llano Seco Rancho), north to M&T Chico Ranch, or continue west to the M&T Chico Ranch in Edgar Slough. A surge pond is located at the intersection to provide temporary storage of water (Butte Creek Watershed Conservancy 1998).

During winter storms, runoff from urban and range lands around Comanche Creek can produce high flows in the creek. During large storm events in the past, diversions from Butte Creek were curtailed to prevent flooding in Comanche Creek. Although diversions from Butte Creek were reported to be previously curtailed from November through March because of a lack of demand and to allow for channel maintenance (Butte Creek Watershed Conservancy 1998), this is no longer the case due to Llano Seco Rancho becoming a refuge-wetland. During April, May and

June, large quantities of water are diverted from Butte Creek into Comanche Creek to flood rice fields and wetlands, irrigate pasture for cattle, and irrigate orchard trees and other crops. Bank storage and seepage may be significant, with losses of 10-15 percent of the flow diverted from Butte Creek (L. Heringer, M&T Chico Ranch, pers. comm., March 5, 2013). Most of the conveyance losses recharge the groundwater and support riparian vegetation. These losses are to be expected, as the channel is traversing the edge of an alluvial fan. Other creeks in the Chico area exhibit similar reductions in streamflow. Big and Little Chico Creeks also lose much of their flow across the alluvial fan (Butte Creek Watershed Conservancy 1998).

As natural flows in Butte Creek drop, the availability of appropriated Butte Creek water utilized by M&T Chico Ranch and Llano Seco Rancho decreases. Dayton Mutual has a senior right to the natural flows of Butte Creek and can use water during periods when the ranches and the wildlife refuges cannot. During summer, when flows in Butte Creek are low, Dayton Mutual may continue to receive water via Comanche Creek when deliveries to the ranches and the wildlife refuges may be limited. This is because of either the limited availability of flows from the West Branch of the Feather River or because of the lack of a senior right to the natural flow of Butte Creek (Butte Creek Watershed Conservancy 1998).

When water demand at M&T Chico Ranch and Llano Seco Rancho exceeds available supply through Edgar Slough and Comanche Creek, which is normally the case, water is pumped from the Sacramento River at the M&T/Llano Seco Pumps Facility to supply water to the Parrott-Phelan Canal. The M&T/Llano Seco Pumps Facility is also necessary because certain portions of the M&T Chico Ranch can only be serviced by Butte Creek water, and other portions of the ranch can only be serviced by Sacramento River water (Butte Creek Watershed Conservancy 1998). Water in the Parrott-Phelan Canal can be delivered to M&T Chico Ranch, Llano Seco Rancho, and the wildlife refuges. During the late summer and fall when the refuge's water demands increase, there is little additional water available in Butte Creek and water from the Sacramento River is the sole source of the refuge's water supply during most years. Additionally, in years when moderate to severe drought conditions were experienced in the past, very little water from Butte Creek has been available during the summer and fall months (L. Heringer, M&T Chico Ranch, pers. comm., March 5, 2013).

Surface water quality monitoring in Butte Creek is coordinated by DWR's Northern District in Red Bluff, California. Since 1990, DWR has been monitoring water temperature at a variety of sites, and six monitoring stations in Butte Creek have a time series greater than 30 years (Butte Creek Watershed Conservancy 1998).

Overall, water quality in Butte Creek is considered to be good to excellent in the upper portions of the watershed and degrades in quality lower in the system (Butte Creek Watershed Conservancy 1998). Water quality can vary seasonally, corresponding to precipitation and water diversions. It also can vary year-to-year, depending on hydrologic conditions. Large storm events have a great influence on local hydrology and runoff, increasing turbidity and mobilizing pollutants and salts. During the winter, when most of the flow is runoff, the surface water is

cooler and contains fewer dissolved solids. The opposite is true when lower, summer base flow conditions exist, and low flows can reduce water quality by concentrating contaminants. Several potential water quality concerns have been identified in Butte Creek, including high temperatures, nutrient compounds (e.g., nitrogen and phosphorous), and agricultural biocides. Low flow months include July, August, September, and October (Butte Creek Watershed Conservancy 1998).

The Parrott-Phelan Diversion Dam is located near the mouth of the Butte Creek Canyon. At this location, riparian vegetation acting as a canopy over the stream begins to diminish where the channel exhibits a broad cross-sectional shape and vegetation is often a considerable distance from the creek. Exposure to direct solar radiation and slow moving water (due to a lower gradient) contribute to the conditions that raise water temperatures. Lower in the system, water temperatures are higher, stream gradients are very low, and organic loads are high. Water temperatures in lower Butte Creek also are affected by the quantities of water diversions, bypass spills, and the timing of irrigation (Butte Creek Watershed Conservancy 1998).

Water temperature and dissolved oxygen are the primary water quality concerns in Butte Creek (DWR 2005). DWR (2005) report that water temperatures are near the optimum range and, thus, highly suitable during the period when flows are managed and juvenile Chinook salmon are present (e.g., October through January). However, water temperatures can be a concern during October and during late spring (Jones and Stokes 1999, California State University Chico (1998) and Ward et al. (2004); all as cited in DWR 2005). Potential agriculture contaminants enter the stream with irrigation return water that is unmonitored. Increased agricultural return to the total flow during the diversion season can increase the effects of contaminants on fish (USFWS 2000, as cited in DWR 2005).

Seasonal patterns of dissolved oxygen (DO) concentrations in Butte Creek are predictable, with the highest levels occurring in the winter and lowest levels occurring in summer and fall. Monthly grab samples at Gorrill Dam (8.0 to 13.1 mg/L), below Western Canal (8.3 to 12.6 mg/L) and above Little Dry Creek (7.5 to 12.9 mg/L) indicate that there is a general trend of higher concentrations of DO during the spring, corresponding to low water temperatures and higher flows, and lower concentrations during the summer, corresponding to lower flow and higher water temperature conditions (Butte Creek Watershed Conservancy 1998). Biological activity in water can affect DO levels as well. Diurnal patterns, corresponding to photosynthetic production of oxygen during the day, and respiration at night decreasing oxygen levels are also present. Historically, spring-run Chinook salmon smolts and migrating adults have experienced less than desirable DO concentrations that probably resulted in adverse effects during escapement and migration (Butte Creek Watershed Conservancy 1998).

3.6.1.2 SURFACE WATER QUALITY

Water quality standards developed to meet CWA and California Water Code requirements are contained in the SWRCB and Central Valley RWQCB Water Quality Control Plan for the

Sacramento River Basin and the San Joaquin River Basin (Basin Plan). The Basin Plan identifies beneficial uses, water quality objectives, and implementation programs for waters within the Central Valley Basin. The following existing designated beneficial uses are identified for the Sacramento River from Shasta Dam to the Colusa Basin Drain.

- ❑ Municipal and Domestic Supply
- ❑ Irrigation and Stockwatering for Agricultural Use
- ❑ Service Supply and Power for Industrial Use
- ❑ Warmwater Fish[7] Migration and Spawning Habitat
- ❑ Coldwater Fish[8] Migration and Spawning Habitat
- ❑ Warm and Cold Water Freshwater Habitat (Resident Fish)
- ❑ Contact Recreation
- ❑ Canoeing and Rafting
- ❑ Other Non-Contact Recreation
- ❑ Wildlife Habitat
- ❑ Navigation

General water quality objectives for the river relate to maintaining good water quality such that beneficial uses are not adversely affected and minimizing pollutant levels in discharges into the river. More specific, quantified objectives are identified in the Basin Plan for some pollutants and constituents. The primary water quality issues in the Sacramento Valley include (Heiman and Knecht 2011 as cited in USFWS and CDFG 2012): (1) pesticide contamination of surface and ground water from agricultural and urban sources; (2) nitrate contamination of groundwater; (3) sediment binding pesticides that bioaccumulate through the food chain; (4) abandoned mines and discharge of heavy metals; (5) mercury from legacy mining operations and natural sources; (6) urban runoff; and (7) operations of dams and diversions that affect stream flow and water quality.

Water quality data for the Sacramento River are collected by several agencies, including DWR, USGS, RWQCB, and the Department of Pesticide Regulation as part of the various monitoring programs and special studies. The Sacramento River and its tributaries are generally characterized as having good overall water quality. The water quality of the Sacramento River is commonly attributed to the purity of snowmelt, the primary source of water in the river system (USFWS and CDFG 2012). As water flows downstream through the watershed, it accumulates pollutants and constituents associated with human activities, resulting in decreased water quality. Major sources of added constituents are eroded soils, agricultural return flows, runoff from urban areas, discharges from municipal wastewater treatment facilities, and runoff from historic mining activity. Water quality in most reaches is considered good with regard to drinking water parameters (USFWS and CDFG 2012).

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[7] Striped bass, sturgeon and shad (Central Valley RWQCB 2011).

[8] Salmon and steelhead (Central Valley RWQCB 2011).

Over a 10-year period (1998–2008), the Sacramento River Watershed Program (SRWP) conducted water quality monitoring on the Sacramento River and various tributaries. In 2006, a monitoring program summary was developed to help establish a baseline for Sacramento River Basin water quality conditions (SRWP 2012). SRWP (2006) found that most sites analyzed met water quality objectives and that the Sacramento River is a high quality source for domestic and municipal use. Despite the legacy of contaminants from the early twentieth century mining era, metals are generally not a problem in the watershed, with the exception of mercury (SRWP 2006). Mercury and methylmercury levels are a health concern because they accumulate in the tissue of organisms and can be magnified up through the food chain. Organophosphate pesticide levels were found to be trending downward in response to restrictions on the use of diazinon and chlorpyrifos and resulting changes in their use in both agricultural and residential applications (USFWS and CDFG 2012).

MERCURY

In California, mercury was historically mined in the Coast Range and transported across the Central Valley for use in placer gold mining in the Sierra Nevada Mountains (Central Valley RWQCB 2004). Mercury, including elemental mercury, is commonly found in the sediments of streams that were mined for gold or mercury and/or received mercury-contaminated hydraulic mine debris and hardrock mill tailings.

The majority of mercury appears to have originated from the Sacramento River Basin above the confluence of the Feather River, and is primarily transported during periods of high winter storm runoff (Central Valley RWQCB 2004). However, the reach of the Sacramento River from Hamilton City to Knights Landing, which includes the Action/Project Area, is listed as a 303(d) impaired segment for mercury based on measured fish tissue concentrations (Central Valley RWQCB 2010). Measured concentration samples at selected locations of the Sacramento River Basin including Big Chico Creek and Butte City indicate that mercury concentration levels in the area tend to be higher than the average amount of mercury found in rocks on the earth's surface (USGS 2000). The source of high levels of mercury is unknown, but analyses of fish tissues sampled in the river between Hamilton City and Knights Landing reported exceedances of the State's mercury screening value (0.3 micrograms per gram), which indicates that mercury concentrations in the Sacramento River could threaten beneficial uses (EPA 2006 in USFWS and CDFG 2012; Central Valley RWQCB 2010).

Although mercury may be present in Sacramento River streambed sediments within the Action/Project Area, the concentration of mercury is likely low. Findings from recently conducted soil sample testing for the Llano Seco Riparian Sanctuary Unit Restoration and Pumping Plant/Fish Screen Facility Project (Riparian Sanctuary Project) did not detect hazardous materials or contaminants (e.g., mercury) in project area soils. They determined that there are low concentrations of metals and other chemicals in the samples tested from the Riparian Sanctuary project area and in soils that would be excavated as part of the bank protection installation or rock removal for that project (USFWS and CDFW 2013). Additionally, mercury

concentrations in the Sacramento River downstream of the Riparian Sanctuary project area would not be elevated as a result of the project (USFWS and CDFW 2013). The Riparian Sanctuary Project is located at RM 178, a short distance downstream of the Action/Project Area. Mercury and other contaminants tend to accumulate and become more concentrated lower in a system. Because mercury was not detected in the sediments at the Riparian Sanctuary site, mercury concentrations in Sacramento River sediments within the Action/Project Area are anticipated to be even lower.

To provide information regarding whether the proposed dredging operations may have the potential to mobilize sediment-laden mercury in the Sacramento River, Reclamation conducted a one-time sampling and sediment characterization within the Action/Project Area during May 2013. The characterization was intended to determine the suitability of sediment for upland disposal, as well as potential water quality impacts caused by re-suspension of sediment during the dredging process. The results of this effort, including details regarding monitoring, data assessment, and water quality findings, are provided in a report titled *M&T / Llano Seco Fish Screen/Pumping Facility Dredging Project Sediment Characterization Report* (Reclamation 2013) and are also summarized in Section 3.6.4 below. Based on the sampling results from Reclamation's sediment characterization, dredging activities would likely result in minimal changes to surface water quality (Reclamation 2013).

The limited mercury work undertaken so far in the Central Valley has concentrated on estimating mercury loads to the Delta and on determining *in situ* mercury bioavailability in Central Valley waterways. Although the bioavailability of these sources of mercury is generally unknown (Central Valley RWQCB 2004), concerns regarding elevated concentrations of mercury in the Sacramento River relate to fish consumption and the protection of wildlife and human health (USFWS and CDFG 2012).

Since 2000, maintenance dredging has been occurring in the Sacramento River Deepwater Ship Channel. Because maintenance dredging in the Sacramento River is part of the Proposed Action/Project and potential effects would be similar to those of other Sacramento River dredging operations, findings from the Sacramento River Deepwater Ship Channel dredging project are summarized here to provide context regarding mercury conditions in the Sacramento River. For those reaches requiring dredging (between RM 4 through 44), sediment chemistry was sampled between 2000 and 2007, and sediment exceedances of criteria for mercury was detected. Only one of 34 discrete samples for total mercury exceeded the Sacramento – San Joaquin TMDL sediment target (Central Valley RWQCB 2001). The mercury concentration at RM 31.0 exceeded sediment quality criteria. Bioaccumulation levels of mercury in aquatic organisms (0.02 to 0.52 mg/kg) exposed to mercury-contaminated sediments (at concentrations ranging from 0.01 to 1.1 mg/kg) were found to be well below levels shown to cause detrimental effects on aquatic organisms (USACE 2011). USACE (2011) determined that the sampling results indicate that the newly exposed surface after dredging would not likely cause any additional risk to aquatic organisms over baseline conditions nor would it cause impairment to beneficial use.

When standard attenuation was calculated for the maintenance dredging placement sites, Waste Discharge Requirement General Order criteria were achieved and the Central Valley RWQCB issued a permit to dredge for every year (USACE 2011). Concentrations of methylmercury increase with distance downstream in the Sacramento River (SWRCB 2008). Because the Sacramento River Deepwater Ship Channel maintenance dredging areas are located a considerable distance downstream of the Action/Project Area and sampling in these downstream areas found that mercury-related sediment levels were below levels to cause adverse effects to aquatic organisms, it is therefore unlikely that upstream sediment in the Action/Project Area would exceed mercury concentration levels that would adversely affect aquatic resources.

The presence of methylmercury in the water in dredged material placement sites has generated recent attention (USACE 2011). Methylmercury may accumulate in wildlife directly, from water in the placement sites, or indirectly, after water is released. A symposium on dredging operations and methylmercury was conducted by the San Francisco Bay Long Term Management Strategy summarizing previous and ongoing pertinent research (LTMS 2010). The interim conclusion was that although there is some cursory knowledge on the relation between certain environmental factors and methylation rates, the state of the science is not sufficient to promulgate best management practices for minimizing methylation (USACE 2011).

A methylmercury Total Maximum Daily Load (TMDL) is in progress for the Delta, and a mercury TMDL for the Sacramento River (Red Bluff to Knights Landing) is scheduled to be developed by 2021 (Central Valley RWQCB 2010).

TURBIDITY

Turbidity is an expression of the optical property that causes light to be scattered and absorbed through the water column. It is caused by suspended matter or impurities (e.g., clay, silt, sand, organic matter and other substances) that interfere with the clarity of the water. The amount of suspended matter and related turbidity levels are a result of natural erosion and sediment transport processes of a fluvial system, with higher discharge volume relating to higher turbidity values (USFWS and CDFG 2012). Based on available data, Sacramento River water quality in the area where dredging could occur can be classified as relatively soft moderately alkaline, containing low to moderate concentrations of total dissolved solids, and containing low concentrations of total suspended solids (CDFG and USFWS 2007). Three years of monthly turbidity data measured at Hamilton City reveal that the turbidity of the Sacramento River ranges between 1 nephelometric turbidity unit (NTU) and 270 NTU (USGS 1993), varying somewhat according to river flow. Turbidity levels in the Sacramento River also fluctuate seasonally. During the rainy season (November–April), turbidity levels of the Sacramento River at Hamilton City range between 5 NTU and 70 NTU, and during the dry season (June-October), turbidity levels range between 1 NTU and 5 NTU (USFWS and CDFG 2012). Turbidity as a result of naturally occurring processes is not necessarily a detriment to beneficial uses, but elevated levels of turbidity due to anthropogenic activities may adversely affect aquatic organisms and other beneficial uses (USFWS and CDFG 2012).

As described in RWQCB (2007), waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses and increases in turbidity attributable to controllable water quality factors shall not exceed the following limits:

- Where natural turbidity is less than 1 NTU, controllable factors shall not cause downstream turbidity to exceed 2 NTUs
- Where natural turbidity is between 1 and 5 NTUs, increases shall not exceed 1 NTU
- Where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20 percent
- Where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs
- Where natural turbidity is greater than 100 NTUs, increases shall not exceed 10 percent

Additionally, there are no known aquatic life impacts when turbidity is below 3 NTUs (RWQCB 2007).

3.6.1.3 GROUNDWATER HYDROLOGY AND QUALITY

Groundwater is water located beneath the ground surface in soil pore spaces and in the fractures of rock formations. The Sacramento River hydrologic region is heavily groundwater reliant. Groundwater provides about 30 percent of the water supply for urban and agricultural uses in the region, and develops in both the alluvial basins and the hard rock uplands and mountains. In Butte County, groundwater reserves are found in the thick sedimentary deposits of the Sacramento Valley and the mountainous areas to the east and north (Butte County 2010). A review of geologic maps prepared by the USGS indicates that wells in the Chico Area probably obtain water from alluvial deposits associated with the Sacramento River (Red Bluff Formation) (CDFG and USFWS 2007). Groundwater recharge occurs primarily from the Sacramento River, with seasonal contributions from Coast Range and Cascade Range tributaries and general surface runoff. The major sources of groundwater recharge in Butte County are precipitation, infiltration from streams, subsurface inflow and deep percolation of applied irrigation water in agricultural areas (Butte County 2010). Throughout a large portion of Butte County, fresh water reportedly extends to a depth of 800 to 1,350 feet below the ground surface, though groundwater levels can change due to extraction and natural processes. Change in groundwater storage is dependent on the annual rate of groundwater extraction and the annual rate of groundwater recharge, which commonly fluctuate within a given year and from year-to-year. During periods of drought, groundwater in storage typically declines, but it increases during periods of above normal precipitation. Groundwater storage also declines during the summer as groundwater is extracted for municipal and agricultural use, and recovers as extraction slows and seasonal precipitation increases recharge. According to Butte County (2010), there has been very little change in groundwater levels in most areas of the valley since the 1970s and 1980s.

Groundwater in the area generally is considered good based on a USGS water quality survey of the Sacramento Valley (USGS 1978). Groundwater is characterized as calcium-magnesium-

carbonate water, generally low in sulfates and chlorides, and having moderate dissolved mineral content with a low sodium absorption ratio. The Butte County Department of Water and Resource Conservation has monitored groundwater quality since 2002. These efforts, in addition to monitoring by other State and Federal agencies, such as the SWRCB and the Federal Toxic Substances Control Board, indicate that Butte County's groundwater is of high quality, free of saline intrusion and generally in good health (Butte County 2010).

3.6.2 REGULATORY SETTING

The following section describes applicable laws, regulations, and standards related to surface and groundwater quality.

3.6.2.1 CLEAN WATER ACT

The Clean Water Act (CWA) is a comprehensive set of statutes aimed at restoring and maintaining the chemical, physical and biological integrity of the nation's waters. The CWA is the foundation of surface water quality protection in the United States[9]. The CWA does not directly address groundwater or water quantity issues.

Initial authority for the implementation and enforcement of the CWA rests with the USEPA; however, this authority can be exercised by states with approved regulatory programs, and, in California, this authority is exercised by the SWRCB and the RWQCB. The CWA contains a variety of regulatory and non-regulatory tools to significantly reduce direct pollutant discharges into waters of the United States, to finance municipal wastewater treatment facilities, and to manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's waters so that they can support "*the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water*."

SECTION 401 OF THE CLEAN WATER ACT

Section 401 of the CWA (33 U.S.C. § 1311) prohibits the discharge of any pollutants into navigable waters, except as allowed by permit issued under sections 402 and 404 of the CWA (33 USC § 1342 and 1344). If new structures (e.g., treatment plants) are proposed, that would discharge effluent into navigable waters, relevant permits under the CWA would be required for the Project applicant(s). Section 401 requires any applicant for an individual USACE dredge and fill discharge permit to first obtain certification from the State that the activity associated with dredging or filling would comply with applicable State effluent and water quality standards. This certification must be approved or waived prior to the issuance of a permit for dredging and filling.

[9] http://www.epa.gov/watertrain/cwa/

SECTION 404 OF THE CLEAN WATER ACT

Section 404 of the CWA authorizes the USACE to issue permits to regulate the discharge of "*dredged or fill materials into waters of the United States*" (33 U.S.C. §1344). Should activities such as dredging or filling of wetlands or surface waters be required for Project implementation, then permits obtained in compliance with CWA section 404 would be required for the Project applicant(s).

STATE RECLAMATION BOARD ENCROACHMENT PERMIT

Under California Water Code Sections 8534, 8608, 8609, and 8710-8723, the California State Reclamation Board is tasked with enforcing appropriate standards for the construction, maintenance and protection of adopted flood control plans. The adopted plan of flood control under the jurisdiction and authority of the Reclamation Board includes the Sacramento and San Joaquin rivers and their tributaries, distributaries, and designated floodways. A Reclamation Board Encroachment Permit must be obtained prior to initiating any activity, including excavation and construction, removal or planting of landscaping, within floodways, levees, and 10 feet landward of the landside of levee toes. Additionally, activities located outside of the adopted plan of flood control but which may foreseeably interfere with the functioning or operation of the plan of flood control also is subject to a permit of the Reclamation Board.

SECTION 1602 OF THE CALIFORNIA FISH AND GAME CODE

CDFW regulates work that will substantially affect resources associated with rivers, streams, and lakes in California, pursuant to Fish and Game Code Sections 1600-1607. Any action from a public project that substantially diverts or obstructs the natural flow or changes the bed, channel, or bank of any river, stream, or lake, or uses material from a streambed must be previously authorized by CDFW in a Lake or Streambed Alteration Agreement under Section 1602 of the Fish and Game Code. This requirement may in some cases apply to any work undertaken within the 100-year floodplain of a body of water or its tributaries, including intermittent streams and desert washes. As a general rule, however, it applies to any work done within the annual high-water mark of a wash, stream, or lake that contains or once contained fish and wildlife, or that supports or once supported riparian vegetation.

PORTER-COLOGNE ACT

The Porter-Cologne Act, enacted in 1969 and amended in 2005, specifies requirements for water quality protection in California. Under the Porter-Cologne Act, California is required to adopt water quality policies, plans, and objectives that ensure beneficial uses of the State are reasonably protected. The SWRCB and the RWQCBs are the agencies charged with the primary responsibilities of water quality protection and CWA implementation in California. In their respective regions, the RWQCBs engage in several water quality functions. One of the most important is preparing and periodically updating water quality control plans (Basin Plans), which specify the beneficial uses to be protected within a particular region. RWQCBs also regulate all

pollutant or nuisance discharges that may affect either surface water or groundwater, including non-point source discharges to surface water. Additionally, the SWRCB, in acting on water rights applications, may establish terms and conditions in water rights permits to help implement water quality control plans.

WATER QUALITY CONTROL PLAN FOR THE SACRAMENTO RIVER AND SAN JOAQUIN RIVER BASINS

The Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Basin Plan) (Central Valley RWQCB 1998) designates beneficial uses, establishes water quality objectives, contains implementation plans and policies for protecting waters of the basin, and incorporates by reference plans and policies adopted by the State Water Resources Control Board (SWRCB). The Basin Plan contains specific numeric water quality objectives that must be attained or maintained to protect beneficial uses (e.g., bacteria, dissolved oxygen, pH, pesticides, electrical conductivity, TDS, temperature, turbidity, and trace elements), as well as numerous narrative water quality objectives, that are applicable to certain waterbodies or portions of waterbodies.

PUBLIC TRUST DOCTRINE

When planning and allocating water resources, the State of California is required to consider the public trust and preserve for the public interest the uses protected by the trust. The public trust doctrine embodies the principle that certain resources, including water, belong to all and, thus, are held in trust by the State for future generations.

In common law, the public trust doctrine protects navigation, commerce, and fisheries uses in navigable waterways. However, the courts have expanded the doctrine's application to include protecting tideland, wildlife, recreation, and other public trust resources in their natural state for recreational, ecological, and habitat purposes and they affect birds and marine life in navigable waters. The National Audubon Society v. Superior Court of Alpine County (1983) 33 Cal 3d 419 decision extended the public trust doctrine's limitations on private rights to appropriative water rights, and also ruled that longstanding water rights could be subject to reconsideration and could possibly be curtailed. The doctrine, however, generally requires the court and the SWRCB to perform a balancing test to weigh the potential value to society of a proposed or existing diversion against its impact on trust resources.

GROUNDWATER MANAGEMENT ACT (ASSEMBLY BILL 3030)

Local groundwater management plans and county ordinances vary by authority, agency and region, but typically involve provisions to limit or prevent groundwater overdraft, regulate transfers, and protect groundwater quality. AB3030, the Groundwater Management Act, encourages local water agencies to establish local Groundwater Management Plans.

3.6.3 ENVIRONMENTAL CONSEQUENCES

3.6.3.1 ASSESSMENT METHODOLOGY

Water quality constituent concentrations are usually highly correlated with river flow, and flow is strongly weather-dependent. According to the EPA (2008), while temporal variations in water quality can be affected by source activity, they are more often related to environmental conditions such as weather and resulting flow patterns. When the source of a pollutant is fairly constant in its frequency and magnitude, low flow (i.e., the period of minimum dilution) is typically the critical condition for the receiving water (EPA 2010; EPA et al. 2002). Dilution is the primary mechanism by which the concentrations of contaminants (e.g., mercury) from point and some non-point sources are reduced. However, during low flow conditions, there is less water available to dilute effluent loadings, resulting in higher in-stream concentration of pollutants (EPA 2010).

Potential water quality impacts are considered here primarily in relation to the potential impacts of suction dredging and spoils disposal in general, including re-suspension of sediments and metals from dredging activities in the Sacramento River, as well as the subsequent fate and transport of these materials. Water quality impact assessment methods focus on the July 1 through October 15 in-river work period, which encompasses the low flow season and potential for decreased dilution capability. Additionally, suction dredges operate using internal combustion engines while floating on the surface of the water. Therefore, the potential exists for oil and gas leaks or spills to occur, resulting in discharges of these contaminants to the Sacramento River, potentially affecting water quality. Discussion of the potential for hazardous materials release can be found in Section 3.12 – Hazards and Hazardous Materials.

In a review of published literature on the effects of suction dredging on streams, Harvey and Lisle (1998) indicate that the effects of suction dredging on river ecosystems have not been studied extensively. Nonetheless, the water quality impact assessment was conducted in consideration of potential suction dredge-related impacts described in available literature. When available, specific reference to Central Valley streams was relied upon. However, the paucity of empirical data describing the potential effects of suction dredging on water quality in the Sacramento River (e.g., effects on sediment mobilization and turbidity increases, mercury and methylmercury mobilization, etc.) often required the use of information from other aquatic systems and geographic locations. Specifically, two recent environmental documents describe potential effects of suction dredging in California. CDFW's Suction Dredge Permitting Program Draft Supplemental EIR (CDFG 2011b) and the Sacramento Deep Water Ship Channel Draft Supplemental Environmental Impact Statement/Supplemental Environmental Impact Report (USACE and Port of West Sacramento 2011) were used, as appropriate, to describe potential impacts on water quality resulting from suction dredging. Although these documents are not directly relevant to the type of suction dredging activities to be conducted as part of the Proposed Action/Project because the aquatic environments and dredge equipment differ from those at the

M&T/Llano Seco Pumps Facility it was assumed that potential impacts on water quality would be similar.

3.6.3.2 SIGNIFICANCE CRITERIA

The significance criteria used to evaluate potential impacts on hydrology and water quality were based on and incorporate guidance contained in Section 1508.27 of the CEQ NEPA regulations regarding significance determinations; the mandatory findings of significance, as listed in Section 15065 of the State CEQA Guidelines (Title 14, Chapter 3 of the CCR); and criteria derived from Appendix G of the State CEQA Guidelines (for additional detail, see Section 3.3.3.2).

For the purposes of this analysis, the Proposed Project would be considered to have an adverse effect under NEPA and a significant impact under CEQA on hydrology and water quality if it would contribute to any one of the following within the Action/Project Area.

- Substantial alteration in the quantity and quality of surface runoff.
- Substantial degradation of water quality.
- Violation of any water quality standards or waste discharge requirements.
- Substantial alteration of the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in increased flood risk or result in substantial erosion or siltation on- or off-site.
- Placement of structures that would impede or redirect flood flows within a 100-year floodplain.
- Exposure of people, structures, or facilities to significant risk from flooding, including flooding as a result of the failure of a levee or dam.
- Creation of or contribution to runoff that would exceed the capacity of an existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.
- Substantial depletion of groundwater supplies or substantial interference 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 which would not support existing land uses or planned uses for which permits have been granted.

Some of the criteria contained in Appendix G of the State CEQA Guidelines do not apply to the Proposed Project, and in particular include: (1) inundation by seiche, tsunami or mudflow; and (2) 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 are not applicable

because the Proposed Project would not involve construction of housing and does not have the potential to cause a seiche, tsunami or mudflow that would pose a significant impact to hydrology and water quality.

3.6.3.3 IMPACT ANALYSIS

The evaluations below describe the types of effects that could occur on hydrology and water quality as a result of the Proposed Project under the following three scenarios.

- No Action Alternative Compared to Existing Conditions (NEPA Analysis)
- Proposed Action/Project Compared to Existing Conditions (CEQA Analysis)
- Proposed Action/Project Compared to the No Action Alternative (NEPA Analysis)

Following the presentation of technical information, a conclusion is made at the end of each analytical comparison regarding whether the scenario evaluated, relative to the basis of comparison, would have an adverse effect under NEPA or a significant impact under CEQA, as appropriate.

NO ACTION ALTERNATIVE RELATIVE TO EXISTING CONDITIONS (NEPA ANALYSIS)

***H-1**. Potential to increase surface runoff or exacerbate flooding-related impacts in the vicinity of the Action/Project Area.*

Several technical investigations (e.g., USACE's Hamilton City Flood Damage Reduction Project) have been conducted to characterize Existing Conditions and the potential for flood-related impacts in the M&T/Llano Seco reach of the Sacramento River. A recent study also was conducted to evaluate potential effects of the Proposed Hamilton City Setback Levee Project on the reach of the Sacramento River, the results of which are useful for characterizing Existing Conditions. These studies are summarized below.

Analytical results presented in Tetra Tech (2011) indicate that, while the J-Levee project would significantly affect water-surface elevations upstream of the M&T/Llano Seco reach, there would be little or no impact within the reach (**Figure 3.6-5**). The inclusion of the setback levee decreases the width of the floodplain, and as the result, the water-surface elevations increase in area to the east of the setback levee, and decrease in the area behind (to the west) of the training levee. The effect of the proposed setback levee, as shown by the area with the increase in water-surface elevations, extends downstream along the floodplain to approximately opposite the M&T/Llano Seco Pumps Facility. The largest increase in water surface elevation opposite the M&T/Llano Seco Pumps Facility is about 0.2 feet, occurring approximately 1,500 feet to the west of the main channel. The water-surface elevations in the vicinity of River Road increase by approximately 0.1 feet under the proposed setback levee conditions.

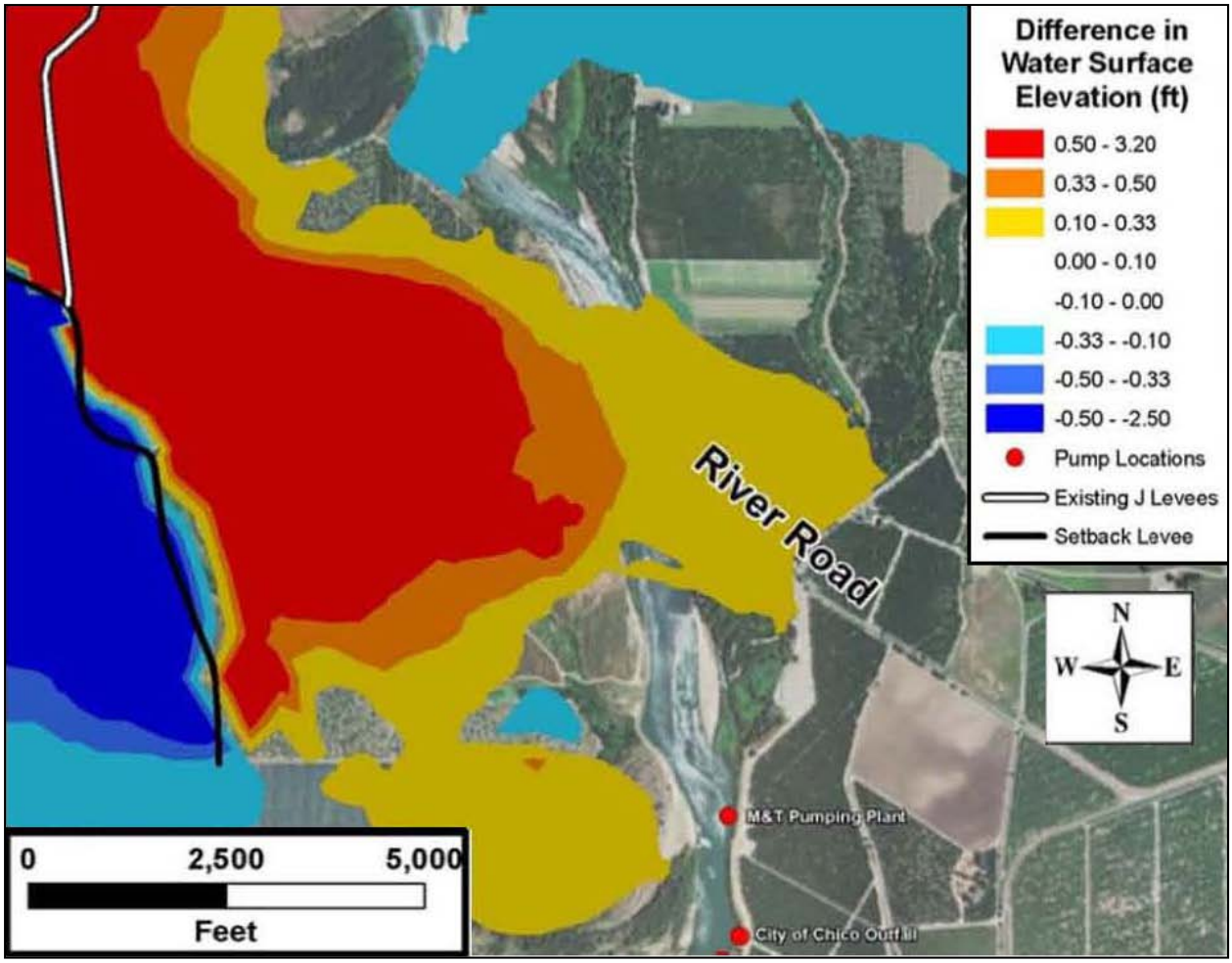

Figure 3.6-5. Difference in Water Surface Elevation at the 50-year Peak Flow Event Between the Phase III Setback Levee Model and Phase III J-Levee Model Conditions (Tetra Tech 2011).

WQ-1. *Potential for increased turbidity and sedimentation, including release of mercury, resulting in reduced surface water quality in the Sacramento River.*

Under the No Action Alternative, existing in-river conditions would predominate because no dredging activities would occur. If the encroaching sedimentation renders the M&T/Llano Seco Pumps Facility non-functional prior to implementation of a long-term solution, under the No Action Alternative, the M&T Chico Ranch/Llano Seco Rancho could exercise their right to divert their entire Butte Creek entitlement at the Parrott-Phelan Diversion Dam, foregoing the 40 cfs bypass which has maintained Butte Creek instream flows since implementation of the 1996 Agreement. The Sacramento River entitlement would be diverted at the Big Chico Creek diversion facility.

Under Existing Conditions, diversions at the M&T/Llano Seco Pumps Facility reportedly divert an estimated 1 percent of the Sacramento River's average flow and, thus, the effect on daily flows in the Sacramento River would be negligible (Jones and Stokes 1996). In consideration of the total volume of water in this reach of the Sacramento River, relative to the potential change

in flow that could occur if the M&T/Llano Seco Pumps Facility was rendered non-functional, Sacramento River water quality conditions generally would remain similar to those under Existing Conditions.

***WQ-2**. Potential to reduce water quality in Butte Creek.*

Under existing conditions, Butte Creek water quality is considered to be good to excellent, especially in the upper watershed (SRWP 2012). Seasonal variability does occur, and is related to weather patterns and reduced flows resulting from existing water diversions and other management activities. Increased water temperatures are of concern due to the potential for elevated water temperatures to negatively impact anadromous fish passage and survival in Butte Creek (for more information, see Chapter 3.3 – Fisheries and Aquatic Resources).

If increasing sediment deposition were to render the M&T/Llano Seco Pumps Facility non-functional prior to implementation of a long-term solution, under the No Action Alternative, the M&T Chico Ranch/Llano Seco Rancho could divert their entire Butte Creek entitlement at the Parrott-Phelan Diversion Dam, foregoing the 40 cfs bypass which has maintained Butte Creek instream flows since implementation of the 1996 Agreement. In the event that increased water diversions from Butte Creek were to occur under the No Action Alternative, it is reasonable to assume that reductions in Butte Creek flows of up to 40 cfs could occur downstream of the Parrott-Phelan Dam from October 1 through June 30 of each year.

As described above, the No Action Alternative would be likely to decrease the amount of flow in Butte Creek from October through June, which could be more than 30% of the mean monthly flow during October (CDFG et al. 1996). Historically, this reduction in flow could be potentially significant in dry years when flows from October through January were less than 100 cfs (CDFG et al. 1996). Although diversions from Butte Creek were reported to be previously curtailed from November through March because of a lack of demand and to allow for channel maintenance (Butte Creek Watershed Conservancy 1998), this is no longer the case due to Llano Seco Rancho becoming a refuge-wetland. During April, May and June, large quantities of water are needed to flood rice fields and irrigate orchards (Jones and Stokes 1996). Prior to relocation of the M&T/Llano Seco Pumps Facility in 1997, water during the months of April, May and June was diverted from Butte Creek. Diversions generally decline in the early summer and increase again in early fall as fields are flooded for waterfowl habitat. Under the No Action Alternative, M&T Chico Ranch would continue to take delivery of their water rights for crop irrigation purposes. It also is assumed that the USFWS and CDFW will limit delivery of Llano Seco's available supplies for wetland habitat management and restoration purposes, as was the practice prior to relocation of the M&T/Llano Seco Pumps Facility in 1997 (CDFG et al. 1996).

As part of the existing irrigation system, Comanche Creek is used to convey water diverted from Butte Creek into the Phelan Canal (Jones and Stokes 1996). Flows are diverted from Butte Creek to Comanche Creek to supply the Comanche Creek irrigation system, which provides water to M&T Chico Ranch, Llano Seco Rancho, the Llano Seco wildlife refuges, Dayton Mutual water

users, and others. The creek flows into the Phelan Canal approximately 3 miles past Edgar Road. At the intersection of Comanche Creek and the Phelan Canal, water can be diverted south to Llano Seco Rancho, north to M&T Chico Ranch, or west into the Phelan Canal. There is a surge pond at the intersection to provide temporary storage of water (Jones and Stokes 1996). On the northwest bank of Butte Creek, there is a screened inlet for diversion and a fish ladder on the mainstream to allow fish passage alongside the dam. Diversions from Butte Creek are controlled with a screw gate and conveyed with a natural and improved channel (Jones and Stokes 1996). The ranches prefer to divert from Butte Creek to Edgar Slough and Comanche Creek because the system operates by gravity (Jones and Stokes 1996). As part of the No Action Alternative, diversions from Butte Creek to Comanche Creek would be increased by up to 40 cfs at the Parrott-Phelan Diversion Dam from October through June. Because the No Action Alternative would increase flow in Comanche Creek during this period, the increased flows entering Comanche Creek may slightly increase groundwater recharge to local wells. Comanche Creek would continue to be used to deliver water to other users and to convey stormwater.

The No Action Alternative would not affect diversions from Butte Creek during July, August, and September and, thus, flows in Butte Creek and in other tributaries that are part of the water conveyance system would not be affected by project operations during these three months (i.e., the summer low flow period).

Butte Creek flow reductions from October 1 through June 30 would have the potential to adversely affect several beneficial uses, including water quality. Reduced flows in the lower reaches of Butte Creek between the Parrott-Phelan Dam and the confluence of Butte Creek and the Sacramento River during October and during the April through June period could result in warmer water temperatures, which may cause instream conditions (e.g., lower dissolved oxygen concentrations) to be less suitable for fisheries and aquatic resources. Therefore, overall, potential impacts to water quality in Butte Creek could be adversely affected under the No Action Alternative.

***WQ-3**. Potential to reduce water quality in Big Chico Creek.*

Under the No Action Alternative, the ranches could relocate the diversion to its previous location on Big Chico Creek if the sediment deposition were to render the M&T/Llano Seco Pumps Facility non-functional prior to implementation of a long-term solution. Historically, pumping on Big Chico Creek generally increased throughout the spring months and did not increase substantially until the later portions of May (CH2MHill 1993). Prior to construction of the M&T/Llano Seco Pumps Facility, the pump station on Big Chico Creek diverted up to 135 cfs at maximum capacity, drew water approximately 0.75 miles up the channel of Big Chico Creek from the Sacramento River, and resulted in reverse flows in the lowermost section of Big Chico Creek.

Big Chico Creek hydrologic data suggest that the highest seasonal flows generally occur during December through April and the lowest flows occur from June through October. Located in a

backwater slough, past operations of the Big Chico Creek pumping plant caused flow reversals during the April through June period, which occurred in approximately one out of four years (Resources Agency 1989). Under the No Action Alternative, it is assumed that operations associated with reinitiating diversions on Big Chico Creek would result in conditions similar to those that occurred before 1997.

During certain months of the year, reverse flows would draw Sacramento River water upstream into the lower 0.75 miles of Big Chico Creek, causing Sacramento River water to mix with water flowing out of Big Chico Creek. Although water quality in the Sacramento River is generally good, the remote possibility exists that a small amount of contaminants (e.g., pesticides, trace metals) from the Sacramento River could be introduced into the lower reach of Big Chico Creek, particularly during low flow conditions when contaminants would be more concentrated. More importantly, however, because the old pumping plant is located in a backwater area possessing little water movement during low flow conditions when there is a lack of hydrologic continuity with upstream reaches, the increased volume of water from the Sacramento River would increase mixing in this backwater area, which could increase dissolved oxygen levels and dilute concentrations of contaminants that may have previously accumulated in the stagnant, backwater area. During the summer (i.e., June-October), base flows in Big Chico Creek typically range from 20 to 25 cfs above Five-Mile Diversion (east Chico) and most of this base flow is lost to infiltration in the region of Big Chico Creek's outwash fan. Therefore, by late summer during most years, surface flows do not extend downstream of Rose Avenue (west Chico) (USFWS 1995 as cited in NMFS 2009b). Because of the lack of hydrologic continuity between the upstream reaches of Big Chico Creek and the lower reach where diversions from the old pumping plant site would be reinitiated, it is unlikely that the No Action Alternative would adversely affect water quality conditions in Big Chico Creek.

Overall, the slight changes in water quality conditions that may potentially occur in the lowermost reach of Big Chico Creek under the No Action Alternative would not be expected to substantially adversely affect beneficial uses, including fisheries resources.

Removal of the Temporary Rock-toe and Tree Bank Revetment

H-2*. Potential to increase surface runoff or exacerbate flooding-related impacts in the vicinity of the Action/Project Area.*

Removal of the existing rock-toe and tree revetment under the No Action Alternative would return the 1,520 linear feet of riverbank along the Sacramento River to the physical conditions that were in place in 2007, resulting in decreased bank stability, increased bank disturbance, and increased potential for continued river meander and continued erosion of the west bank of the Sacramento River. Flooding potential, and Sacramento River channel migration patterns and rates in the vicinity of Action/Project Area would return to the localized site-specific conditions that existed prior to revetment installation in 2007. However, revetment removal would not be expected to increase exposure of people, structures, or facilities to significant risk from flooding.

Additionally, the construction period associated with revetment removal would be limited to between July 1 and October 15 to minimize flooding potential. Therefore, the No Action Alternative would not cause incremental risks to any flooding problems.

***WQ-4**. Potential for increased turbidity and sedimentation, including release of mercury, resulting in reduced surface water quality in the Sacramento River.*

During construction activities associated with revetment removal, there also would be temporary, localized increases in turbidity and sediment levels that would have the potential to degrade water quality and affect the beneficial uses of the Sacramento River. The removal of about 5,482 cubic yards (9,120 tons) of rock within the Sacramento River channel would temporarily generate increased turbidity in the immediate vicinity of the Action/Project Area. Removal of stone at or below the water surface could result in a plume of sediments generated from the channel bottom and the channel side, becoming suspended in the water and could generate turbidity levels above those identified as acceptable by the Basin Plan (the Basin Plan identifies a change in turbidity above 10 percent of the ambient turbidity as significant). Because the in-river area that would be disturbed during removal of the rock-toe revetment was previously disturbed during revetment installation in 2007, the potential for mercury remobilization is remote, but nevertheless remains a concern. The turbidity resulting from construction has the potential to be significant unless control measures are taken. Potential impacts associated with sedimentation and turbidity would be reduced or avoided through implementation of a SWPPP, an ECP, and PCSWMP by the contractor.

On a long-term basis, episodic bank erosion would resume and subsequently continue to occur as a result of flood flows, wave wash, and human use of the site. Short-term turbidity would be generated during bank erosion events. However, turbidity would be masked if erosion occurs during high-flow events when the Sacramento River is already extremely turbid. Overall, the No Action Alternative would not adversely affect water quality in the Sacramento River.

***WQ-5**. Potential for hazardous materials releases resulting in reduced groundwater quality or surface water quality in the Sacramento River.*

Under the No Action Alternative, the rock-toe and tree revetment would be removed from 1,520 feet of shoreline along the west bank of the Sacramento River. Under this alternative, revetment removal activities would involve the use of a wide variety of potentially hazardous materials such as oils, greases, fuels, and other similar materials. As with any construction project, the construction phase of this alternative includes a risk of accidental or inadvertent discharge of hazardous materials that, if released to a surface water body in sufficient volumes, may be toxic to aquatic resources and wildlife. This resource would not be considered adversely affected, however, because preparation and implementation of a hazardous spill prevention plan (see ***Environmental Commitment HAZ-1***) is being required to address potential hazardous materials spills that could occur during construction activities.

PROPOSED ACTION/PROJECT RELATIVE TO EXISTING CONDITIONS (CEQA ANALYSIS)

In-river Dredging and Spoils Disposal

***H-3**. Potential to increase surface runoff or exacerbate flooding-related impacts in the vicinity of the Action/Project Area.*

As described above, the hydraulics and sediment transport characteristics of the project reach have been modeled extensively for a wide range of flows (10,000 cfs to 134,000 cfs). Initial one-dimensional modeling (HEC-RAS) of both the reach hydraulics and sediment transport was conducted in 2003 (Mussetter Engineering, Inc. 2004). Two-dimensional (RMA-2) modeling of the hydraulics and sediment transport within the project reach (RM 190 to RM 195) was subsequently conducted to evaluate existing conditions and a range of alternatives and their potential upstream and downstream impacts (Mussetter Engineering, Inc. 2005, 2006, 2008). A scaled (1:100) physical model of the reach also was developed to investigate and validate the hydraulics and sediment transport conditions under existing conditions and a number of potential project alternatives (Colorado State University 2008). Additional 2-dimensional hydraulic and sediment transport modeling (SRH-2D and SRH-2DSED) of the reach was conducted under a range of flows (66,000 cfs, 76,000 cfs and 102,000 cfs) to evaluate pump relocation and dredge alternatives (Tetra Tech 2011, 2012c) and the alternatives were further investigated with a 1:75 scaled physical model (Colorado State University 2011). Finally, a 3-dimensional hydrodynamic model was developed to investigate the presence of a helical flow cell in the vicinity of the fish screens and pump inlets that may be responsible for limiting sedimentation in the immediate vicinity of the screens under current river geometry (Alden 2012). The hydraulics and sediment transport results from the entire suite of numerical and physical models are summarized in Tetra Tech (2012b). Additionally, although not directly applicable to the Proposed Project evaluated in this Draft EA/IS, meander modeling of the reach with and without existing bank revetments, and with and without various alternatives, was conducted to evaluate the potential impacts of the project on river meandering and resulting ecological succession (Larsen 2005, 2008).

The M&T/Llano Seco Pumps Facility and intake structure was designed to operate at design capacity under wide range of river flow conditions, from minimum drought flows to maximum flood flows (CH2MHill 1995). In addition, the pump station was located at an elevation that will ensure major equipment is protected during a 100-year flood. Analysis by CH2M Hill (1995) indicated that a 100-year peak flows of 285,000 cfs would have a water-surface elevation of approximately 136 feet in the vicinity of the project (RM 192.6), well below the top of the existing flood control levee along the east bank of (~140 feet). The revised 100-year peak flow from Tetra Tech (2011) of about 276,000 cfs would have an even lower elevation relative to the top of the levee.

The existing stockpile is subject to some flooding at flows in excess of about 90,000 cfs, which is the bankfull channel capacity of the Sacramento River in this reach. However, two-

dimensional hydraulic modeling indicates that the flow velocities in the vicinity of the stockpile are very low at both the 50- and 100- year recurrence interval peak flow events (MEI 2005).

Additionally, two-dimensional hydrodynamic modeling (RMA-2) (Mussetter Engineering 2006) and scaled physical modeling (Colorado State University 2006) showed that the existing gravel stockpile has very little, if any, effects on hydraulic conditions within the project reach. On the rare occasions when the peak flows in the two systems are coincident, Big Chico Creek experiences backwatered from the Sacramento River, and thus the velocities in Big Chico Creek are very low. When the peak flows are not coincident, the Big Chico Creek flows do not impinge on the stockpile and thus the stockpile has no hydraulic impact. Following initial construction of the stockpile in 2001, floodplain volume remained essentially the same because the gravels were dispersed at the storage area in a pattern similar to their distribution on the gravel bar. The 2001 project did not include the construction of any additional impervious area, and CDFG (2001) determined that the drainage pattern or quantity of direct run-off was not altered by the stockpile placement.

Under the Proposed Action/Project, dredged material removed from the Sacramento River would be placed on top of the existing stockpile. Because the top of the existing stockpile is higher in elevation than the existing flood control levee, the new material would be above the area of the existing floodplain that is subject to inundation. As a result, the Proposed Action/Project will not impact the extent of the 100-year flood, nor will it expose people or structures to increased risk of harm due to flooding. Storage of dredged material will not significantly impede or redirect flows, as the storage area is within a backwatered portion of the floodplain. Consequently, the Proposed Action/Project will have less than significant impact, relative to Existing Conditions.

***WQ-6**. Potential for increased turbidity and sedimentation, including release of mercury, resulting in reduced surface water quality in the Sacramento River.*

Discharges from dredging operations may contain suspended solids, turbidity, oxygen-depleting compounds, and increased metal concentrations, which impact water quality near the dredging site. Water column effects from dredging may occur when contaminants on the sediment particles are either dissolved or resuspended in the water column. Dredging operations may cause some degradation temporarily to surface waters as concentrations of turbidity, total suspended solids, and other wastes may increase and dissolved oxygen decrease as bottom sediments are disturbed in the excavation process. To determine whether dredging activities have an impact to the surface waters, receiving water monitoring often is appropriate.

Overview

The proposed suction dredging activities would remove up to approximately 200,000 cubic yards of material immediately upstream, adjacent to, and downstream of the M&T Chico Ranch/Llano Seco Rancho pumping plant facilities. The dredge boat is an anchored barge with a basket cutterhead mounted to a ladder positioned at the front of the boat. A suction pipe located within the cutterhead runs from the cutting apparatus, along the length of the barge, and extends from

the rear of the barge with a flexible flanged pipeline system that will float on the river from the barge to shore. Additional segments of pipeline will be added to the floating portion of the pipeline system as the barge advances downstream. Polyethylene pipe connected to the floating pipe will be placed on the riverbank and will remain stationary, extending from the riverbank to a spoils containment area. Detailed discussion on the dredging process, including details of how dredging activities are completed by such a vessel are found in Section 2.0, Project Description.

Gravel materials will be excavated to a depth of approximately 20 feet, with about 15-16 feet of material removed in 4-5 feet of moving water. Due to the size of the sedimentation field, the dredge vessel is expected to make several passes over the sedimentation field, with each pass beginning at the upstream end and suction dredging in a downstream direction. The production rate is anticipated to be about 90 cubic yards per hour using a 550 horsepower motor that will pump approximately 7,000 gallons of water per minute (420,000 gallons per hour) with enough force to mobilize and pump course material to the containment area located approximately 1,600 to 2,500 feet away.

Refueling will be conducted once per day using a skiff boat to transfer approximately 120 gallons of fuel to the barge. Appropriate spill prevention measures will be applied, and are further discussed in the Hazardous Materials section.

The excavated materials will be disposed of in confined disposal areas located upstream and inland from the dredge site, in an area that already holds approximately 300,000 tons of materials that were stockpiled during dredging activities in the same project area in 2001 and 2007. Two containment areas, bound by six-foot high berms will be established within the spoils disposal area. Containment Area #1 will receive the dredge spoils pumped directly from the Sacramento River and Containment Area #2 will be available for overflow and serve as a siltation and settling pond area. Both areas will be fully enclosed to ensure that no water re-enters the river. In the event that the water in Containment Area #2 exceeds the rate of absorption into the ground, two 5,500 gallon per minute capacity pressure pumps will be used to pump the excess water through approximately 1,100 feet of aluminum pipeline to a stilling well at the M&T Chico Ranch/Llano Seco pumping plant.

Assessment

Turbidity

Suction dredging activities cause resuspension of course and fine sediments into the water column. Fine sediment resuspension increases water turbidity levels immediately downstream of dredging areas and increases near-field and far-field transport of total suspended solids (TSS) downstream of the dredging. Both turbidity and TSS are regulated water quality parameters, and increased water column concentrations have the potential to adversely affect aquatic organisms, or other beneficial uses.

The operation of hydraulic dredges (e.g., cutterhead) will resuspend some sediment dislodged by the cutterhead that escapes the suction pipe. Both the mechanical force of the rotating cutterhead and the plowing action of the swinging ladder result in some resuspension of sediments. The shearing action of a cutterhead dredge through sediment, in combination with the positioning of the suction pipe for the dredge, results in the formation of a fallback layer (sometimes referred to as a spillage layer) unique to hydraulic dredging, as shown in **Figure 3.6-6**. The spillage from a cutterhead suction dredge is defined as the amount of material that is cut by the cutter but is not removed from the system by the suction line (Burger 2003). This material can either settle to the bottom of the channel as a residual or become resuspended sediment in the water column causing turbidity (Bridges et al. 2008). When the sediment is resuspended, a plume may form. The plume from a cutterhead suction dredge normally stays near the bottom of the water profile but can travel in horizontal directions and affect the water quality in specific locations (Henriksen 2009).

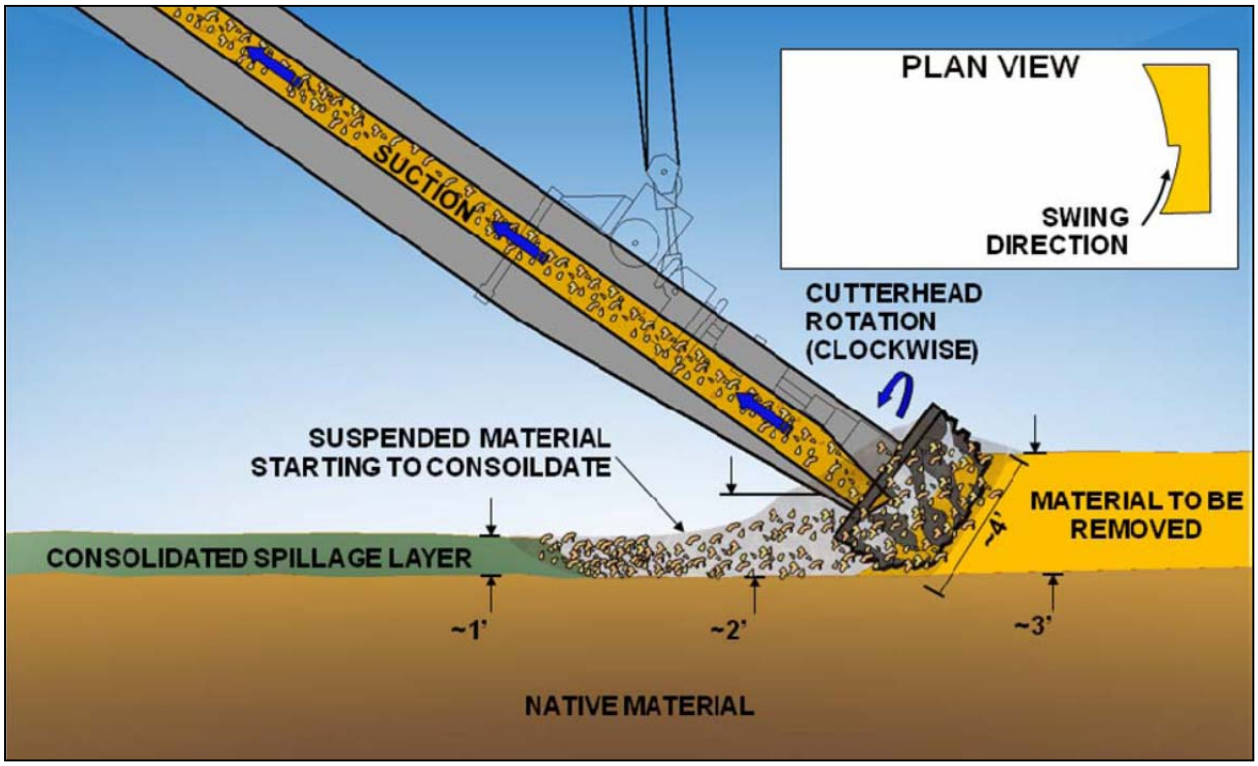

Figure 3.6-6. Illustration of the Typical Spillage Layer from a Cutterhead Suction Dredge (Palermo et al. 2008).

The thickness of the spillage layer is a function of the dredged material type, and can be affected by specific operating parameters including the configuration of the cutterhead and suction pipe, velocity within the flowfield around the cutterhead and intake pipe, cutterhead revolution speed, thickness of the cut, the ladder angle, the ladder swing speed and the method in which the dredge is operated (Palermo et al. 2008). As a rule of thumb, Palermo et al. (2008) report that the thickness of the spillage layer for a conventional cutterhead dredge can be about 0.2 times the

cutterhead diameter or 0.5 times the discharge pipe diameter. For dredges with articulated ladders, the suction pipe can be located closer to the cutline, with a resulting decrease in the spillage layer thickness (perhaps half of the spillage of a conventional ladder) (Palermo et al. 2008). If the rate of advance of the ladder swing advance exceeds the capability of the suction to remove dislodged material, the dredgehead is essentially plowing through the sediment, with increased resuspension and release (Palermo et al. 2008). By reducing the amount of spillage, the production of the dredge can be maximized and the turbidity generation can be minimized (Henriksen 2009).

A properly designed cutter will efficiently cut and guide the bottom material toward the suction, but the cutting action and the turbulence associated with the rotation of the cutter will resuspend a portion of the bottom material being dredged (Herbich and Brahme 1991). Most of the sediment resuspended by a cutterhead dredging operation is found in the lower portion of the water column where the cutter encounters the sediment, and elevated levels of suspended material appear to be localized to the immediate vicinity of the cutter as the dredge swings back and forth across the dredging site (Barnard 1978 in Herbich and Brahme 1991).

Potential impacts from turbidity and TSS on aquatic organisms are discussed in Section 3.3 – Fisheries and Aquatic Resources. As determined in CDFW's Literature Review conducted during development of the Suction Dredge Permitting Program Draft Supplemental EIR, available scientific studies of suction dredging suggest that the effects on turbidity and suspended sediment concentrations on aspects of water clarity and physical effects to aquatic organisms are limited to the area immediately downstream of the dredging for the duration of active dredging (CDFG 2011b). Although this study was primarily conducted for suction dredge gold mining, hose sizes up to 10 inches and motors up to 36 horsepower were included in the review. However, it is likely that larger motors would produce greater suction, thereby further limiting downstream sediment plumes. The document also noted that settling rates are largely determined by the grain size of the suspended material. Although grain size distributions in the Action/Project Area have not been evaluated in detail, reconnaissance level observation as part of the 2007 Temporary Maintenance Project and subsequent observation of the dredged material indicated that gravel in the area is relatively course (golf ball to softball-sized gravel was the most common size distribution observed). Although river substrates can become embedded (i.e., larger gravel surrounded and buried by finer materials), the degree to which the Action/Project Area substrates are embedded is unknown. Stillwater Sciences (2003) reported that fine sediments were patchily distributed with fine sediment composition increasing on the downstream ends of point bars at three study sites on the Sacramento River between Red Bluff (RM 243) and Colusa (RM 143). One of the study sites, Phelan Island, was located downstream of Big Chico Creek at RM 192-193 (i.e., the vicinity of the Action/Project Area). Based on observed gravel size distributions and reported patchy distribution of fine sediments in the Action/Project Area, large amounts of silt and clay fine sediments generally are not present in the reach and, thus, are not be available for extended resuspension.

Further, CDFG (2011b) indicates that "*the turbidity plumes created by suction dredging likely may exceed the applicable Basin Plan objectives, particularly in streams that have low background turbidity levels*." However, CDFG and USFWS (2007) reported that background turbidity in the Sacramento River at Hamilton City have ranged from 1 nephelometric turbidity unit (NTU) to 270 NTU. Although water quality in the Action/Project Area also is reported to be generally good (median of 3 NTU during September and October according to CDFG and USFWS (2007) available literature indicates that turbidity and TSS concentrations within suction dredging plumes are unlikely to exceed 50 NTUs and 340 mg/L, respectively, and are, therefore, not expected to approach or exceed the levels that would cause lethal or other adverse physiological effects to fisheries or other aquatic resources (CDFG 2011b). Moreover, the potential for dredge-induced increases in turbidity/TSS levels would be expected to rapidly return to near background levels downstream within a few hundred meters or less of the dredge operation (CDFG 2011b). Thus, while potentially exceeding a Basin Plan turbidity objective within temporary plumes created during dredging operations, CDFG (2011b) reported that "*suction dredging activity permitted under the Program is not expected to adversely affect aquatic organisms, which is the most sensitive beneficial use that could be affected by elevated turbidity/TSS levels*" (CDFG 2011b).

In another review of suction dredge impacts conducted during the Draft SEIS/SEIR for large commercial dredging in the Sacramento River Deep Water Ship Channel (USACE and Port of West Sacramento 2011), it was reported that larger plumes and elevated suspension levels typically occur at the bottom closer to the actual dredging action, and sediment plume sizes decrease exponentially with movement away from the dredging site both vertically and horizontally (Bridges et al. 2008; Nightengale and Simenstad 2001; both as cited in USACE and Port of West Sacramento 2011). Further, the SEIS/SEIR states that studies have shown that typical resuspension rates range from less than 0.1 percent to more than 5 percent, with cutterhead type equipment producing limited resuspension rates (Anchor 2003; Hayes and Wu 2001; both as cited in USACE and Port of West Sacramento 2011). The length of time it takes for the suspended material to settle, combined with the current direction and velocity, would determine the size and duration of the turbidity plume; however, it is expected that the mixing zone would rapidly return to baseline or pre-construction conditions upon completion of the construction activities. Settling rates are largely determined by the grain size of the suspended material. In addition, cutterhead dredging minimizes turbidity at the dredge location due to the suction of the dredge (USACE and Port of West Sacramento 2011). In the event that project activities result in the creation of a visible plume in the Sacramento River, or if activities cause an increase in turbidity of 20 percent higher than naturally occurring turbidity levels, monitoring (e.g., grab sampling) will be conducted. If increases in turbidity exceed 20 percent, the contractor will coordinate with the appropriate agencies, including the Central Valley RWQCB, to determine if remedial measures, if any, are necessary.

Dissolved Oxygen

Potential impacts due to dredging also include short-term decreases in dissolved oxygen (DO) and increases in nutrient concentrations as a result of resuspension of sediment and sediment-bound organic material. These impacts would be temporary, generally confined to the dredging area, and would return to baseline levels following dredging activities in the immediate area (USACE and Port of West Sacramento 2011). USACE (1998) report that the reduction in DO during dredging is minimal (1 to 2 ppm) and transitory in surface waters, but can be slightly more severe in bottom waters (reduction of up to 6 ppm for 4 to 8 minutes). Further studies conducted by the USACE Dredged Material Research Program supported the hypothesis that localized decreases in DO would dissipate rapidly, and were often undetectable only a short distance from the dredge (USACE and Port of West Sacramento 2011). A number of other studies reviewed by LaSalle (1988, as cited in USACE and Port of West Sacramento 2011) showed little or no measurable reduction in DO around dredging operations.

Mercury

The vast majority of mercury lost to the environment in California was from placer-gold mines, which used hydraulic, drift, and dredging methods (USGS 2000). The northwestern Sierra Nevada region was extensively mined for both its hardrock-gold and placer-gold deposits. In the northwestern Sierra Nevada region, it was primarily the watersheds of the American, Bear, Yuba, and Feather rivers that were affected by hydraulic mining (USGS 2000), all of which are located south (downstream) of the project site by more than 100 miles. Additionally, concentrations of mercury in the streambed sediments of 24 sites sampled in California during the USGS National Water-Quality Assessment Program suggested that sites on the Sacramento River downstream from the Feather River tended to have higher mercury concentrations relative to sites sampled upstream from the confluence of these two rivers because of the locations of historical gold mining (USGS 2000).

While release of contaminants during dredged material disposal operations has long been a subject of environmental concern (Ludwig and Sherrard 1988), the potential release of pollutants during the dredging process has recently come under the scrutiny of Federal and State regulatory agencies. Although the concentration of sediment-bound mercury within the proposed dredging area is likely low, if any, the potential for mobilization and downstream transport exists as a result of suction dredging. The downstream distance of mercury transport associated with suction dredging has not been empirically tested but reportedly has some potential for long-range transport (CDFG 2011a). Further, CDFG (2011a) reported that neither the aquatic nor human toxicity of mercury discharged from suction dredging operations have been sufficiently evaluated for even small dredging efforts in California. A data gap exists in the characterization of the typical range of mercury discharged during suction dredging at different locations and likely is dependent on sediment characteristics, suction dredge size, and specific dredge operations.

Potential effects of mercury in the water would be dependent on the reactivity of mercury, which could be altered by in-river disturbance or transport, and could contribute to increased mercury levels in fish tissues in downstream reaches, as well as elevated mercury levels that could affect beneficial uses (USFWS and CDFG 2012). At this time, it is not clearly understood whether the reactivity or speciation of mercury remaining at a dredge site is altered by dredging activities (CDFG 2011a). Concentrations of mercury resuspended in the water column are anticipated to correlate with suspended sediment because most of the load is transported with the suspended material and remains bound to the sediment particles (Alpers et al. 2000). Because it is anticipated that the plume of resuspended particles is limited in size and expected to settle downstream relatively quickly, it is also anticipated that the level of mercury resuspension will be low.

Mercury and other contaminants tend to accumulate and become more concentrated lower in a system. Although mercury has the potential to be present in streambed sediments in the project vicinity based on historical conditions, recent sediment sampling efforts conducted downstream for the Riparian Sanctuary Final EIS/EIR (USFWS and CDFW 2013) determined that "*concentrations of metals and other chemicals evaluated in the lab were low, and mercury, as well as several other chemicals, was not detected…*". Additionally, USFWS and CDFW (2013) also stated that "*Based on soil sampling and a phase I environmental site assessment conducted since the Draft EIS/EIR was published, no hazardous materials or contaminants have been identified in the project area or in soils that would be excavated as part of the bank protection installation or rock removal. No impacts from mercury-rich sediment are anticipated during project implementation, and mercury concentrations in the Sacramento River downstream of the project area would not be elevated as a result of the project*."

It is likely that previous gravel bar removal operations conducted during 2001 and 2007 have resulted in the downstream transport of sediment from the Action/Project Area. As part of the two previous gravel excavations, the outer berm remaining after construction was inundated and scoured by higher winter flows, which also transported material downstream. Because mercury was not detected in the sediments at the Riparian Sanctuary site (~RM 178), it is likely that mercury concentrations in the Sacramento River 15 miles upstream in the Action/Project Area (~RM 192.5) are even lower and, thus, would not have the potential to significantly impact water quality.

The mechanical action of a dredging operation causes resuspension of sediment particles and release of soluble contaminants to the water column. A pre-dredging test can be used to estimate the amount of soluble release at or near the point of dredging to ascertain potential water quality impact. The Standard Elutriate Test (SET) has proven to be a good estimator of soluble contaminant release for dredged material disposal operations (Ludwig and Sherrard 1988). Developed by the U.S. Army Corps of Engineers and the Environmental Protection Agency, the SET is an empirical test (Lee and Plumb 1974; EPA 1979) that compares the chemical analysis of the elutriate from a sediment/disposal water mixture to a similar analysis of the disposal site

water. Test results that exceed set standards cause the sediment to be classified as being contaminated and requiring further testing and/or special disposal techniques (Ludwig and Sherrard 1988).

To investigate potential water quality concerns associated with the presence of contaminants in the dredged material, a sediment characterization study was conducted by Reclamation during May 2013. Sampling was conducted at the downstream terminus of the existing sediment deposition area upstream of the M&T Pumps Facility and on materials at the existing stockpile. Water samples from the Sacramento River were collected as reference samples, and used to assess method preparation and instrument accuracy (Reclamation 2013).

Twelve benthic sediment samples were collected from the Sacramento River, representing material to be dredged using SET with water from the river. Reclamation also collected four sediment samples from the existing gravel stockpile. To assess potential threats to groundwater at the upland disposal site (i.e., the existing stockpile), leaching characteristics of core composite samples were evaluated using a DI-SET. A suite of inorganic and physical parameters were measured to assess water quality impacts that could result from the disturbance of sediment in the Sacramento River. A complete list of analyses conducted for sediment elutriates and the water is provided in the Sediment Characterization Report (Reclamation 2013), and constituent-specific analytical criteria were taken from the screening values for soluble constituents in dredge material described in the Delta Dredging and Reuse Strategy (CALFED Bay-Delta Program 2002). Assessment of the data from the sediment elutriate characterization also focused on data that exceeds any numeric values set forth in the Compilation of Water Quality Goals (CVRWQCB 2003).

Overall, the results for Sacramento River sediments tested from the in-river deposition area generally demonstrated that constituent concentrations, including mercury, were below assessment criteria values. Results for sediments tested from the existing stockpile showed similar results, as described below.

These results are consistent with the high percentage of coarse grain material associated with these samples (98% and 99% sand and gravel). In high energy erosional environments, as in this area of the Sacramento River, the percentage of fine grained sediments is low. In general, contaminants tend to be associated with silt and clay particles of high organic content.

<u>Standard Elutriate (SET)</u>

To evaluate potential water quality impacts resulting from dredge material mixing with water in the Sacramento River, constituent concentrations from elutriate samples were compared to surface water quality objectives (CVRWQCB 2002, as cited in Reclamation 2013), including Primary Maximum Contaminant Level (PMCL), Secondary Maximum Contaminant Level (SMCL), Agricultural Water Quality Limit (AWQL), California Public Health Goal (CPHG), Sacramento-San Joaquin River Basin Plan Water Quality Objectives (Basin Plan), and USEPA Ambient Water Quality Criteria for Freshwater Aquatic Life, Continuous Concentration (CC).

Reclamation (2013) reports that results from the standard elutriate analyses show constituent concentrations, including mercury, were generally below assessment criteria with a few exceptions:

- Total aluminum concentrations (180 to 320 µg/L) exceeded the CC surface water objective (87 µg/L), but were consistent with the Sacramento River background concentrations (230 µg/L).
- Hexavalent chromium criteria of 11 µg/L for dissolved was not exceeded, however the laboratory tested for **total** hexavalent chromium at an RL of 5 µg/L. Due to the dissolved portion being part of the total concentration, reanalysis for dissolved hexavalent chromium was not considered.
- Total iron concentrations (370 to 740 µg/L (mean of 528)) exceeded the SMCL surface water objective (300 µg/L), which equaled or exceeded the Sacramento River background concentration (370 µg/L).

<u>DI-SET Elutriate Test</u>

To evaluate leaching potential of dredge material at the disposal site, constituent concentrations from sample extracts were compared to surface and ground water quality objectives (CVRWQCB 2002, as cited in Reclamation 2013).

Reclamation (2013) reports that results from the DI-SET analyses show constituent concentrations, including mercury, were generally below assessment criteria with four exceptions:

- Aluminum concentrations (1700 and 4300 µg/L) exceeded the public health goal (60 µg/L).
- Hexavalent Chromium criteria of 0.02 µg/L for dissolved was not known to be exceeded, the laboratory tested for total hexavalent chromium at an RL of < 25 µg/L and <100 µg/L for the two stockpile samples. It is unlikely that hexavalent chromium is of concern in this area of the Sacramento River.
- Total Iron concentrations (2900 and 8300 µg/L) exceeded the SMCL surface water objective (300 µg/L).
- Manganese concentrations (62 and 140 µg/L) exceeded the SMCL surface water objective (50 µg/L).

Based on the results of the sediment characterization study, Reclamation (2013) determined that potential impacts from dredging activities on surface water quality would be minimal, although increased local concentrations of aluminum and iron may occur. Additionally, because there would be no direct discharge back into the Sacramento River, adverse impacts to surface water quality adjacent to the spoils disposal area would not be expected to occur.

In summary, to minimize potential impacts associated with increased turbidity and sediment transport, environmental commitments (e.g., BMPs and requirements of the waste discharge requirements) have been incorporated into the Proposed Action/Project and are listed in Section 2.2.3 - Environmental Commitments and Mitigation Measures. BMPs, provided by the contractor, will be implemented and may include, among others:

- Implementing the terms and conditions of the CWA Section 401 Water Quality Certification, including the ECP, PCSWMP, SWPPP, and HMCSPRP to prevent any substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses, including ditches and canals.
- Establishing and implementing a HMCSPRP before project construction that includes strict onsite handling rules to keep construction and maintenance materials out of drainage and waterways.
- Training all construction personnel in the proper use and cleanup of potentially hazardous materials.
- Cleaning up all spills immediately according to the HMCSPRP, and notify CDFW and the Central Valley RWQCB immediately of spills and cleanup procedures.
- Providing staging and storage areas for equipment, materials, fuels, lubricants, solvents, and other possible contaminants away from watercourses and their watersheds.

In consideration of the BMPs incorporated into the project, compliance with CWA Section 401 certification requirements, implementation of a SWPPP, the potential for suction dredging to result in short-term, localized resuspension of sediments and reduced DO concentrations, and the potential for localized resuspension and transport of mercury, the Proposed Action/Project Alternative would have less than significant water quality impacts associated with the suction dredging activities.

***WQ-7**. Potential for hazardous materials releases resulting in reduced groundwater quality or surface water quality in the Sacramento River.*

The Proposed Action/Project would not impact groundwater supplies or interfere with groundwater recharge. Project activities consist solely of dredging and transporting spoils material to the existing stockpile on the M&T Chico Ranch property and should not impact groundwater processes.

Under this alternative, project activities would involve the use of a wide variety of potentially hazardous materials such as oils, greases, fuels, and other similar materials. As with any construction project, the construction phase of this alternative includes a risk of accidental or inadvertent discharge of hazardous materials that, if released to a surface waterbody in sufficient volumes, may be toxic to aquatic wildlife. This impact is considered less than significant because the preparation and implementation of a hazardous spill prevention plan (***Environmental Commitment HAZ-1***) will be in place during construction activities.

***WQ-8**. Potential to reduce water quality in Butte Creek.*

Under the Proposed Action/Project, the M&T/Llano Seco Pumps Facility would remain operational and diversions from the Sacramento River would continue to occur in accordance with exiting agreements and regulatory authorizations. The Proposed Action/Project would not result in any changes to instream flows and water temperatures in Butte Creek. Consequently, there would be no impacts to surface water quality in Butte Creek under this alternative, relative to Existing Conditions.

***WQ-9**. Potential to reduce water quality in Big Chico Creek.*

Under the Proposed Action/Project, the M&T/Llano Seco Pumps Facility would remain operational and diversions from the Sacramento River would continue to occur in accordance with exiting agreements and regulatory authorizations. Because the Proposed Action/Project would not result in any changes to instream flows and water temperatures in Big Chico Creek, no impacts to surface water quality would occur.

Bank Revetment Monitoring and Maintenance

***H-4**. Potential to increase surface runoff or exacerbate flooding-related impacts in the vicinity of the Action/Project Area.*

As described in Chapter 2, if maintenance-related repairs are required, work would be conducted in a manner that would return the rock-toe and tree revetment to the condition in which it was originally designed and constructed. To minimize flooding potential in the Action/Project Area, the construction period associated with revetment maintenance would occur between June 14 and October 28, with any in-river work occurring between July 1 and October 15. Continued monitoring and maintenance of the rock-toe and tree revetment would not change existing drainage patterns, cause incremental risks to flooding problems or increase exposure of people, structures, or facilities to significant risk from flooding, relative to Existing Conditions. Therefore, potential flooding-related impacts associated with the Proposed Action/Project would be less than significant.

***WQ-10**. Potential for increased turbidity and sedimentation, including release of mercury, resulting in reduced surface water quality in the Sacramento River.*

During construction activities associated with maintaining or repairing the rock-toe and tree revetment, some in-river work potentially may need to occur. Maintenance activities would be conducted from shore using cranes, a dragline, or other appropriate machinery. Water quality protective measures and environmental commitments identified in Section 2.2.3 are incorporated into the Proposed Action/Project (see ***Environmental Commitments WQ-1*** through ***WQ-3***). Therefore, the Proposed Action/Project would have less than significant water quality impacts.

***WQ-11**. Potential for hazardous materials releases resulting in reduced groundwater quality or surface water quality in the Sacramento River.*

During maintenance activities associated with the revetment, there would be a remote possibility of accidental spills of fuel or oil from the construction equipment that may be used. Best construction practices and protective measures (e.g., spill prevention and recovery plan) for hazardous materials are incorporated into the Proposed Action/Project (see ***Environmental Commitment HAZ-1*** in Section 2.2.3). No other maintenance-related impacts associated with the rock-toe and tree revetment are anticipated to impact surface water or groundwater quality. Therefore, the Proposed Action/Project would have less than significant water quality impacts.

PROPOSED ACTION/PROJECT RELATIVE TO THE NO ACTION ALTERNATIVE (NEPA ANALYSIS)

For additional NEPA analysis purposes, this section presents those considerations under the Proposed Action/Project, relative to the No Action Alternative.

In-river Dredging and Spoils Disposal

***H-5**. Potential to increase surface runoff or exacerbate flooding-related impacts in the vicinity of the Action/Project Area.*

As previously discussed, the hydraulics and sediment transport characteristics of the M&T reach have been modeled extensively for a wide range of flow conditions (10,000 cfs to 134,000 cfs). The hydraulics and sediment transport results from the entire suite of numerical and physical models are summarized in Tetra Tech (2012b). Additionally, although not directly applicable to the Proposed Project evaluated in this Draft EA/IS, meander modeling of the reach with and without existing bank revetments and with and without various alternatives has been conducted to evaluate the potential impacts of the project on river meandering and resulting ecological succession (Larsen 2005, 2008).

The existing stockpile is subject to some flooding at flows in excess of about 90,000 cfs, which is the bankfull channel capacity of the Sacramento River in this reach. However, two-dimensional hydraulic modeling indicates that the flow velocities in the vicinity of the stockpile are very low at both the 50- and 100-year recurrence interval peak flow events (Mussetter Engineering, Inc. 2005). Under the No Action Alternative, no dredging activities would occur and existing in-river conditions would predominate.

Under the Proposed Action/Project, dredged material removed from the Sacramento River would be place on top of the existing stockpile. Because the top of the existing stockpile is higher in elevation than the existing flood control levee, the new material would be above the area of the existing floodplain that is subject to inundation. Therefore, the Proposed Action/Project will not impact the extent of the 100-year flood, nor will it expose people or structures to increased risk of harm due to flooding. Storage of dredged material will not significantly impede or redirect flows, as the storage area is within a backwatered portion of the floodplain. Consequently, the

Proposed Action/Project will have less than significant impact, relative to the No Action Alternative.

***WQ-12**. Potential for increased turbidity and sedimentation, including release of mercury, resulting in reduced surface water quality in the Sacramento River.*

Under the No Action Alternative, no dredging activities would occur and existing in-river conditions would predominate. The No Action Alternative would avoid short-term temporary increases in turbidity in the Sacramento River during in-river construction activities, but would not achieve project objectives. The continued downstream movement of sediment deposition expected to occur under the No Action Alternative also would have the potential to adversely affect the M&T Llano Seco Pumps Facility and the City's WWTP outfall operations.

With the implementation of ***Environmental Commitments WQ-1*** through ***WQ-3***, suction dredging activities associated with the Proposed Action/Project would have a less than significant impact on water quality.

***WQ-13**. Potential for hazardous materials releases resulting in reduced groundwater quality or surface water quality in the Sacramento River.*

The No Action Alternative would avoid short-term temporary risks associated with release of hazardous materials during in-river construction activities and other hydrologic and water quality effects associated with the Proposed Project, but would not achieve project objectives.

The Proposed Action/Project would not impact groundwater supplies or interfere with groundwater recharge processes because activities would consist solely of dredging and transporting spoils material to the existing stockpile on the M&T Chico Ranch property. With the implementation of ***Environmental Commitment HAZ-1*** to address potential hazardous materials spills that could occur during construction activities, suction dredging activities associated with the Proposed Action/Project would have a less than significant impact on water quality.

***WQ-14**. Potential to reduce water quality in Butte Creek.*

Under the No Action Alternative, the M&T Chico Ranch/Llano Seco Rancho could divert their entire Butte Creek entitlement at the Parrott-Phelan Diversion Dam, foregoing the 40 cfs bypass which has maintained Butte Creek instream flows since implementation of the 1996 Agreement. In the event that increased water diversions from Butte Creek were to occur under the No Action Alternative, it is reasonable to assume that reductions in Butte Creek flows of up to 40 cfs could occur downstream of the Parrott-Phelan Dam from October 1 through June 30 of each year.

Under the No Action Alternative, the sedimentation in the Sacramento River may render the M&T/Llano Seco Pumps Facility non-functional prior to implementation of a long-term solution. The M&T Chico Ranch/Llano Seco Rancho could divert their entire Butte Creek entitlement at the Parrott-Phelan Diversion Dam, foregoing the 40 cfs bypass which has maintained Butte Creek instream flows since implementation of the 1996 Agreement. In the event that increased

water diversions from Butte Creek were to occur under the No Action Alternative, reductions in Butte Creek flows of up to 40 cfs could occur downstream of the Parrott-Phelan Dam from October 1 through June 30 of each year. Flow reductions in Butte Creek from October 1 through June 30 would have the potential to adversely affect several beneficial uses, including water quality. Reduced flows in the lower reaches of Butte Creek between the Parrott-Phelan Dam and the confluence of Butte Creek and the Sacramento River during October and during the April through June period could result in warmer water temperatures, which may cause instream conditions (e.g., lower dissolved oxygen concentrations) to be less suitable for fisheries and aquatic resources. However, in the 1996 Agreement, both CDFW and USFWS agreed to assist with permitting to maintain the M&T/Llano Seco Pumps Facility on the Sacramento River.

Under the Proposed Action/Project, the M&T/Llano Seco Pumps Facility would remain operational and diversions from the Sacramento River would continue to occur in accordance with existing agreements and regulatory authorizations. The Proposed Action/Project would not result in any changes to instream flows and water temperatures in Butte Creek. Consequently, there would be no impacts to water quality in Butte Creek under the Proposed Action/Project, relative to the No Action Alternative.

WQ-15. *Potential to reduce water quality in Big Chico Creek.*

Under the No Action Alternative, reinitiation of diversion from the Big Chico Creek pumping plant would be anticipated to cause reverse flows in the lower 0.75 miles of Big Chico Creek during certain times of the year. Although water quality in the Sacramento River is generally good, the remote possibility exists that a small amount of contaminants (e.g., pesticides, trace metals) from the Sacramento River could be introduced into the lower reach of Big Chico Creek, particularly during low flow conditions when contaminants would be more concentrated. More importantly, however, because the old pumping plant is located in a backwater area possessing little water movement during low flow conditions when there is a lack of hydrologic continuity with upstream reaches, it is also possible that the increased volume of water from the Sacramento River would increase mixing in this backwater area, which could increase dissolved oxygen levels and dilute concentrations of contaminants that may have previously accumulated in the stagnant, backwater area. Overall, the slight changes in water quality conditions that may potentially occur in the lowermost reach of Big Chico Creek under the No Action Alternative would not be expected to substantially adversely affect beneficial uses, including fisheries resources.

Under the Proposed Action/Project, the M&T/Llano Seco Pumps Facility would remain operational and diversions from the Sacramento River would continue to occur in accordance with exiting agreements and regulatory authorizations. Consequently, there would be no impacts to water quality in Big Chico Creek under the Proposed Action/Project, relative to the No Action Alternative.

Bank Revetment Monitoring and Maintenance

H-6*. Potential to increase surface runoff or exacerbate flooding-related impacts in the vicinity of the Action/Project Area.*

Removal of the existing rock-toe and tree revetment under the No Action Alternative would be expected to cause a return to the physical conditions that were in place in 2007. Flooding potential, and Sacramento River channel migration patterns and rates in the vicinity of Action/Project Area would be expected to return to the localized site-specific conditions that existed prior to revetment installation in 2007. However, revetment removal would not be expected to increase exposure of people, structures, or facilities to significant risk from flooding. Additionally, the construction period associated with revetment removal would be limited to between July 1 and October 15 to minimize flooding potential.

If maintenance-related repairs are required under the Proposed Action/Project, work would be conducted in a manner that would return the rock-toe and tree revetment to the condition in which it was originally designed and constructed. To minimize flooding potential in the Action/Project Area, any required in-river work would occur between July 1 and October 15. Continued monitoring and maintenance of the rock-toe and tree revetment would not change existing drainage patterns, cause incremental risks to flooding problems or increase exposure of people, structures, or facilities to significant risk from flooding, relative to Existing Conditions. Therefore, potential flooding-related impacts associated with the Proposed Action/Project would be less than significant.

WQ-16*. Potential for increased turbidity and sedimentation including release of mercury, resulting in reduced surface water quality in the Sacramento River.*

Under both the No Action Alternative and the Proposed Action/Project, there would be temporary, localized increases in turbidity and sediment levels that would have the potential to degrade water quality and affect the beneficial uses of the Sacramento River as a result of construction activities. Potential impacts associated with sedimentation and turbidity would be reduced or avoided through implementation of the water quality protective measures and environmental commitments identified in Section 2.2.3, which would be incorporated into both alternatives. Therefore, potential impacts to water quality would be less than significant.

WQ-17*. Potential for hazardous materials releases resulting in reduced groundwater quality or surface water quality in the Sacramento River.*

Under both the No Action Alternative and the Proposed Action/Project, there would be a remote possibility of accidental spills of fuel or oil from the construction equipment that may be used. BMPs and other protective measures (e.g., spill prevention and recovery plan) for hazardous materials would be incorporated into both alternatives (see ***Environmental Commitment HAZ-1*** in Chapter 2). Therefore, potential water quality impacts from hazardous materials releases would be less than significant.

3.6.4 ENVIRONMENTAL COMMITMENTS

The BMPs and the environmental commitments to address potential project effects on hydrology and water quality are described in Section 2.2.3 – Environmental Commitments and Mitigation Measures. Additional detailed descriptions of the environmental commitments and other protective measures are provided in the Mitigation Monitoring and Reporting Program (Appendix I). Standard water pollution prevention measures, including erosion and sediment control measures, proper maintenance of equipment and storage of materials, proper control of non-stormwater discharges, and hazardous spill prevention and response measures would be implemented as part of both the Proposed Action/Project and the No Action Alternative. These measures, together with the other BMPs and other protective measures incorporated into the Proposed Project, are adequate to avoid potentially significant effects under both NEPA and CEQA. A brief summary of the hydrology and water quality environmental commitments is presented below.

To the extent that they would apply to alternative-specific actions, the protective measures described in Chapter 2 would be implemented for both the Proposed Action/Project and the No Action Alternative. If the Proposed Action/Project is not implemented, then similar measures would likely have to be undertaken when future decisions are made under the No Action Alternative. By implementing BMPs and the other environmental commitments, impacts to hydrology and water quality would be less than significant.

- ***Environmental Commitment WQ-1:*** *(1) Obtain appropriate NPDES Permit and Water Quality Certification; and (2) comply with the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities by Preparing and Implementing a Stormwater Pollution Prevention Plan.*
- ***Environmental Commitment WQ-2:*** *Prepare and Implement an Erosion Control Plan and a Post-Construction Stormwater Management Plan.*
- ***Environmental Commitment WQ-3:*** *Minimize the potential for increased sediment and turbidity by reducing the cutterhead dredge speed and/or the ladder swing speed, as conditions warrant.*

3.7 GEOLOGY, GEOMORPHOLOGY AND SOILS

3.7.1 AFFECTED ENVIRONMENT/ENVIRONMENTAL SETTING

The Sacramento River drains the northern portion of the Great Valley of California, an alluvial plain about 50 miles wide and 400 miles long that is characterized as a structural trough between the Sierra Nevada and the Coast Ranges (California Geological Survey 2002). The river enters the Great Valley near Red Bluff and flows within the alluvial valley fill, the surface of which is comprised primarily of recent alluvium and the Pleistocene-age, paleo-Sacramento River deposits of the Riverbank and Modesto Formations (Harwood and Helley 1987). Marked

changes appear in the character of the river and its floodplain in the valley, with particularly dramatic changes at about Hamilton City (RM 199) (Olmstead and Davis 1961). Upstream of Hamilton City, the river is bounded by a well defined floodplain that is flanked by terraces. In contrast, downstream of Hamilton City, the river flows between natural levees. The recent alluvium is bounded on its margins by outcrops of both the Riverbank and Modesto Formations that define the width of the Holocene-age meanderbelt of the river. Changes in the character of the Sacramento River within the valley could be the result of ongoing structural deformation (Harwood and Helley 1987; Helley and Jaworowski 1985; Schumm and Harvey 1986; Fischer 1994).

Although the major bounding faults (Chico Monocline and Corning/Willows Faults) dominate the structural geology of the northern part of the valley, the smaller anticlines and synclines probably control the course, and perhaps the behavior of the river itself (WET 1990). The Sacramento River enters the Glenn syncline at about RM 205. The width of the active channel deposits widen as the river enters the syncline and then it narrows at RM 200 to RM 197, where the river crosses the axis of the syncline. The active channel deposits widen at RM 197 as the river turns abruptly east and then south to follow the axis of the syncline to RM 173, where the active channel deposits narrow again where the river flows up the structural dip and out of the Glenn syncline. Within the reach of interest (RM 198 to RM 190), the historical data (Larsen et al. 2002) indicate that this reach of the river has been very active within the last 100 years, probably because this reach flows down the structural dip towards the axis of the Glenn syncline (Schumm and Harvey 1985).

The soils of the Sacramento River floodplain consist of moderately well drained, or somewhat poorly drained, soils of recent alluvium. The Columbia Soil Series occupies areas along both sides of the Sacramento River. Like most alluvial soils, these are generally stratified, contain a small amount of organic matter in the surface layer, and have little or no differentiation between horizons. Columbia soils are pale-brown, stratified fine sandy loam, or silt loam soils with strong-brown mottling in the subsoil. The representative profile is pale-brown, slightly hard silt loam that is brown and friable when moist. Deeper layers may include very fine sandy loam, contain stratified thin layers of loamy fine sand and sand that are massive to single grain.

3.7.1.1 RIVER MEANDER

The Sacramento River between Red Bluff and Colusa represents an alluvial river ecosystem that is characterized by the processes of flooding, erosion, deposition, and channel movement (i.e., sinuous meandering) (USFWS 2005). Although levees are present along the Sacramento River, they are generally set back from the river, leaving a 0.5 to 1.5 mile wide belt of channel and proximal floodplain (approximately 1 to 3 times meander amplitude), in which the channel can shift (Constantine 2006 in Michalková et al. 2010). Built by the USACE, private landowners, and other government agencies, bank protection structures are widespread along the Sacramento River, mostly downstream of RM 175, and extend over lengths of bankline ranging from 0.6 to 2 miles (DWR 1994; CALFED 2000).

Previous studies of factors controlling bank erosion on the Sacramento River have reached different conclusions highlighting longitudinal variations associated with changes in bank resistance due to geologic setting or river hydrology. Changes in flood intensity due to dam construction or temporal variability due to flood characteristics also are identified as factors that affect differences in bank erosion through time (Michalková et al. 2010). Differences in interpretation can be attributed largely to the previous authors focus on smaller reaches, subsampling schemes, or simplified data (such as the channel centerline rather than the actual channel area or banklines) (Michalková et al. 2010).

As described in Stillwater Sciences (2001), historical maps and aerial photographs compiled by DWR indicate that the Sacramento River has not meandered east of its current location at the M&T/Llano Seco Pumps Facility, which is located on a geologic control, since at least 1896. This location was selected as the site for the new pumping plant in 1997 because the river bank in this location is relatively stable. At this location, however, the Sacramento River has historically migrated to the west (Stillwater Sciences 2001). In 1995, DWR geologists reported that the river mile location of 192.75 would be a safe location for the pumping plant into the foreseeable future, because of the two mile long straight reach immediately upstream, and because of this location's proximity to the mouth of Big Chico Creek where flushing flows were anticipated to occur.

Larsen et al. (2002) summarized the historical locations of the Sacramento River between 1870 and 1997. Between Hamilton City and the Stony Creek confluence, the current sinuosity (ratio of channel length to straight-line valley length, or ratio of valley slope to channel slope) of the river is a minimum for the period of record. Four large bends were cut off upstream of the Big Chico Creek confluence between approximately 1900 and 1952, a period before Shasta Dam was constructed. Since 1952, a portion of this reach of the river has remained essentially straight, and the river appears to be flowing along the line of the Modesto Formation outcrop, indicating that this is the farthest east the river has been in approximately 10,000 years. This suggests that future locations of the river are most likely to be to the west of the present location. An examination of the historical record of the Sacramento River between the confluence with Big Chico Creek and the confluence with Stony Creek also shows that the current alignment of the river represents a minimum sinuosity (Larsen et al. 2002). Minimum sinuosity for much of the reach from Hamilton City to Stony Creek implies that the river slope, and hence the potential sediment-transport capacity of the river, are at or near their historical maxima. Neill (1984) reported that bank-erosion rates are generally about the same as sediment-transport rates in a reach, and a balance exists between the volume of bed-material deposition in bars and bank erosion. This suggests that the bank-erosion potential within the reach should be high under current conditions, and all other things being equal, the sinuosity of the river should increase with time. The rate of bank erosion also is related to the radius of curvature (Rc) to channel width (W) ratio (Nanson and Hickin 1983, 1986), and therefore, as the bend radius decreases with time, the rate of erosion increases until Rc/W is less than about 2.5, when the rate then decreases. The current radius of curvature of the bend at the M&T/Llano Seco Pumps Facility is

about 3,000 ft. For a bend with this radius of curvature, the expected annual migration in the Butte Basin reach of the Sacramento River is about 30 ft per year. If erosion continues so the radius of curvature of the bend decreases to about 2,000 ft, however, the annual migration rate could be expected to increase to about 80 ft per year (CDFG and USFWS 2007).

Two other factors must be considered when assessing the potential for future bank erosion and platform adjustment in the M&T reach. Completed in the late 1940s, Shasta Dam has enabled the flows in the river to be manipulated to meet irrigation and other needs. A comparison of the pre- and post-Shasta Dam mean daily flow records at the Bend Bridge gage (WET 1990) revealed that the median flow has increased substantially (6,500 to 11,000 cfs) in the post-Shasta Dam period. Although no records exist of the pre-Shasta Dam flow at the Hamilton City gage, the median flow there during the post-Shasta Dam period is approximately 9,000 cfs. Perhaps the increased summer flows are partially responsible for the increase in the bank-erosion rate in those areas where the toes of the banks are composed of noncohesive sands and gravels, such as the bank opposite the M&T/Llano Seco Pumps Facility.

The potential for future bank erosion and resultant lateral migration of the river at the M&T site also is related to the history of emplacement of riprap in the reach between Hamilton City and the M&T/Llano Seco Pumps Facility. The right descending bank between about RM 198 and RM 197 was revetted by the USACE under the Chico Landing to Red Bluff project in 1975. The downstream end of the revetment was flanked in the 1983 flood, and the river achieved its current configuration at the mouth of Pine Creek. This revetment is not currently being maintained and the downstream end of the revetment is subject to a scour hole that is continuing to erode the riprap. This location of the river further ensures that the revetment installed on the left descending bank at about RM 194 in 1973 to protect River Road will be required in the foreseeable future. Erosion of the right bank immediately upstream of the pumps is due to flow deflection off the upstream revetment. With the revetment in place, bank erosion will continue to occur opposite the pumps unless the bank itself is revetted. The left descending bank from the mouth of Big Chico Creek is revetted for a distance of about 2,800 ft, the revetment protecting the Phelan levee and the present location of the M&T/Llano Seco Pumps Facility.

Based on recommendations in the original Steering Committee report (Harvey et al., 2004), a series of 2-dimensional (2-D) models were developed and applied to further evaluate the historic and present dynamics of the Sacramento River in the vicinity of the M&T/Llano Seco Pumps Facility (Mussetter Engineering, Inc. 2005). A 1996 conditions model was used to establish and validate the model input parameters because it is based on the most complete topographic data, and because result from the model could be directly compared with the validated 1-dimensional model of the reach that was prepared by the USACE for the Sacramento/San Joaquin Comprehensive Study. The 2003 baseline conditions model was used to estimate changes in hydraulic and bed material transport conditions in the study reach associated with continued erosion of the west bank since the 1996 topography was prepared. The proposed dike field was then evaluated by superimposing the dikes on the estimated 2003 topography. The 1979

conditions model was used to evaluate differences in hydraulic and sediment-transport conditions when the channel was considerably narrower and the channel thalweg was most likely along the east bank at the M&T intake. A final model was developed and applied to evaluate the effects of realigning the revetment on the east bank along River Road upstream from the mouth of Big Chico Creek and the M&T intake.

To facilitate the analysis, the models were run for a discharge of 90,000 cfs, which is the approximate bankfull capacity of the reach. Discharges above 90,000 cfs were not modeled because nearly all of the additional flow at higher discharges is conveyed in the overbanks, resulting in relatively insignificant changes to water-surface elevation and hydraulic conditions above bankfull (Mussetter Engineering, Inc. 2005). Results from the various models led Mussetter Engineering, Inc (2005) to the following conclusions:

- Maximum flow velocities in the main channel along the reach generally range from 8 to 12 fps, and maximum channel depths range from 17 feet to 40 feet at the modeled discharge of 90,000 cfs.
- The highest velocities occur in the riffle area at the upstream end of the reach, and the lowest velocities typically occur in the expansion zone near the downstream end of the gravel bar, which creates the conditions for sediment deposition and further gravel bar development. The maximum flow depth in the reach occurs near the M&T pump intake, where velocities in this area are in the range of 7 fps.
- At 90,000 cfs, the velocity over the gravel bar is approximately 6 to 7 fps and the flow depth is approximately 10 feet.
- The orientation of the main flow channel upstream of the bar is directed slightly towards the west bank, but most of the flow is concentrated toward the center of the channel.
- A flow expansion area occurs at the head of the gravel bar and the majority of flow is orientated mostly in line with the bar; however, some shoaling occurs towards the left bank over the bar.
- Normalized grain shear stresses (NGS) in the main channel from the analysis range from 2.2 to 4.0 at 90,000 cfs, indicating that significant sediment-transport is occurring over the entire reach. The highest NGS values occur in the reach upstream from the head of the gravel bar, and the lowest values occur at the downstream end of the bar in the vicinity of the M&T intake. *[Note that NGS values of 1.0 indicate that the surface bed material is at a condition of incipient motion and NGS values of 1.5 or greater indicate significant bed material transport]*.
- Although the overall range of shear stresses predicted by the 2003 conditions model are similar to those from the 1996 model, the distribution is significantly less uniform, with significantly lower shear stresses and bed material transport capacities between the downstream end of the gravel bar and several hundred feet downstream from the intake.

- In the vicinity of the M&T intake, the shear stresses and bed material transport capacities are relatively low (1.0 or slightly above). The low energy in the immediate vicinity of the M&T intake indicates that this area will likely continue to be depositional.
- The model indicate that realignment of the east bank revetment along River Road would probably not be effective in preventing continued growth of the gravel bar or depositional problems at the M&T intake.

Previous work by the Steering Committee detailed the historic migration of the Sacramento River in this area and identified the hydraulic factors that are responsible for creation and continued development of the gravel bar and the resulting sedimentation problems at the M&T pump intake (Harvey et al. 2004). A significant conclusion from the Steering Committee report was, as follows:

> *"The sediment-transport analyses confirms that the locus of sediment deposition on the bar immediately upstream of the M&T pump inlets is due to local hydraulic conditions that favor deposition. These conditions can be expected to persist under the existing channel morphology, and will most likely become worse if the right bank is allowed to continue to erode. If the difference in sediment-transport capacities at the head and toe of the bar is a reasonable estimate of the volume of material deposited on the gravel bar on an average annual basis, then the bar could rebuild to its 2000 pre-dredged configuration within about four years. On the other hand, if an infrequent flood event like the 1974 flood were to occur (a 2-percent chance exists of a flood of this magnitude occurring), the bar could be rebuilt within a single event..."*

Larsen (2008) analyzed meander migration patterns 50 years into the future when revetment is removed on selected bends of the Sacramento River between RM 222 and RM 179. Modeling was conducted by Larsen (2008) to first simulate the future migration with revetment in place, and then simulated with revetment removed. Maps were produced to show the migration patterns 50 years into the future, with channel locations at 5-yr increments (Larsen 2008). In the Hamilton City Reach, which includes the Action/Project Area, six bends were modeled by Larsen (2008). Model simulation results by Larsen (2008) generally indicate that upstream of the Action/Project Area, increased Sacramento River channel migration would be expected to occur to the east in the vicinity where the revetment at RM 196L is removed (**Figure 3.7-1)**. According to Larsen (2008), the increase would be somewhat limited by the natural restraint that occurs because of the erosion-resistant material near RM 196 on the east (left hand side of the channel looking downstream).

Within the Action/Project Area, model simulation results by Larsen (2008) show that channel migration would increase toward the west side of the Sacramento River if the existing rock-toe and tree revetment were to be removed (**Figure 3.7-2**). According to Larsen (2008), there also is a slight change in the pattern of area reworked in the bend immediately downstream of RM 191-192.

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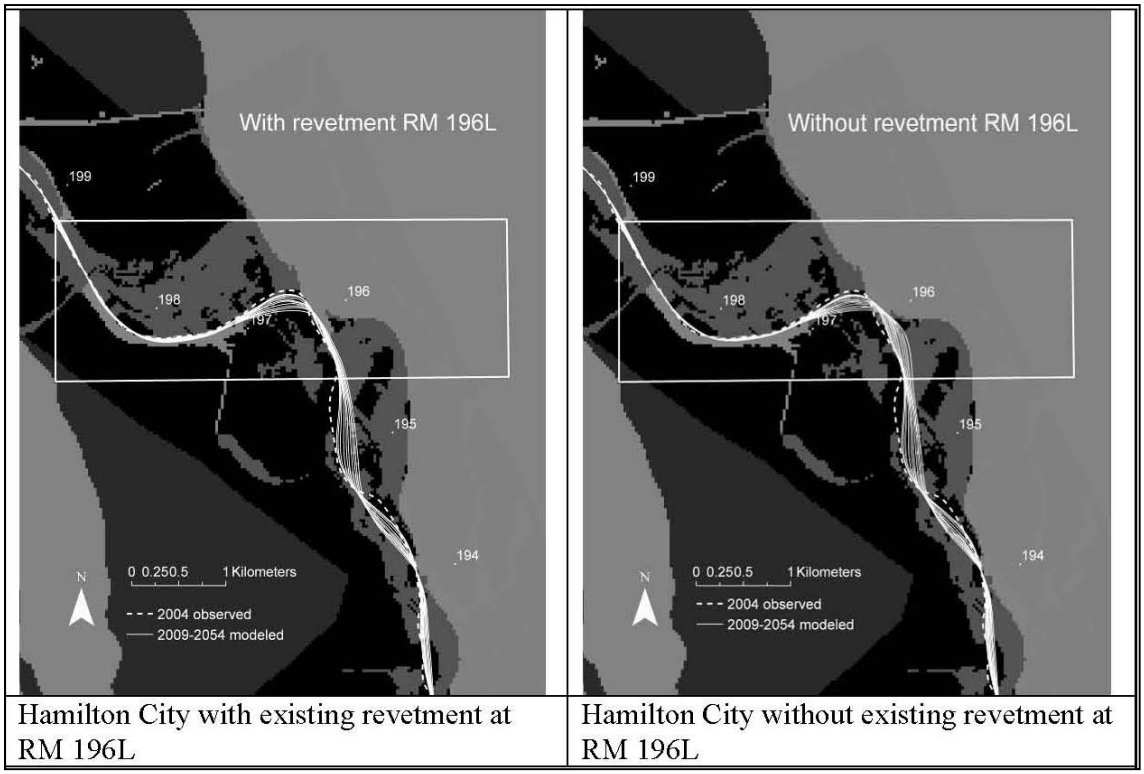

Figure 3.7-1. Channel Migration Modeling Results for the Hamilton City Revetment at RM 196L (Larsen 2008).

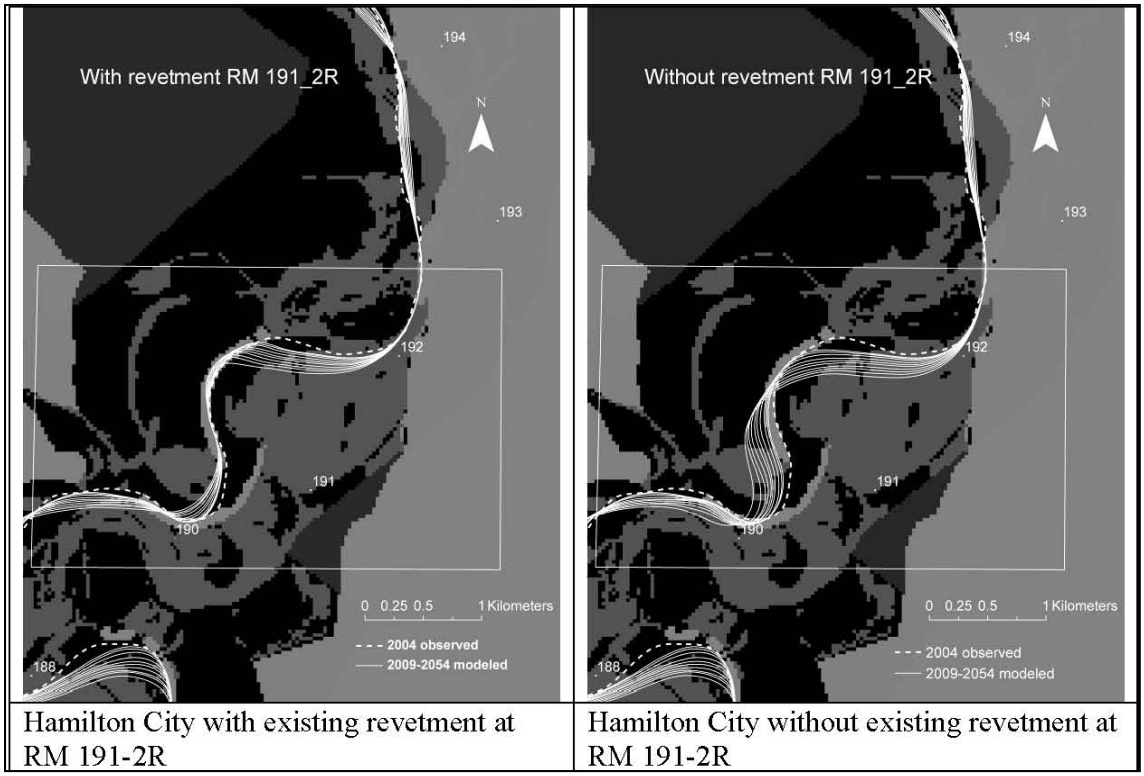

Figure 3.7-2. Channel Migration Modeling Results for the Hamilton City Revetment at RM 191-192L (Larsen 2008).

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3.7.1.2 SOILS

Although the major bounding faults (Chico Monocline and Corning/Willows Faults) dominate the structural geology of the northern part of the valley, the smaller anticlines and synclines probably control the course, and perhaps the behavior of the river itself (WET 1990). The Sacramento River enters the Glenn syncline at about RM 205. The width of the active channel deposits widen as the river enters the syncline and then it narrows at RM 200 to RM 197, where the river crosses the axis of the syncline. The active channel deposits widen at RM 197 as the river turns abruptly east and then south to follow the axis of the syncline to RM 173, where the active channel deposits narrow again where the river flows up the structural dip and out of the

Glenn syncline. Within the reach of interest (RM 198 to RM 190), the historical data (Larsen et al. 2002) indicate that this reach of the river has been very active within the last 100 years, probably because this reach flows down the structural dip towards the axis of the Glenn syncline (Schumm and Harvey 1985).

3.7.2 REGULATORY SETTING

The following section describes applicable laws, regulations and standards regarding geology, geomorphology and soils in the vicinity of the Proposed Project.

3.7.2.1 STATE

ALQUIST-PRIOLO EARTHQUAKE FAULT ZONING ACT

The Alquist-Priolo Earthquake Fault Zoning Act (formerly the Alquist-Priolo Special Studies Zone Act), signed into law December 1972, requires the State Geologist to establish or delineate zones, known as "Earthquake Fault Zones," along active faults in California and to issue appropriate maps. Areas along faults considered sufficiently active and well-defined are zoned differently than other areas, and construction in these areas is regulated more stringently. The purpose of the Alquist-Priolo Earthquake Fault Zoning Act is to regulate development, specifically construction of buildings used for human occupancy, on or near the surface trace of active faults. The study area is not located within an Alquist-Priolo Earthquake Fault Zone.

SEISMIC HAZARDS MAPPING ACT

The Seismic Hazards Mapping Act was developed to protect the public from the effects of strong ground shaking by addressing earthquake hazards from nonsurface fault rupture, including liquefaction and seismically induced landslide, and from other hazards caused by earthquakes. The Seismic Hazards Mapping Act, conceptually similar to the Alquist-Priolo Earthquake Fault Zoning Act, requires the State Geologist to delineate various seismic hazard zones, and requires cities, counties, and other local permitting agencies to regulate certain development projects within these zones. No seismic hazards maps have been created for Glenn and Butte counties.

CALIFORNIA BUILDING CODE

The California Building Code (CBC) is another name for the body of regulations known as the California Code of Regulations (CCR), Title 24, Part 2, which is a portion of the California Building Standards Code. Title 24 is assigned to the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under State law, all building standards must be centralized in Title 24 or they are not enforceable. Published by the International Conference of Building Officials, the Uniform Building Code (UBC) is a model building code widely adopted in the United States. The CBC incorporates by reference the UBC, with necessary California amendments. About one-third of the text within the CBC has been tailored for California earthquake conditions. No project structures required to comply with the CBC are being constructed for the alternatives considered in this Draft EA/IS.

SB1086 PROGRAM – SACRAMENTO RIVER CONSERVATION AREA

The Action/Project Area is located within the Chico Landing to Colusa Reach (RM 194L to RM 143) of the Sacramento River Conservation Area (SRCA). The goal of the SRCA (SB1086 Program) is to preserve remaining riparian habitat and reestablish a continuous riparian corridor along the Sacramento River. The objective of the SRCA "inner river zone" management is to retain downstream movement of point bars and the natural river meander. Within this reach, the inner river zone guideline consists of the 100-year meanderbelt combined with 50-year erosion projections, and does not compromise the structural integrity of the existing State or Federally authorized flood control levees and structures or conflict with the operation and maintenance jurisdiction of local maintaining entities as designated by the Reclamation Board (Resources Agency 2003). The purpose of the inner river zone is to focus the preservation and reestablishment of a continuous riparian ecosystem on the erosion and flood-prone areas along the Sacramento River in a manner that follows six guiding principles.

- Uses an ecosystem approach that contributes to recovery of threatened and endangered species and is sustainable by natural processes
- Uses the most effective and least environmentally damaging bank protection techniques to maintain a limited meander where appropriate
- Operates within the parameters of local, State, and Federal flood control and bank protection programs
- Participation by private landowners and affected local entities is voluntary, never mandatory
- Gives full consideration to landowner, public, and local government concerns
- Provides for the accurate and accessible information and education that is essential to sound resource management

Early SB1086 Riparian Habitat Committee and Advisory Council efforts focused on the concept of a limited, or managed, meander that provides room for the channel movement necessary to attain the goal of the SB1086 Program, but also provided a greater degree of certainty for landowners along the Sacramento River (Resources Agency 2003).

Resources Agency (2003) recognizes that a restriction of the Sacramento River's meander patterns may be necessary where studies indicate unobstructed meander could impair the operational viability of public and private facilities (e.g., buildings, bridges, pumping plants), which are considered to be protected "hard points". A structural "hard point" is defined as a structure within the area of recent river meander that because of various attributes including, but not limited to, historic location, public and private investment, and government commitment is deemed necessary to be protected from river movement (Resources Agency 2003). The SB1086 Program also considers bank stabilization an implementation tool that, when used carefully, can further the goals of the program (Resources Agency 2003). Specifically, there are locations along the Sacramento River where bank stabilization will be necessary to limit the meander to the inner river zone (Resources Agency 2003). This limitation will take into account the potential need to protect existing land uses, including agriculture and structural "hard points", from bank erosion. According to the Resources Agency (2003), when a need is identified and other alternatives have been considered, the most effective, economically feasible, and least environmentally damaging techniques should be used (Resources Agency 2003).

The SRCAF recognizes that *"There are places along the river where bank stabilization will be necessary to limit the meander to the inner river zone. This limitation will take into account the potential need to protect existing land uses including agriculture and structures such as buildings, bridges, pumping plants, and flood management structures from bank erosion. A structural "hard point "is deemed as a structure or group of structures within the aria of recent river meander that because of various attributes, including, but not limited to, historic location, public and private investment, and government commitment, is deemed necessary to be protected from river movement. It is the intent and goal to expedite the permit process for protection of these structural hard points as discussed on pages 9-7 through 9-9.When a need is identified, and other alternatives have been considered, the most effective, economically feasible, and least environmentally damaging techniques should be used: (SRCA Handbook)."*

GOOD NEIGHBOR POLICY

In addition, *[I]it is the fundamental policy of the SRCAF to promote communication and understanding among neighbors*[10] *within the adopted Sacramento River Conservation Area (Conservation Area).* On March 15, 2007, the SRCAF adopted the Good Neighbor Policy.

[10] "Neighbor" pertains to adjacent, nearby, or "in the vicinity".

General Policy

As an essential part of this policy, the SRCAF will make every reasonable effort to prevent harm or loss to any person and public or private entity from activities prescribed in the SRCAF handbook. It is also a policy that the SRCAF will use its resources to promptly address, and resolve to the best of its ability, a conflict between neighbors resulting from activities associated with the implementation of the Handbook within the Conservation Area.

Need for a Good Neighbor Policy (GNP)

The SRCAF supports management of water and land resources that is consistent with the overall goals of the SRCAF and principles described in its Handbook. To accomplish these goals, the SRCAF recognizes that historic uses and local concerns must be respected.

The following are some of the key principles of the GNP:

1. *The SRCAF appreciates the value of the Sacramento River as a vital habitat area for fish and wildlife and supports the overall goal to "preserve remaining habitat and reestablish a riparian ecosystem along the Sacramento River and between Redding and Chico, and to reestablish riparian vegetation along the river from Chico to Verona".**
2. *The SRCAF also appreciates the agricultural heritage of the Sacramento Valley as an important part of the Sacramento River's history, and recognizes that much of the land within the Conservation Area has been in agricultural use for more than a century and provides open space and environmental benefits.*
3. *Agriculture is an essential life sustaining industry on which many local communities depend; therefore protection and preservation of agricultural land is a high priority.*
4. *The SRCAF also recognizes the importance of the Sacramento River as a water supply for the local agricultural economic base and as a public recreation resource.*
5. *Flood control for the local citizens, communities, and agricultural lands is also a concern.*
6. *All activities within the Conservation Area must demonstrate planning and management that is sensitive to agricultural needs, public safety, recreation, and flood protection, along with fish and wildlife and their habitat.*
7. *The goal of the GNP is to avoid negative impacts, address and resolve unavoidable impacts, and foster good communication and relationships among neighbors and communities.*

*Overall goal of the Sacramento River Conservation Area Handbook, Page 1-1.

8. *The GNP envisions all landowners being good stewards of the land, understanding the issues facing their neighbors and implications of land use practices on the neighbors and community.*

Policy Actions

1. *Communication and Review – The SRCAF recommends that prior to initiating any land use or management actions, all landowners within the Conservation Area be considerate of, and communicate with, those neighbors potentially affected.*
2. *Sacramento River Conservation Area and Regulatory Assurances – The SRCAF will work to promote the concept of the Sacramento River Conservation Area as a "self-mitigating area"; where implementation of the activities prescribed in the 1989 Plan and the Handbook are anticipated to provide significant net conservation benefit to fish, wildlife, and their habitats within the Conservation Area. Additionally, the SRCAF will work with signatory agencies and stakeholders to identify and pursue mechanisms that will minimize, avoid or eliminate the potential for conflict that might arise due to provisions of federal and state Endangered Species Acts. The goal of this effort would be to provide landowners in proximity to restoration sites assurance that increases in populations of listed threatened or endangered species due to restoration actions will not adversely affect their otherwise lawful current or future operations.*
3. *Conflict Resolution – It is the intent of the SRCAF to facilitate a voluntary process to help resolve unforeseen conflicts between project activities and neighboring landowners in a quick, responsive, and cost-effective manner."*

3.7.2.2 LOCAL

SACRAMENTO RIVER NATIONAL WILDLIFE REFUGE COMPREHENSIVE CONSERVATION PLAN

The USFWS SRNWR CCP describes the goals, objectives and strategies for refuge management, and provides guidance to achieve these conditions. Refuge management strategies with respect to floodplain and river processes including the following.

- Modifying privately constructed levees, restoring or enhancing topographic features, and other bank stabilization features on Refuge land if supported by feasibility studies, associated hydrologic investigations and NEPA documentation.
- Working with Federal, State, county, levee and irrigation districts to investigate best management practices for habitat, water diversion, and flood management projects through technical studies and coordination with various agencies, including USFWS Ecological Services, NMFS, CDFW and the State Reclamation Board, as well as others.

- Continuing to protect and manage Refuge lands within the 100-year floodplain, which will facilitate natural geomorphic and hydrological processes that create and maintain habitat features to which migratory birds and anadromous fish have adapted.

3.7.3 ENVIRONMENTAL CONSEQUENCES

3.7.3.1 ASSESSMENT METHODOLOGY

The analysis will qualitatively assess whether the Proposed Project would expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving the significance criteria described below.

3.7.3.2 SIGNIFICANCE CRITERIA

The significance criteria used to evaluate potential impacts on geology, geomorphology and soils were based on and incorporate guidance contained in Section 1508.27 of the CEQ NEPA regulations regarding significance determinations; the mandatory findings of significance, as listed in Section 15065 of the State CEQA Guidelines (Title 14, Chapter 3 of the CCR); and criteria derived from Appendix G of the State CEQA Guidelines (for additional detail, see Section 3.3.3.2).

For the purposes of this analysis, the Proposed Project would be considered to have an adverse effect under NEPA and a significant impact under CEQA on geology, geomorphology and soils it would contribute to any one of the following within the Action/Project Area.

- Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo earthquake fault zone maps issued by the State geologist for the area or based on other substantial evidence of a known fault.
- Strong seismic ground shaking.
- Seismic-related ground failure, including liquefaction.
- Result in substantial soil erosion or the loss of topsoil.
- Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in on- or off-site lateral spreading, subsidence, liquefaction, or collapse.
- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code, creating substantial risks to life or property.

3.7.3.3 IMPACT ANALYSIS

The evaluations below describe the types of effects that could occur on geology, geomorphology and soils as a result of the Proposed Project under the following three scenarios.

- No Action Alternative Compared to Existing Conditions (NEPA Analysis)
- Proposed Action/Project Compared to Existing Conditions (CEQA Analysis)
- Proposed Action/Project Compared to the No Action Alternative (NEPA Analysis)

Following the presentation of technical information, a conclusion is made at the end of each analytical comparison regarding whether the scenario evaluated, relative to the basis of comparison, would have an adverse effect under NEPA or a significant impact under CEQA, as appropriate.

NO ACTION ALTERNATIVE RELATIVE TO EXISTING CONDITIONS (NEPA ANALYSIS)

There are no active faults, potentially active faults, or Alquist-Priolo Earthquake Fault Zones located in or adjacent to the Action/Project Area. Therefore, there would be no effect from surface fault rupture. The No Action Alternative would not increase potential geologic hazards, including liquefaction or landslides.

Removal of the Temporary Rock-toe and Tree Bank Revetment

***G-1**. Potential for seismic-related ground shaking or failure, increased soil instability, or increased risk to human life or property associated with revetment removal that would result in adverse effects to geology, geomorphology, or soils.*

As previously discussed, a temporary bank protection consisting of approximately 1,520 feet of rock-toe and tree revetment was placed on the west bank of the Sacramento River to prevent further bank erosion and river migration, thereby preserving options for a long-term solution. Revetment removal was previously evaluated in the 2007 Final EA/IS (CDFG and USFWS 2007) and authorized in NEPA and CEQA decision documents approved by USFWS and CDFW for the 2007 project. Under Existing Conditions, ongoing erosion is lowering the bank angle as the bank rotates backwards from the armored toe of the revetment (Tetra Tech 2012a). However, Tetra Tech (2012a) also report that there is no evidence of scour along the contact between the rock and the bank, and woody vegetation (primarily willows) has become established at the base of the bank and on the lower angle portions of the bank (**Figures 3.7-3 and 3.7-4**).

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Figure 3.7-3. Upstream View of the Upstream End of the Rock-toe and Tree Revetment Under Existing Conditions. Note: (a) the Presence of Riparian Vegetation as well as the Large Woody Material Emplaced within the Rock During Construction; (b) there is No Evidence of Loss of Rock; and (c) the Larger Anchor Boulders used to Secure the Large Woody Material Emplaced on the Top of the Revetment (Tetra Tech 2012a).

Figure 3.7-4. Upstream View of the Middle Section of the Rock-toe and Tree Revetment Under Existing Conditions. Note the Dense Riparian Vegetation Species Voluntarily Growing on the Top of the Rock, and the Presence of the Emplaced Large Woody Material on the Top of the Rock and within the Revetment (Tetra Tech 2012a).

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Vegetation clearing and removal of revetment materials during construction would result in ground and soil disturbance. These disturbances would increase the hazard of erosion and could temporarily increase erosion and sedimentation rates into the Sacramento River above existing levels. Earthwork would be conducted on and immediately adjacent to the top of the western river bank. Therefore, accelerated erosion and sedimentation resulting from construction-related ground and vegetation disturbance could result in substantial effects.

Removal of the rock-toe and tree revetment under the No Action Alternative would be expected to cause a return to 2007 baseline conditions (i.e., 1,200-feet of cut bank at about 12-feet high) (**Figure 3.7-5**). Prior to revetment installation and as described in CDFG and USFWS (2007), the average rate of bank erosion in the area was estimated at about 40 feet per year through the mechanisms of flood flows. The No Action Alternative would have an effect on geomorphology and soils because erosion would be expected to continue at the former rate and the west bank of the Sacramento River would be subject to continued erosional events associated with flood flows, thus contributing to continued westward migration of the river channel. Without the stabilization provided by the revetment, it is anticipated that the bank would continue to erode once the revetment was removed, increasing on-site disturbance and causing an increased amount of soil material and vegetation to enter the Sacramento River.

Depending on river hydrology and its effect on fluvial geomorphic processes in the Action/Project Area, the potential exists for the bank to retreat far enough to render the intake pumps at the M&T/Llano Seco Pumps Facility inoperable and to adversely affect the City's WWTP outfall, which would represent a potentially adverse affect of the No Action Alternative.

Figure 3.7-5 Photographs of the Apex of the Eroding Bend and the Middle Portion of the Downstream End of the Eroding Bank, Respectively, Prior to Construction of the Rock-toe and Tree Revetment (Photo taken on 10/24/2006) (Tetra Tech 2012a).

PROPOSED ACTION/PROJECT RELATIVE TO EXISTING CONDITIONS (CEQA ANALYSIS)

There are no active faults, potentially active faults, or Alquist-Priolo Earthquake Fault Zones located in or adjacent to the Action/Project Area. Therefore, there would be no effect from surface fault rupture. The Proposed Action/Project would not increase potential geologic hazards, including liquefaction or landslides, nor would it result in the loss of a unique geographical feature of statewide or national significance. The Action/Project Area has been previously disturbed by agricultural practices and construction activities associated with the 2001 and 2007 dredging projects, and contains no unique geographical features.

In-river Dredging and Spoils Disposal

G-2*. Potential for seismic-related ground shaking or failure, increased soil instability, or increased risk to human life or property associated with dredging operations that would result in adverse effects to geology, geomorphology, or soils.*

As previously discussed, bathymetric surveys were conducted during 2010, 2011, and 2012 to quantify the physical changes in the Sacramento River in the vicinity of the M&T/Llano Seco Pumps Facility (Appendix C). The key objective of these surveys was to provide updated bathymetry data to ascertain whether future dredging operations may be required prior to implementation of a long-term solution.

Based upon recent bathymetric survey results, sediment deposits were found downstream of the gravel bar location dredged during the fall of 2007 and in the center-left portion of the channel opposite the M&T/Llano Seco Pumps Facility. Although interim stabilization of the toe of the west bank in the fall of 2007 prevented further westward migration of the river, it has not prevented downstream bar migration to the point where the focus of deposition is now opposite the M&T/Llano Seco Pumps Facility inlets. Given the current sedimentation patterns in the river, the "dryland" bar dredging methods that were previously utilized for the 2001 and 2007 dredging operations are not a viable option for removal of gravel material in the Sacramento River in the vicinity of the M&T/Llano Seco Pumps Facility. Therefore, due to the unanticipated changes in the rate and pattern of sediment deposition proximate to the M&T/Llano Seco Pumps Facility, the Proposed Action/Project involves suction dredging as described in Section 2.2.1, In-River Dredging and Spoils Disposal Operations.

The Proposed Action/Project would not conflict with legal requirements regarding geological hazards and soil conservation. Although sediments would be removed from the Sacramento River proximate to the M&T/Llano Seco Pumps Facility, the material would be disposed of at an existing stockpile site on the M&T Chico Ranch property within the floodplain of the Sacramento River (for additional information regarding floodplain issues, refer to the discussion presented in Section 3.6.1.1 – Hydrology and Section 3.6.3.3 – Impact Analysis for Hydrology and Water Quality).

As previously discussed, several technical investigations (e.g., USACE's Hamilton City Flood Damage Reduction Project) have been conducted to characterize Existing Conditions and the

potential for flood-related impacts in the M&T/Llano Seco reach of the Sacramento River. The inclusion of the proposed setback levee decreases the width of the floodplain, and as the result, the water-surface elevations increase in area to the east of the setback levee, and decrease in the area behind (to the west) of the training levee. Analytical results presented in Tetra Tech (2011) indicate that, while the J-Levee project would significantly affect water-surface elevations upstream of the M&T/Llano Seco reach, there would be little or no impact within the reach.

Additionally, hydrographic and topographic surveys of the Sacramento River between RM 192 and RM 193.5 were conducted in December 2005, May 2006, January 2010 and June 2011 to monitor geomorphic changes in the reach, including aggradation of the bed, bank erosion and lateral migration. In general, Tetra Tech (2012) suggests that deposition tends to occur in the vicinity of the M&T/Llano Seco pump intake and fish screens during years with relatively low peak flows, and this material is then eroded during the higher-flow years. Tetra Tech (2012) also reports that the same general trend is observed on the upper part of the migrating bar, with aggradation occurring during the lower peak flow years (2005, 2010) and scour in the higher peak flow years (2006, 2011). Although Tetra Tech (2012) hypothesizes that the scour is due to the formation of a helical flow cell along the riprap that lines the east bank of the Sacramento River in the vicinity of the M&T/Llano Seco pump inlets and fish screens, further study is required to confirm this hypothesis.

As previously discussed, Mussetter Engineering, Inc (2005) evaluated flows from Big Chico Creek to aid in evaluating the hydraulic and sediment-transport effects on the Sacramento River. Their evaluation showed that flows from the mouth of Big Chico Creek are directed towards the left side of the gravel bar, and probably prevent the bar from attaching directly to the east bank upstream from the M&T/Llano Seco intake pump. An evaluation was also conducted to determine if backwater effects associated with Big Chico Creek were occurring in the vicinity of the gravel bar, and if so, whether these effects impact the location, geometry, and stability of the gravel bar. Comparison of the timing of peak flows recorded at the Big Chico Creek gage that is located about 11 miles upstream from the mouth on the northeast side of the City of Chico with the timing of peak flows in the Sacramento River indicates little correlation, primarily because of the relative size of the drainage basins and the effects of upstream flow regulation on the Sacramento River.

Overall, and in consideration of the types of activities associated with dredging and soils disposal, and the relatively limited area that would affected by the Proposed Action/Project, it is unlikely that the Proposed Action/Project would cause the rupture of a known earthquake fault, strong seismic ground shaking, or seismic-related ground failure, including liquefaction. The Action/Project Area is not located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in on- or off-site lateral spreading, subsidence, liquefaction, or collapse. Additionally, because an ERC and PCSWMP are environmental commitments incorporated into the Proposed Action/Project, the Proposed Action/Project also would not result in substantial soil erosion or the loss of topsoil. Therefore,

the Proposed Action/Project would have a less-than-significant impact on geology, geomorphology, and soils.

Bank Revetment Monitoring and Maintenance

***G-3**. Potential for seismic-related ground shaking or failure, increased soil instability, or increased risk to human life or property associated with revetment maintenance that would result in adverse effects to geology, geomorphology, or soils.*

Continued maintenance of the revetment under the Proposed Action/Project would continue to limit westward lateral migration of the Sacramento River channel; thus, changes in the geomorphic characteristics of the reach are not expected, relative to the conditions that have been in place since 2007 after construction of the revetment. The revetment has prevented further westward migration of the river and reduced the recruitment of soils into the river at this location.

Surveys were conducted during April 2010 and November 2011 to evaluate the condition of the revetment and to determine whether maintenance activities would be required (**Appendix D**). Based on surveyor observations, it was determined that no immediate maintenance was required. The 2010 survey revealed that the upstream end of the revetment, as well as pre-existing bank vegetation, were intact and woody vegetation that was incorporated into the revetment was still in place. Deposition of sediment (primarily fine sands and silts) on top of and within the upper layer of the rock has occurred, along with erosion and retreat of the unprotected portion of the bank, but there was no evidence of scour behind the rock, and the within-rock woody material was still in place. Similarly, the 2011 survey found no evidence to suggest that erosion has occurred at the upstream end of the structure or that there has been loss of rock along the entire 1,500 feet of the structure (Tetra Tech 2012a). Observation of the downstream end of the revetment did not reveal significant erosion of the bank downstream of the revetment, and there also did not appear to have been any loss of rock. Woody material piles placed on the top of, and within the revetment were intact along the entire site. The large woody material anchored on the top of the structure appears to be sites of preferential establishment of boxelders, sycamore and willows, probably because of their effects on local flow velocities. Comparison of the January 2010 and June 2011 bathymetric surveys of the reach indicate that high flows during March 2011 may have caused about two feet of scour along the revetment.

Although occasional replacement of rock or tree material may be necessary at the revetment, the maintenance activities are not anticipated to occur frequently and would not disturb soils or cause additional erosion at the site. Soil erosion is not considered to be a major issue because revetment maintenance work would be conducted during the summer months when the risk of rain-induced erosion is low. However, to minimize potential impacts of soil and other substances from entering the Sacramento River and increasing river turbidity and suspended sediment loads and otherwise affecting water quality, several protective measures would be implemented including the ECP, PCSWMP, SWPPP, and HMCSPRP (see Section 2.2.3).

Overall, and in consideration of the types of activities associated with revetment maintenance, and the relatively limited area that would affected by the Proposed Action/Project, it is unlikely that the Proposed Action/Project would cause the rupture of a known earthquake fault, strong seismic ground shaking, or seismic-related ground failure, including liquefaction. The Action/Project Area is not located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in on- or off-site lateral spreading, subsidence, liquefaction, or collapse. Additionally, because an ERC and PCSWMP are environmental commitments incorporated into the Proposed Action/Project, the Proposed Action/Project also would not result in substantial soil erosion or the loss of topsoil. Therefore, the Proposed Action/Project would have a less-than-significant impact on geology, geomorphology, and soils.

PROPOSED ACTION/PROJECT RELATIVE TO THE NO ACTION ALTERNATIVE (NEPA ANALYSIS)

For additional NEPA analysis purposes, this section presents those considerations under the Proposed Action/Project, relative to the No Action Alternative.

In-river Dredging and Spoils Disposal

***G-4**. Potential for seismic-related ground shaking or failure, increased soil instability, or increased risk to human life or property associated with dredging operations that would result in adverse effects to geology, geomorphology, or soils.*

Comparison of the Proposed Action/Project relative to the No Action Alternative is similar, with respect to dredging, to the comparison of the Proposed Action/Project relative to Existing Conditions. Logically, the No Action Alternative would resemble Existing Conditions with little to no changes from existing physical conditions resulting from continued deposition and expansion of the in-channel gravel bar. Previous analysis of sediment transport and deposition at the gravel bar by Mussetter and Cui (2004) indicated that the average annual rate of deposition on and near the gravel bar was likely to be about 43,000 tons. More recent bathymetric results found that between the 2006 and 2012 surveys, about 61,300 cubic yards (~82,800 tons) of material accumulated in the reach. The Proposed Action/Project would have the same short-term construction-related impacts as those described for the comparison of the Proposed Action/Project, relative to Existing Conditions.

Bank Revetment Monitoring and Maintenance

***G-5**. Potential for seismic-related ground shaking or failure, increased soil instability, or increased risk to human life or property associated with revetment maintenance that would result in adverse effects to geology, geomorphology, or soils.*

Short-term construction impacts associated with the Proposed Action/Project would be less than the impacts of the No Action Alternative related to removing the revetment and returning the site

to a naturally-eroding bank that would be subject to scour and other erosional processes as the Sacramento River channel continues to migrate in a westward direction.

For the Sacramento River, Constantine et al. (2009) report that vegetation effects on bank erosion rates are small compared with the influence of bank material composition on resistance to fluvial shear. Where confined to the tops of tall cutbanks, vegetation can resist tension cracking and exert a minor influence on the shear strength across a potential failure surface, but not on the rate of the erosion at the toe of the bank, which eventually undermines even root-reinforced slopes (Constantine et al. 2009). Under the No Action Alternative, despite the presence of existing vegetation communities observed on-site, hydraulic forces associated with repeated high flow events would continue to erode the area where revetment removal occurs, and the river would continue its westward migration. Because bank material properties are the predominant control on long-term meander migration rates (Constantine et al. 2009), it is anticipated that the continued westward migration of the river, over time, also potentially could result in a loss of privately-owned property along the shoreline of the Sacramento River, as well as the currently vegetated revetment area on the USFWS Capay Unit under the No Action Alternative. Additionally, increased depositional material in the Sacramento River immediately upstream of the M&T/Llano Seco Pumps Facility has the potential to adversely affect water supply operations by reducing functionality, or potentially rendering the M&T/Llano Seco Pumps Facility inoperable if the intakes become clogged or isolated from river.

Based on the above considerations, potential impacts to geology, geomorphology and soils associated with the Proposed Action/Project would be less than significant, relative to the No Action Alternative.

3.7.4 ENVIRONMENTAL COMMITMENTS

Impact avoidance and minimization measures identified to address potential effects on geology, geomorphology and soils are based on the measures described for water quality (see Section 2.2.3 – Environmental Commitments and Mitigation Measures and Appendix I – Mitigation Monitoring and Reporting Program). These measures, together with the other environmental commitments incorporated into the project description, are adequate to avoid potentially significant effects under both NEPA and CEQA.

Under the Proposed Action/Project, potential impacts related to geology and seismic-related ground failure would not occur, and potential impacts on Sacramento River geomorphology would be minimal, relative to Existing Conditions. To address potential short-term impacts related to soil and erosion, standard water pollution prevention measures, including erosion and sediment control measures, proper maintenance of equipment and storage of materials, proper control of non-stormwater discharges, and hazardous spill prevention and response measures would be implemented as part of the Proposed Action/Project. Construction-related water quality impact avoidance and minimization measures associated with the Proposed Action/Project are described in Section 2.2.3.

Additionally, water quality-related impact avoidance and minimization measures associated with revetment removal construction activities under the No Action Alternative would be similar to those described in Section 3.6.4, excluding ***Environmental Commitment WQ-3***.

3.8 AESTHETICS/VISUAL RESOURCES

The term "aesthetics" refers to the perceived visual character of an area such as a scenic view, open space, or architectural facade. The esthetic value of an area is a measure of its visual character and visual quality combined with viewer response (Federal Highway Administration, 1983). This combination may be affected by the components of a project (for example, buildings constructed at heights that obstruct views, hillsides cut and graded, and open space changed to an urban setting), as well as variable elements such as light, weather, and the length and frequency of viewer exposure to the setting.

3.8.1 AFFECTED ENVIRONMENT/ENVIRONMENTAL SETTING

3.8.1.1 VISUAL CHARACTER

Visual character is the appearance of the physical form of the landscape - composed of natural and manmade elements including topography, water, vegetation, structures, roads, infrastructure, and utilities - and the relationships of these elements in terms of form, line, color, and texture.

VISUAL QUALITY

Visual quality is evaluated based on the relative degree of vividness, intactness, and unity as modified by its visual sensitivity.

VIVIDNESS

Vividness is the visual power or memorability of landscape components as they combine in striking or distinctive visual patterns.

INTACTNESS

Intactness is the visual integrity of the natural and human-built landscape and its freedom from encroaching elements; this factor can be present in well-kept urban and rural landscapes as well as in natural settings.

UNITY

Unity is the visual coherence and compositional harmony of the landscape considered as a whole; it frequently attests to the careful design of individual components in the artificial landscape (Federal Highway Administration 1983).

High-quality views are highly vivid, relatively intact, and exhibit a high degree of visual unity. Low-quality views lack vividness, are not visually intact, and possess a low degree of visual unity.

VIEWER RESPONSE

Viewer response is the psychological reaction of a person to visible changes in the viewshed, defined as all of the surface area visible from a particular location (for example, an overlook) or sequence of locations (for example, roadway or trail) (Federal Highway Administration 1983). The measure of the quality of a view must be tempered with the overall sensitivity of the viewer and viewer response. Viewer sensitivity depends on the number and type of viewers and the frequency (for example, daily or seasonally) and duration of views (that is, how long a scene is viewed). Visual sensitivity is also modified by viewer activity, awareness, and visual expectations in relation to the number of viewers and the viewing duration.

The Action/Project Area is located west of the City of Chico, in a rural agricultural area on the Sacramento River. The visual landscape near the Action/Project Area is composed primarily of agricultural land planted with row crops and the riparian corridors along the Sacramento River and Big Chico Creek. The west side of the proposed Action/Project Area is located on the USFWS Capay Unit. Restoration activities on the USFWS Capay Unit are maturing, and presently provide a higher quality visual character than when the rock-toe revetment was installed in 2007. The southern portion of the Action/Project Area contains upland riparian forest on the top of the bank, including entanglements of woody material at various points along the river's edge in the vicinity of the project site. The eastern side of the proposed Action/Project Area is comprised of the location of the former gravel bar that was excavated in 2007 near Big Chico Creek and its confluence with the Sacramento River. Setback from the location of the 2007 gravel bar excavation, beyond Big Chico Creek, is an extensive area of dense riparian vegetation which supports nesting sites for a variety of species. Standing on the Capay Unit and looking across the river toward the east bank, the top of the existing gravel stockpile is barely visible near the southern edge of dense riparian forest adjacent to Big Chico Creek. From the elevation of the Sacramento River, the existing levee creates a visual barrier to the M&T/Llano Seco Pumps Facility. During clear days, views to the east reveal the volcanic tablelands of the foothills and the Mount Lassen area, whereas views to the south from the site are primarily of agricultural land and possibly Sutter Buttes (Jones and Stokes 1996).

The vividness, intactness, and unity of this reach are moderate to high because of the scenic views it provides of the Sacramento River and the presence of mature riparian vegetation. Viewers of the site would be described as recreationalists traveling on the river, visitors to the Bidwell-Sacramento River State Park and the USFWS Capay Unit, and adjoining landowners. Visual features in the Action/Project Area include the Sacramento River, riparian habitat, and the banks and floodplain of the river (**Figures 3.8-1, 3.8-2 and 3.8-3**). The visual character of the Sacramento River in the Action/Project Area is typical of other reaches up- and downstream of the Action/Project Area where banks have eroded, bank protection or stabilization measures have

Figure 3.8-1. View from the SRNWR Capay Unit Looking Across the Sacramento River Toward the Confluence of Big Chico Creek with the Sacramento River and the M&T Chico Ranch.

Figure 3.8-2. View Looking Downstream Across the Sacramento River Toward the M&T/Llano Seco Pumps Facility.

Figure 3.8-3. View from the M&T/Llano Seco Pumps Facility Looking Upstream Across the Sacramento River to the SRNWR Capay Unit and the Existing Temporary Rock-toe and Tree Revetment.

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been installed, and the river meanders across its broad floodplain. No scenic highways have been designated near the Action/Project Area, and the Sacramento River near the Action/Project Area is not a designated wild and scenic river. Therefore, these topics are not discussed further.

3.8.2 REGULATORY SETTING

The following section describes applicable laws, regulations, and standards of aesthetic and visual resources located in the Action/Project Area and surrounding environment.

3.8.2.1 BUTTE COUNTY AND GLENN COUNTY GENERAL PLANS

California Government Code Section 65300 et seq. establishes the obligation of cities and counties to adopt and implement general plans. The general plan is a comprehensive, long-term, and general document that describes plans for the physical development of a city or county and of any land outside its boundaries that, in the city's or county's judgment, bears relation to its planning. The general plan addresses a broad range of topics, including, at a minimum, land use, circulation, housing, conservation, open space, noise, and safety. In addressing these topics, the general plan identifies the goals, objectives, policies, principles, standards, and plan proposals that support the city's or county's vision for the area. The general plan is a long-range document that typically addresses the physical character of an area over a 20–year period. Finally, although the general plan serves as a blueprint for future development and identifies the overall vision for the planning area, it remains general enough to allow for flexibility in the approach taken to achieve the plan's goals.

The State Zoning Law (California Government Code Section 65800 et seq.) establishes that zoning ordinances, which are laws that define allowable land uses within a specific district, are required to be consistent with the general plan and any applicable specific plans. When amendments to the general plan are made, corresponding changes in the zoning ordinance may be required within a reasonable time to ensure the land uses designated in the general plan would also be allowable by the zoning ordinance (Gov. Code, Section 65860(c)).

Both the Glenn and Butte County General Plans should serve as a useful guide for local decision-making. In addition to meeting the requirements of State law, there is also a "common sense" standard that provides for the general plan to focus on issues of greatest local concern.

The Open Space/Public Lands elements of the Glenn County General Plan identifies a general goal to "… *identify areas having open space value as primitive or natural areas, to identify areas in public ownership which are reserved for wilderness use or as a wildlife or nature preserve; to retain certain lands in a natural or undisturbed state; to identify lake recreation areas and to provide for use of these areas for active or passive public recreation purposes*." The Conservation and Open Space elements of the Butte County General Plan identifies the Sacramento River and its riparian corridor as a scenic resource and included a general goal to "*Maintain and enhance the quality of Butte County's scenic and visual resources*".

The conservation element must address the conservation, development and utilization of natural resources including water and its hydraulic force, rivers and other waters, reclamation of waters, prevention and control of the pollution of streams and other waters, and the protection of watersheds.

3.8.3 ENVIRONMENTAL CONSEQUENCES

3.8.3.1 ASSESSMENT METHODOLOGY

The analysis of potential aesthetic and visual resource impacts was based on a review of applicable management plans, previous environmental documentation and photographs taken during field visits and an evaluation of the potential to modify aesthetic or visual resources in the Action/Project Area. To assess visual effects, the concepts presented above were used in combination to identify the following:

- Visual character and quality of the Action/Project Area.
- Relevant policies and concerns for protection of visual resources.
- General visibility of the Action/Project Area and site using descriptions and photographs.
- Viewer response and potential effects.

3.8.3.2 SIGNIFICANCE CRITERIA

The significance criteria used to evaluate potential impacts on aesthetics and visual resources were based on and incorporate guidance contained in Section 1508.27 of the CEQ NEPA regulations regarding significance determinations; the mandatory findings of significance, as listed in Section 15065 of the State CEQA Guidelines (Title 14, Chapter 3 of the CCR); and criteria derived from Appendix G of the State CEQA Guidelines (for additional detail, see Section 3.3.3.2).

For the purposes of this analysis, the Proposed Project would be considered to have an adverse effect under NEPA and a significant impact under CEQA on aesthetics and visual resources if it would contribute to any one of the following within the Action/Project Area.

- Have a substantial adverse effect on a scenic vista.
- Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway.
- Substantially degrade the existing visual character or quality of the site and its surroundings.
- Create a new source of light or glare, which would adversely affect day or nighttime views in the area.

3.8.3.3 IMPACT ANALYSIS

The evaluations below describe the types of effects that could occur on aesthetics and visual resources as a result of the Proposed Project under the following three scenarios.

- No Action Alternative Compared to Existing Conditions (NEPA Analysis)
- Proposed Action/Project Compared to Existing Conditions (CEQA Analysis)
- Proposed Action/Project Compared to the No Action Alternative (NEPA Analysis)

Following the presentation of technical information, a conclusion is made at the end of each analytical comparison regarding whether the scenario evaluated, relative to the basis of comparison, would have an adverse effect under NEPA or a significant impact under CEQA, as appropriate.

NO ACTION ALTERNATIVE RELATIVE TO EXISTING CONDITIONS (NEPA ANALYSIS)

Removal of the Temporary Rock-toe and Tree Bank Revetment

VR-1. *Potential to substantially damage or degrade scenic resources by reducing the existing visual character or quality of the site and its surroundings, or creating new sources of light or glare associated with revetment removal that would result in adverse effects to aesthetics/visual resources.*

The No Action Alternative would remove 1,520 feet of rock and tree revetment. Rock material would be removed from the toe of the bank, and woody material and vegetation that was placed within and above the rock also would be removed. Riparian vegetation that has voluntarily recolonized the revetment area over the past five years, which provide visual relief also would be taken out as part of revetment removal operations. As previously discussed, the interim revetment was designed to provide toe protection only to the eroding bank and there was a general expectation that the upper, nearly vertical and unprotected portion of the bank would continue to erode until a lower bank angle developed that would be colonized by plants and, thereby, be stabilized (Tetra Tech 2010a). Under the No Action Alternative, the west bank of the Sacramento River would be expected to revert to conditions that existing prior to installation of the revetment.

Construction equipment working on the of the west bank of the Sacramento River in the Action/Project Area would be visible to boaters, Bidwell-Sacramento State Park visitors, and adjoining landowners on the Sacramento River that would see the construction activities for a few weeks. Removal work would be conducted during daylight hours and potential impacts from light or glare would be minimal. The presence of construction equipment would temporarily degrade the visual quality of scenic vistas from the bank top and river to low vividness, intactness and unity. However, this effect is temporary and would last no longer than the construction period.

It is expected that the visual resources and aesthetics of the site would change somewhat over time. Continued erosion and river meander would create a naturally appearing river system. Restoration activities completed on the Capay Unit of the SRNWR in 2010 will continue to mature and appear more like a natural valley-foothill riparian and annual grassland ecosystem, thus providing a higher quality visual character (i.e., high vividness, intactness, and unity) in the Action/Project Area.

PROPOSED ACTION/PROJECT RELATIVE TO EXISTING CONDITIONS (CEQA ANALYSIS)

In-river Dredging and Spoils Disposal

***VR-2**. Potential to substantially damage or degrade scenic resources by reducing the existing visual character or quality of the site and its surroundings, or creating new sources of light or glare associated with dredging operations that would result in adverse effects to aesthetics/visual resources.*

The dredge barge, construction vehicles, and associated dredge equipment would be visible at the project site and affect visual conditions on the east side of the Sacramento River. Boaters and adjoining landowners on the Sacramento River may see construction activities during the project work window. While dredging activities would not generate sources of light or glare, the suction dredge pipe and other dredging equipment necessary to convey dredged material to the containment area and the stockpile site may create reflection on sunny days. Any reflection would be temporary and sporadic, seen only from certain angles by boaters or other recreationalists passing adjacent to the operations. To increase visibility for navigational safety purposes, lighted warning buoys would be placed in the river. Additionally, the dredge barge and the floating suction dredge line would be illuminated between dusk and dawn, which may temporarily result in a small amount of increased light or glare on the river. These temporary sources of lighting would be low in intensity. The presence of construction equipment could potentially degrade the visual quality of scenic vistas from the river to low vividness, intactness and unity. However, this effect would be temporary and would last no longer than the construction period.

The existing gravel stockpile is located just east of the riparian forest at the confluence of Big Chico Creek and the Sacramento River. The existing stockpile is not visible from the river. Mature trees and dense riparian vegetation along the east bank of the river obscure the stockpile and most of the M&T/Llano Seco Pumps Facility from sight, although the top of the facility and the top of the existing levee are visible from the SRNWR Capay Unit (Figure 3.8-1). For impact assessment purposes, it is assumed that up to 200,000 cubic yards of material could be removed from the river and stored at the stockpile. The material would be uniformly distributed, and the height of the stockpile could be increased by up to 15 feet in some places. Because some areas near the center and the north end of the stockpile are lower than others, a more reasonable estimate assumes that the height of the area could be increased between 10 to 15 feet. Recognizing the uncertainties regarding the amount and location of material in the Sacramento

River, as well as production capacity limitations associated with the swinging ladder dredging technique, the actual quantity of material to be removed from the river will most likely be less than the values indicated. Based upon photographs and on-site field inspection, and in consideration of: (1) the height, density and location of the mature riparian forest; (2) the height of the existing levee proximate to the height and location of the riparian forest and the existing stockpile; and (3) distance of the existing stockpile from the river, visual estimation suggests that if the existing stockpile were increased an additional 10 to 15 feet in height, it is unlikely that it would be visible the Sacramento River. Therefore, because the potential impacts to aesthetics and visual resources associated with implementation of the dredging and spoils disposal portion of the Proposed Action/Project would be temporary and primarily occur during construction operations, and would not degrade the existing visual character or quality of the site and its surroundings, these impacts would be less than significant.

Bank Revetment Monitoring and Maintenance

VR-3. *Potential to substantially damage or degrade scenic resources by reducing the existing visual character or quality of the site and its surroundings, or creating new sources of light or glare associated with revetment maintenance that would result in adverse effects to aesthetics/visual resources.*

The Proposed Action/Project involves the rock-toe and tree revetment remaining in place until a long-term solution is developed and completed. The visual character of the Action/Project Area has returned to a more natural viewshed since construction of the revetment during the fall of 2007, with establishment of boxelders and other plants on top of the revetment, and woody vegetation such as willows at the base of the revetted bank (Tetra Tech 2010a). It is anticipated that vegetation on the revetment will continue to establish and mature, and will provide views of natural vegetation along the Sacramento River corridor.

Maintenance associated with the revetment may include placement of additional rock material at the toe of the bank, as well as re-vegetation within and above the rock if materials become dislodged. Although vegetation and large woody material has naturally reestablished within the revetment, additional large woody material and fill material may need to be added as determined by periodic surveys of the site. Although construction equipment necessary to implement potential maintenance activities, including heavy machinery used for the placement of additional rock and/or tree clusters on the revetment, could temporarily degrade the visual character of the site, the impact would be temporary and would occur infrequently over the duration of the project.

Therefore, for the reasons described above, the Proposed Action/Project would result in less than significant impacts to aesthetics/visual resources.

PROPOSED ACTION/PROJECT RELATIVE TO THE NO ACTION ALTERNATIVE (NEPA ANALYSIS)

For additional NEPA analysis purposes, this section presents those considerations under the Proposed Action/Project, relative to the No Action Alternative.

In-river Dredging and Spoils Disposal

VR-4. *Potential to substantially damage or degrade scenic resources by reducing the existing visual character or quality of the site and its surroundings, or creating new sources of light or glare associated with dredging operations that would result in adverse effects to aesthetics/visual resources.*

For this alternatives comparison, potential impacts associated with dredging and spoils disposal under the Proposed Action/Project would be short-term in nature and similar to those previously discussed. Therefore, for the reasons described in the previous analyses, and in consideration of the environmental commitments that would be implemented as part of the Proposed Action/Project, potential impacts to aesthetics/visual resources would be less than significant.

Bank Revetment Monitoring and Maintenance

VR-5. *Potential to substantially damage or degrade scenic resources by reducing the existing visual character or quality of the site and its surroundings, or creating new sources of light or glare associated with revetment maintenance that would result in adverse effects to aesthetics/visual resources.*

The Proposed Action/Project would involve the rock-toe and tree revetment remaining in place until a long-term solution is developed and completed. Because the visual character of the Action/Project Area has returned to a more natural viewshed since the revetment was installed in 2007, it is anticipated that vegetation on the revetment will continue to establish and mature, and will provide views of natural vegetation along the Sacramento River corridor. Under the No Action Alternative, the 1,520 feet of rock and tree revetment would be removed, and continued erosion and river meander would create a naturally appearing river system.

Under both alternatives, the presence of construction equipment would degrade the visual quality of scenic vistas from the bank top and river to low vividness, intactness and unity. However, these effects would be temporary and would last no longer than the construction period. Because revetment maintenance activities would generally require less time and equipment than that which would be required to completely remove the revetment, it is anticipated that potential impacts to visual resources under the Proposed Action/Project would be less than those under the No Action Alternative.

3.8.4 ENVIRONMENTAL COMMITMENTS

There would be a less than significant long-term effect on aesthetics or visual resources and, thus, no impact avoidance and minimization measures are required.

3.9 CULTURAL RESOURCES

3.9.1 AFFECTED ENVIRONMENT/ENVIRONMENTAL SETTING

Several surveys for archaeological and cultural resources have been conducted within the Action/Project Area as part of past actions, including the Cultural Resource Management Plan for the Capay Unit of the Sacramento River National Wildlife Refuge (White et. al. 2003), the Sacramento River Water Intake Stream Channel Maintenance (M&T Chico Ranch et al. 1991), the M&T/Parrott Pumping Plant and Fish Screen Project (CDFG et al. 1996) and the Archaeological Survey Report for the M&T Ranch Bank Stabilization (Gallaway Consulting 2005).

Four isolates have been recorded in proximity to the Action/Project Area as identified through the records searches at the Northeast Information Center:

1. SRNC Iso-025M is a modified trailer frame that rests on a cement pad. The frame is attached to uprights that support the frame over the water. It is recorded as a possible pump frame.
2. SRNC I-027M is a split cobble core with 2 unidirectional flakes driven from an exposed platform.
3. MT-JSA-2 is an existing pump station located on the banks of Big Chico Creek.
4. MT-JSA-1 is a prehistoric site located near the Phelan Canal.

As part of the Archaeological Survey Report (ASR) produced by Gallaway Consulting, Inc. (2005), a records search at the Northeast Information Center was conducted on August 10, 2005 and survey of the bank stabilization site was examined using general survey techniques on September 14, 2005. The majority of the bank stabilization area had visibility of 100 percent. The project area was surveyed using transects of 15–20 meters. No cultural resources were identified during the survey of the site. No evidence of the previously recorded isolates was identified.

As part of the ASR completed for the bank stabilization site, consultation with local Native American groups was completed per the requirements of Section 106 of the National Historic Preservation Act. There were no concerns identified by the consulted groups during the process.

Additionally, CALFED, utilizing the Cultural Resource Management Plan for the SRNWR Capay Unit, completed a CEQA analysis for restoration and maintenance activities, including roadways, on the Capay Unit. No archeological sites were encountered on the Capay Unit during a 2002 survey. The Cultural Resource Management Plan and the Final EIR Sacramento River-Chico Landing Subreach Habitat Restoration Project (2005) address and describe provisions of NEPA/CEQA and Section 106 of the National Historic Act of 1966.

While the bank stabilization area has received both project specific and programmatic cultural resources evaluations and Section 106 consultation in 2005, Section 106 compliance for the

dredging area was completed in 2001. Additionally, to further investigate the potential for submerged cultural resources in the area, the CSLC was contacted to request a detailed records search of the CSLC Shipwreck Database and other CSLC records for the Action/Project Area. Results were obtained on November 21, 2012 and indicate that there are no shipwrecks recorded in the Action/Project Area.

3.9.2 REGULATORY SETTING

Under State and Federal law, effects to significant cultural resources – archaeological remains, historic-period structures, and traditional cultural properties – must be considered as part of the environmental analysis of a Proposed Project. Criteria for defining significant cultural resources are stipulated in the National Historic Preservation Act of 1966 (NHPA), as amended (NHPA; 16 U.S.C. 470 *et seq*.) and the California Environmental Quality Act (CEQA, revised 2005).

Under the NHPA, the Federal lead agency must consider effects to eligible or potentially eligible properties from the proposed undertaking, in consultation with the State Historic Preservation Officer (SHPO). This includes identification (usually through archival research, field inventories, public interpretation, and/or test evaluations) of cultural properties eligible for the NRHP, assessment of potential adverse effects to eligible properties, and development of mitigation measures to offset those effects.

Under CEQA, the lead non-Federal agency must consider potential effects to important or unique cultural resources. While the language is somewhat different between NHPA and CEQA, the definitions of eligible properties and of adverse impacts are essentially the same. Evaluations under CEQA consider a resource's potential eligibility to the California Register of Historical Resources (CRHP).

Preserving the culture and history of our nation's past are the goals of regulations that include the American Antiquities Act of 1906, Historic Sites Act of 1935, National Historic Preservation Act (NHPA) of 1966, NEPA of 1969, Archaeological and Historic Preservation Act of 1974, American Indian Religious Freedom Act, Archeological Resource Protection Act of 1979, President's April 29, 1994 Memorandum, Executive Order 13007, the United States Trust Responsibility to Indian Tribes. Similar State regulations protect archeological, paleontological, and historical sites and specifically provide for identification and protection of traditional Native American gathering and ceremonial sites on State land (EWA 2005). These organizations and individuals are integral in identifying issues related to historic properties that may be affected by the Proposed Project.

3.9.2.1 FEDERAL

AMERICAN ANTIQUITIES ACT OF 1906

The American Antiquities Act of 1906 (34 Stat. 225) authorizes the President of the United States to designate objects or areas of historic or scientific interest on lands owned or controlled

by the United States as National Monuments. The Act requires that a permit be obtained for examination of ruins, excavation of archaeological sites and the gathering of objects of antiquity on lands under the jurisdiction of the Secretaries of Interior, Agriculture, and Army, and provided penalties for violations.

HISTORIC SITES ACT OF 1935

The Historic Sites Act of 1935 (49 Stat. 666), as amended by Public Law 89-249 in 1965 (79 Stat. 971) declares it a national policy to preserve historic sites and objects of national significance, including those located on refuges. The Act provides procedures for the designation, acquisition, administration and protection of such sites. Among other things, National Historic and Natural Landmarks are designated under authority of this Act. As of 1989, 31 national wildlife refuges contained such sites.

NATURAL HISTORIC PRESERVATION ACT OF 1966 (INCLUDING 36 CFR PART 800, PROTECTION OF HISTORIC PROPERTIES)

The NHPA of 1966, as amended, is the principal legislation that guides cultural resource management for Federal agencies. Section 106 of the NHPA requires that Federal agencies take into account the effects of an undertaking on historic properties listed or eligible for listing on the NRHP. The Section 106 review process is described in 36 CFR 800. The five steps in this process include: (1) initiation of the Section 106 process by identifying interested parties and an area of potential effect (APE); (2) identification and evaluation of historic properties within the APE; (3) assessment of the effects of the undertaking on historic properties within the APE; (4) preparation of an agreement document to address any identified adverse effects on historic properties within the APE; and (5) receipt from the Advisory Council on Historic Preservation (ACHP) of comments on the agreement or results of consultation. The Section 106 process requires consultation though each phase with the SHPO, Indian tribes, and interested parties.

NATIONAL ENVIRONMENTAL POLICY ACT

The NEPA of 1969 declares that it is the policy of the Federal government to preserve important historical and cultural properties that represent our national heritage. NEPA requires consideration of adverse impacts to resources in the planning process for Federal projects or privately initiated undertaking on Federal lands or that require Federal licensing, permits, or funding.

ABANDONED SHIPWRECK ACT OF 1987

Public Law 86-523, approved June 27, 1960, (74 Stat. 220) as amended by Public Law 93-291, approved May 24, 1974, (88 Stat. 174) to carry out the policy established by the Historic Sites Act of 1935, directs Federal agencies to notify the Secretary of the Interior whenever they find a Federal or Federally assisted, licensed or permitted project may cause loss or destruction of

significant scientific, prehistoric or archaeological data. The Act authorizes use of appropriated, donated or transferred funds for the recovery, protection and preservation of such data.

ARCHAEOLOGICAL AND HISTORIC PRESERVATION ACT OF 1974

This Act became law on August 11, 1978 (Public Law 95-341, 42 U.S.C. 1996 and 1996a, as amended) and establishes a policy for the United States to protect and preserve American Indians inherent right of freedom to believe, express, and exercise the traditional religions of the American Indian, Eskimo, Aleut, and Native Hawaiians, including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites. The Act also authorizes the President to direct the various Federal departments, agencies, and other instrumentalities responsible for administering relevant laws, to evaluate their policies and procedures in consultation with native traditional religious leaders in order to determine appropriate changes necessary to protect and preserve Native American religious cultural rights and practices.

AMERICAN INDIAN RELIGIOUS FREEDOM ACT

This Act became law on August 11, 1978 (Public Law 95-341, 42 U.S.C. 1996 and 1996a, as amended) and establishes a policy for the United States to protect and preserve American Indians inherent right of freedom to believe, express, and exercise the traditional religions of the American Indian, Eskimo, Aleut, and Native Hawaiians, including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites. The Act also authorizes the President to direct the various Federal departments, agencies, and other instrumentalities responsible for administering relevant laws, to evaluate their policies and procedures in consultation with native traditional religious leaders in order to determine appropriate changes necessary to protect and preserve Native American religious cultural rights and practices.

ARCHEOLOGICAL RESOURCE PROTECTION ACT OF 1979

Public Law 96-95, approved October 31, 1979, (93 Stat. 721) largely supplanted the resource protection provisions of the Antiquities Act for archaeological items. This Act establishes detailed requirements for issuance of permits for any excavation for or removal of archaeological resources from Federal or Indian lands. It also establishes civil and criminal penalties for the unauthorized excavation, removal, or damage of any such resources; for any trafficking in such resources removed from Federal or Indian land in violation of any provision of Federal law; and for interstate and foreign commerce in such resources acquired, transported or received in violation of any State or local law.

NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT OF 1990

On April 29, 1994, President Clinton signed a memorandum outlining the principles that executive departments and agencies, including every component bureau and office, were to

follow in their interactions with Native American tribal governments. The memorandum states that in order to ensure that the rights of sovereign tribal governments are fully respected, executive branch activities are to be guided by the following: (1) the head of each executive department and agency shall be responsible for ensuring that the department or agency operates within a government-to-government relationship with Federally recognized tribal governments; (2) each executive department and agency shall consult, to the greatest extent practical and to the extent permitted by law, with tribal governments prior to taking actions that affect Federally recognized tribal governments; (3) all such consultations are to be open and candid so that all interested parties may evaluate for themselves the potential impact of relevant proposals; (4) each executive department and agency shall assess the impact of Federal government plans, projects, programs, and activities on tribal trust resources and assure that tribal government rights and concerns are considered during the development of such plans, projects, programs, and activities; (5) each executive department and agency shall take appropriate steps to remove any procedural impediments to working directly and effectively with tribal government rights of the tribes; and (6) each executive department and agency shall work cooperatively with other Federal departments and agencies to enlist their interest and support in cooperative efforts, where appropriate, to accomplish the goals of this memorandum.

3.9.2.2 STATE

CALIFORNIA PUBLIC RESOURCES CODE (HISTORICAL RESOURCES)

Under Title 14 of the CCR, CEQA requires that public or private projects financed or approved by public agencies be assessed to determine the effects of project actions on historical resources and unique archeological resources. Historical resources to include the following: (1) the resource is listed in or determined eligible for listing in the California Register of Historical Resources (CRHR) (Pub. Res. Code Section 21084.1 and CEQA Guidelines Section 15064.5, subds. (a) and (b)); (2) the resource is included in a local register of historical resources, as defined in Section 5020.1(k) of the Public Resources Code, or is identified as significant in a historical resources survey meeting the requirements of Section 5024.1(g) of the Public Resources Code, unless the preponderance of evidence demonstrates that it is not historically or culturally significant; or (3) the lead agency determines the resource to be significant, as supported by substantial evidence in light of the whole record (Title 14 CCR 15064.5[a]). A unique archaeological resource is defined as an artifact, object, or site that meets the criteria for listing in the CRHR and the National Register (Pub. Res. Code Section 21083.2, subd. (g)).

Additionally, title to all abandoned shipwrecks, archaeological sites, and historic or cultural resources on or in the tide and submerged lands of California is vested in the State and under the jurisdiction of the CSLC. Any submerged archaeological site or submerged historic resource that has remained in State waters for more than 50 years is presumed to be significant, and should be considered in the CEQA lead agency's decision on whether an EIR should be prepared for the Proposed Project. The recovery of objects from any abandoned shipwreck, archaeological or

historic site on State land under the jurisdiction of the CSLC may require a salvage permit (Pub. Resources Code, §6309).

Generally, a resource shall be considered by the lead agency to be "historically significant" if the resource meets the criteria for listing on the CRHP. CEQA statutes also state that if implementation of a project would result in significant effects on historical resources, alternative plans or mitigation measures must be considered (Title 14 CCR 15126.4 (b)).

SECTION 5097.5 OF THE CALIFORNIA PUBLIC CODE – DISTURBANCE OF AN ARCHEOLOGICAL SITE

Section 5097.5 of the California Public Code makes it a misdemeanor for anyone to knowingly disturb any archaeological, paleontological, or historical feature on public lands.

STATE HISTORIC PRESERVATION OFFICE COORDINATION

Cultural resources in California are regulated by the SHPO, which was established by the NHPA of 1966. This office is responsible for administering preservation programs established by State and Federal law, including the NHPA, the Archeological and Historic Preservation Act (P.L. 93 291), the American Indian Religious Freedom Act (P.L. 96-34), and the Archeological Resources Protection Act (P.L. 96-95). Under Section 106 of the NHPA and CEQA, the SHPO, in conjunction with State and Federal agencies, identifies resources that may be eligible for inclusion in the NRHP. If a project may affect a historic site, the SHPO must review the project impacts to that site and the proposed mitigation measures to reduce the significance of the impact. During this process, SHPO's Native American Coordinator ensures that Native American concerns for archeological sites and other cultural properties are also considered.

STATE OF CALIFORNIA HEALTH AND SAFETY CODE 8010-8011 – CALIFORNIA NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT

The California Native American Graves Protection and Repatriation Act establishes a State repatriation policy that is consistent with and facilitates implementation of the Federal Native American Graves Protection and Repatriation Act. The act strives to ensure that all California Native American human remains and cultural items are treated with dignity and respect. It encourages voluntary disclosure and return of remains and cultural items by publicly funded agencies and museums in California and states an intent for the State to provide mechanisms for aiding California Native American tribes, including non-Federally recognized tribes, in filing repatriation claims and getting responses to those claims.

3.9.2.3 LOCAL

SACRAMENTO RIVER NATIONAL WILDLIFE REFUGE COMPREHENSIVE CONSERVATION PLAN

As described in the USFWS SRNWR CCP, a management goal of the USFWS includes adequately protecting all natural and cultural resources located on the Capay Unit of the SRNWR.

3.9.3 ENVIRONMENTAL CONSEQUENCES

3.9.3.1 ASSESSMENT METHODOLOGY

The analysis of impacts to historic or cultural resources was based on an assessment of archaeological sensitivity for the Action/Project Area and the potential for the Proposed Project to affect important historic or cultural resources. Archaeological sensitivity (the possibility of unknown cultural resources to exist in an area) is determined by a review of historical maps, historical documents, previous archaeological survey coverage, presence of known cultural resources, and environmental information (e.g., soils, geology, vegetation regime, river conditions). Actions that physically disturb a site, alter its setting, or introduce elements out of character with the site may constitute a potential impact. Similarly, if a site is eligible for inclusion in the National Register of Historic Places (NRHP), any type of physical damage would result in a permanent loss of information that reduces one's understanding of the site's contribution to the past.

3.9.3.2 SIGNIFICANCE CRITERIA

The significance criteria used to evaluate potential impacts on historic properties, cultural resources and unique archeological resources were based on and incorporate guidance contained in Section 1508.27 of the CEQ NEPA regulations regarding significance determinations; the mandatory findings of significance, as listed in Section 15065 of the State CEQA Guidelines (Title 14, Chapter 3 of the CCR); and criteria derived from Appendix G of the State CEQA Guidelines (for additional detail, see Section 3.3.3.2).

Criteria for defining significant historic or cultural resources are stipulated in the NHPA and CEQA. The NHPA defines a significant historic or cultural property as one that is eligible for listing on the NRHP. The criteria for evaluating a property's eligibility for listing in the NRHP is as follows.

> "*The quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling and association, and that: (a) are associated with events that have made a contribution to the broad pattern of our history; (b) are associated with the lives of people significant in our past; (c) embody the distinct characteristics of a type, period, or method of construction, or that represent the*

> *work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction, or (d) have yielded, or are likely to yield, information important in prehistory or history*" (36 CFR 60.4).

It is usually necessary to identify, based on previous scientific studies, research issues which are important to an understanding of the regional history or prehistory, and to determine whether a particular historic or cultural resource contains information which may help to address these issues; a resource which does contain such information is considered significant and, therefore, eligible for NHRP. In practice, and under regulation, unevaluated resources are treated as potentially significant.

CEQA requires that *important* cultural resources be protected. The CEQA Guidelines define an important resource as one listed on, or eligible for listing on, the California Register of Historical Resources (PRC Section 5024). Resources that are found to be eligible for the Register "*are to be protected from substantial adverse change*." Such change is defined in Section 5020.1 as demolition, destruction, relocation, or alteration activities that would impair historical significance; one example would be "*remodeling a historic structure in such a way that its distinctive nature is altered*" (OPR 1994).

Potentially significant impacts can occur when prehistoric or historical archaeological sites, structures, or objects listed on, or eligible for listing on the NHRP are subject to any one of the following effects:

- Physical destruction or alteration of all or part of the property.
- Isolation of the property from, or alteration of, the property's setting when that character contributes to the property's qualification for the NRHP.
- Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting.
- Neglect of a property resulting in its deterioration or destruction.
- Transfer, lease or sale of the property (36 CFR 800.9).

For the purposes of this analysis, the Proposed Project would be considered to have an adverse effect under NEPA and the NHPA, and a significant impact under CEQA on historic properties, cultural resources and unique archeological resources if it would contribute to any one of the following within the Action/Project Area.

- Alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association (36 CFR 21 800.5[a][1]).

- Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5 of the State CEQA Guidelines.
- Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5 of the State CEQA Guidelines.
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.
- Disturb any human remains, including those interred outside of formal cemeteries.

3.9.3.3 IMPACT ANALYSIS

The evaluations below describe the types of effects that could occur on historic properties, cultural resources and unique archeological resources as a result of the Proposed Project under the following three scenarios.

- No Action Alternative Compared to Existing Conditions (NEPA Analysis)
- Proposed Action/Project Compared to Existing Conditions (CEQA Analysis)
- Proposed Action/Project Compared to the No Action Alternative (NEPA Analysis)

Following the presentation of technical information, a conclusion is made at the end of each analytical comparison regarding whether the scenario evaluated, relative to the basis of comparison, would have an adverse effect under NEPA and the NHPA, or a significant impact under CEQA, as appropriate.

NO ACTION ALTERNATIVE RELATIVE TO EXISTING CONDITIONS (NEPA ANALYSIS)

Removal of the Temporary Rock-toe and Tree Bank Revetment

CULT-1. *Potential for revetment removal to physically destroy or alter project site conditions resulting in the impairment of the historical significance of important cultural resources listed on, or eligible for listing on, the California Register of Historical Resources or that would adversely affect a property's eligibility for listing in the National Register of Historic Places.*

Ground disturbance and other construction activities associated with removal of the rock-toe and tree revetment would occur on the same site that was previously disturbed when the revetment was constructed during 2007. Revetment removal was previously evaluated in the 2007 Final EA/IS (CDFG and USFWS 2007) and authorized in NEPA and CEQA decision documents approved by USFWS and CDFW for the 2007 project. No historic or cultural resources were uncovered during the construction of the rock-toe and tree revetment. Additionally, because the ASRs previously conducted for the 2007 project area (an area that has since been disturbed during construction of the revetment) concluded that there would be no known affect on archaeological resources within the area surveyed, it is unlikely that unknown cultural and/or historical resources would be disturbed or uncovered during revetment removal activities under the No Action Alternative. Access and staging activities will utilize existing staging areas that

have been previously disturbed, and would not be expected to result in effects to undiscovered resources. Nevertheless, if resources would be discovered during revetment removal, potential impacts on the resources could be significant if they are determined eligible for listing in the NRHP or the CRHP, and if the impact would affect their eligibility. The USFWS would implement treatment measures in accordance with the SRNWR CCP to ensure consistency with this plan and minimize potential adverse impacts. In addition, ***Environmental Commitments CULT-1*** through ***CULT-3*** (see Chapter 2), would be implemented.

PROPOSED ACTION/PROJECT RELATIVE TO EXISTING CONDITIONS (CEQA ANALYSIS)

The Proposed Action/Project would not conflict with the cultural and historic protection measures established by Federal, State, or local regulatory programs because issuance of Federal funding and permits would be dependent on compliance with Section 106 of the NHPA and issuance of State funding and permits would be dependent on compliance with CEQA and California PRC Section 5024.5.

In-river Dredging and Spoils Disposal

CULT-2. *Potential for dredging operations to physically destroy or alter project site conditions resulting in the impairment of the historical significance of important cultural resources listed on, or eligible for listing on, the California Register of Historical Resources or that would adversely affect a property's eligibility for listing in the National Register of Historic Places.*

The ASRs previously conducted for the Action/Project Area concluded that there would be no known affect on archaeological resources within the surveyed area. Additionally, information recently obtained from the CSLC reconfirmed that there are no shipwrecks recorded in the area of the Sacramento River that is located in the Action/Project Area. Thus, in-water dredging operations would not be expected to affect undiscovered inundated cultural resources because inundated resources are not expected in the affected reach of the Sacramento River. Although the potential exists for unknown cultural and/or historical resources to be disturbed or uncovered on the M&T Chico Ranch property during construction activities, it is relatively low because the area where the existing stockpile is located was agricultural land before 2001 when the existing stockpile was created, and additional excavated gravel material from the Sacramento River would be placed on top of the existing stockpile under the Proposed Action/Project. In addition, the suction dredge pipeline running from the dredge barge to Containment Area #1 and the dewatering pipeline running from Containment Area #2 to the stilling well at the M&T pumping plant would traverse along the surface of the ground in a previously disturbed area. Access and staging activities will utilize existing disturbed areas, and would not be expected to result in effects to undiscovered resources.

Although unlikely, if historic properties, cultural resources and/or unique archeological resources would be discovered, potential impacts on the resources could be significant if they are determined eligible for listing in the NRHP or the California Register of Historical Resources, and if the impact would affect their eligibility. If buried historic or cultural resources are

inadvertently discovered during ground-disturbing activities, the measures described in Section 2.2.3 would be implemented. With the implementation of ***Environmental Commitments CULT-1*** through ***CULT-3***, suction dredging activities associated with the Proposed Action/Project would have a less than significant impact on cultural resources.

Bank Revetment Monitoring and Maintenance

CULT-3. *Potential for revetment removal to physically destroy or alter project site conditions resulting in the impairment of the historical significance of important cultural resources listed on, or eligible for listing on, the California Register of Historical Resources or that would adversely affect a property's eligibility for listing in the National Register of Historic Places.*

Construction-related maintenance activities associated with of the rock-toe and tree revetment would occur on the same site that was previously disturbed when the revetment was constructed during 2007. No historic properties, cultural resources and unique archeological resources were uncovered during the construction of the rock-toe and tree revetment. Additionally, because the ASRs previously conducted for the 2007 project area concluded that there would be no known affect on archaeological resources within the area surveyed, it is unlikely that unknown cultural and/or historical resources would be disturbed or uncovered during revetment maintenance activities. However, if buried historic, cultural or archeological resources are inadvertently discovered, work will cease in that area until a qualified archaeologist can assess the significance of the find and, if necessary, develop appropriate treatment measures in consultation with the SHPO and the CSLC, as appropriate (see Section 2.2.3). With the implementation of ***Environmental Commitments CULT-1*** through ***CULT-3***, revetment maintenance activities associated with the Proposed Action/Project would have a less than significant impact on cultural resources.

PROPOSED ACTION/PROJECT RELATIVE TO THE NO ACTION ALTERNATIVE (NEPA ANALYSIS)

For additional NEPA analysis purposes, this section presents those considerations under the Proposed Action/Project, relative to the No Action Alternative.

The Proposed Action/Project would not conflict with the cultural and historic protection measures established by Federal, State, or local regulatory programs because issuance of Federal funding and permits would be dependent on compliance with Section 106 of the NHPA. Revetment removal, which is part of the No Action Alternative considered in this Draft EA/IS, was previously evaluated in the 2007 Final EA/IS (CDFG and USFWS 2007) and authorized in NEPA and CEQA decision documents approved by USFWS and CDFW for the 2007 Temporary Maintenance Project.

The ASRs previously conducted for the Action/Project Area concluded that there would be no known affect on archaeological resources within the surveyed area. Additionally, information recently obtained from the CSLC reconfirmed that there are no shipwrecks recorded in the area of the Sacramento River that is located in the Action/Project Area. Potential impacts to historic

properties, cultural resources and/or unique archeological resources would be similar to those described in the previous two analytical comparisons.

Although the Proposed Action/Project and the No Action Alternative are not expected to disturb or alter, directly or indirectly, any known cultural resources, unknown historic properties, cultural resources and unique archeological resources could be unearthed. If buried historic, cultural or archeological resources are inadvertently discovered during ground-disturbing activities under either the Proposed Action/Project or the No Action Alternative, the measures described in Section 2.2.3 would be implemented. Consequently, the Proposed Action would have no adverse effect to historic or cultural resources.

3.9.4 ENVIRONMENTAL COMMITMENTS

In the event of an unanticipated discovery of a historic property, a cultural resource or a unique archeological resource, the measures described in Section 2.2.3 and detailed in the Mitigation Monitoring and Reporting Program (Appendix I) would be implemented for both the Proposed Action/Project and the No Action Alternative. A summary of these measures is provided below.

- ***Environmental Commitment CULT-1****: Reduce potential historic and cultural resources impacts if buried resources are discovered during construction.*
- ***Environmental Commitment CULT-2****: Reduce potential historic and cultural resources impacts if human remains are discovered during construction.*
- ***Environmental Commitment CULT-3****: Reduce potential historic and cultural resources impacts if submerged archaeological or historic resources are discovered in the Sacramento River.*

3.10 AIR QUALITY AND GREENHOUSE GAS EMISSIONS

This section describes existing air quality conditions in Butte and Glenn counties, identifies current State and Federal regulations, including the attainment classifications for various types of air pollutants, and evaluates the potential air quality effects that could occur as a result of implementing the Proposed Action/Project.

Air quality in California is regulated by the EPA and the California Air Resources Board (CARB). Regulation occurs at regional levels in designated Air Basins, and at local levels by Air Pollution Control Districts (APCD) or Air Quality Management Districts (AQMD). These districts are responsible for attaining both State and Federal air quality targets. For some pollutants, separate targets have been established for different periods of the year. Most targets have been set to protect public health, although some standards have been based on other values, such as protection of crops, protection of materials, or avoidance of nuisance conditions. Various types of air pollutants are measured, including: (1) ozone; (2) carbon monoxide; (3) nitrogen dioxide; and (4) particulate matter that measures 10 microns or less (PM_{10}). For CEQA purposes, a sensitive receptor is generically defined as a location where human populations are

found, and there is reasonable expectation of continuous human exposure according to the averaging period for Ambient Air Quality Standards (AAQS) (e.g., 24-hour, 8-hour, 1-hour).

Additionally, greenhouse gas (GHG) emissions have the potential to adversely affect the environment because they contribute, on a cumulative basis, to global climate change. Prominent GHGs of primary concern include carbon dioxide (CO_2), methane, and nitrous oxide, as well as gasses that are human-made and are emitted through the use of modern industrial products, such as hydrofluorocarbons, chlorinated fluorocarbons, and sulfurhexafluoride. Typical sources of GHG emissions associated with construction activities include exhaust emissions from fuel combustion for mobile heavy-duty diesel- and gasoline-powered equipment, portable auxiliary equipment, and material delivery trucks.

3.10.1 AFFECTED ENVIRONMENT/ENVIRONMENTAL SETTING

The air quality of a particular area is influenced by several factors, including the amounts of pollutants released, the nature of the sources, and the ability of the atmosphere to transport and disperse the pollutants. The main determinants of transport and dispersion are wind, atmospheric stability or turbulence, topography, and the existence of inversion layers.

3.10.1.1 FACTORS AFFECTING POLLUTANT CONCENTRATIONS

The Action/Project Area is located within both Glenn and Butte counties in the northern part of the Sacramento Valley Air Basin (SVAB). The SVAB encompasses the northern portion of the Central Valley and is bounded by the Coast Ranges to the west, the Cascade Range to the north, and the Sierra Nevada to the east (USFWS and CDFG 2012). Dispersion of local pollutant emissions is predominantly affected by the prevailing wind patterns and inversions that often occur in the northern SVAB (Butte County 2010). Glenn County's air quality issues are managed by the Glenn County Air Pollution Control District (GCAPCD). Butte County's air quality issues are managed by the Butte County Air Quality Management District (BCAQMD).

CLIMATE

The climate of the area is characterized by hot, dry summers and cool, wet winters. During the summer months from mid-April to mid-October, significant precipitation is unlikely and temperatures range from daily maxima exceeding 100°F to evening lows in high 50s and low 60s. During the winter, air temperature highs are typically in the 60s with lows in the 30s. Wind direction is primarily up- and down-valley due to the channeling effect of the mountains to either side of the valley. During the summer months surface air movement is from the south, particularly during the afternoon hours. During the winter months wind direction is more variable.

TEMPERATURE INVERSIONS

The vertical dispersion of air pollutants in the Sacramento Valley is limited by the presence of persistent temperature inversions. Pollutants remain trapped and are able to increase in

concentration in the layer of air where people breathe (SVAQEEP 2012). Because of expansional cooling of the atmosphere, air temperature usually decreases with altitude. A reversal of this atmospheric state, where the air temperature increases with height, is termed an inversion. Inversions can exist at the surface, or at any height above the ground. The height of the base of the inversion is known as the “mixing height.” Pollutants can mix vertically to this level. Semi-permanent systems of high barometric pressure fronts frequently establish themselves over the Sacramento Valley, deflecting low pressure systems that might otherwise bring cleansing rain and winds. Air above and below the inversion base does not mix because of differences in air density. Warm air above the inversion is less dense than below the base. The inversion base represents an abrupt density change where little exchange of air occurs. Inversion layers are significant in determining ozone formation and PM_{10} concentrations.

Ozone is a gas that occurs in two layers of the atmosphere – the stratosphere and the troposhere (EPA 2011a). The stratospheric, extending upward about 6 to 30 miles, or "good" ozone protects life on Earth from the sun's harmful ultraviolet rays. The layer closest to the Earth's surface is the troposphere, which generally extends to a level about 6 miles up, where it meets the stratosphere. The troposhere is where ground-level or "bad" ozone is an air pollutant that is harmful to breathe and it damages crops, trees and other vegetation. It is also a main ingredient of urban smog (EPA 2011a).

The area typically experiences two types of inversions that affect the vertical depth of the atmosphere through which pollutants can be mixed. In summer, sinking air forms a "lid" over the region. These subsidence inversions contribute to summer photochemical smog problems by confining pollution to a shallow layer near the ground.

Ozone and its precursors will mix and react to produce higher concentrations under an inversion. Once formed, ozone remains in the atmosphere for 1 or 2 days. Consequently, ozone is a regional pollutant and may impact a large area by causing damage to vegetation, chemical deterioration of various materials, and irritation and damage to the human respiratory system (USFWS 2005). Because PM_{10} is both created in the atmosphere as a chemical reaction and directly emitted, inversions will also trap and hold directly emitted PM_{10}. Concentration levels are directly related to inversion layers due to the limitation of mixing space.

Radiative inversions are formed when the ground surface becomes cooler than the air above it during the night. The earth's surface goes through a radiative process on clear nights, where heat energy is transferred from the ground to a cooler night sky. As the earth's surface cools during the evening hours, the air directly above it also cools, while air higher up remains relatively warm. The inversion is destroyed when heat from the sun warms the ground, which in turn heats the lower layers of air: this heating stimulates the ground-level air to float up through the inversion layer. Daytime temperature inversions during the summer are usually encountered 2,000 to 2,500 feet above the valley floor and in the winter, the inversion usually occurs 500 to 1000 feet above the valley floor. Summer subsidence inversions occur on more than 90 percent of summer days, persist throughout the day and tend to intensify during the afternoon. Winter

inversions are usually more persistent (stable). These inversions typically occur during winter nights and can cause localized air pollution concerns near emission sources because of poor dispersion. Winter radiation inversions occur on more than 70 percent of winter nights, but are usually destroyed by daytime heating, bringing a rapid improvement in air quality by afternoon. Both types of inversion mechanisms may exist at any time of the year, and in the fall both may occur together to produce the heaviest pollution potential (SVAQEEP 2012).

3.10.1.2 HUMAN HEALTH EFFECTS ASSOCIATED WITH CRITERIA AIR POLLUTANTS

A summary of the human health effects associated with several key criteria air pollutants is provided below.

OZONE

Pollutant	Potential Human Health Effects
Ozone	▪ Ozone can irritate lung airways and cause inflammation. Other symptoms include wheezing, coughing, and breathing difficulties during exercise or outdoor activities. People with respiratory problems are most vulnerable, but even healthy people that are active outdoors can be affected when ozone levels are high.
	▪ Repeated exposure to ozone pollution for several months may cause permanent lung damage.
	▪ Even at very low levels, ground-level ozone triggers a variety of health problems including aggravated asthma, reduced lung capacity, and increased susceptibility to respiratory illnesses like pneumonia and bronchitis.
	▪ Ground-level ozone interferes with the ability of plants to produce and store food, which makes them more susceptible to disease, insects, other pollutants, and harsh weather.
	▪ Ozone reduces crop and forest yields and increases plant vulnerability to disease, pests, and weather.

Ozone is a secondary pollutant that forms as a result of the interaction between ultraviolet light, ROG and NO_x. ROG and NO_x are primary pollutants that are emitted directly into the environment. Secondary or indirect pollutants are formed in the atmosphere, usually as the result of a chemical reaction involving primary pollutants. In the NSVPA, ozone is a seasonal problem, typically occurring during the months of May through October. Sources for the pollutants that react to form ozone include motor vehicles, power plants, factories, chemical solvents, combustion products from various fuels, and consumer products (SVAQEEP 2009).

Ozone acts as a strong irritant that attacks the body's respiratory system. Symptoms include shortness of breath, chest pain when inhaling deeply, wheezing and coughing. When ozone levels are high, people with lung disease (e.g., chronic bronchitis, emphysema, and asthma) are particularly susceptible to adverse health impacts (SVAQEEP 2009).

The major effects of ozone and the other components of photochemical smog include: (1) reductions in plant growth and crop yield; (2) chemical deterioration of various metals; and (3) irritation of respiratory systems and eyes. In addition to the adverse effects on human health described above, ozone is the pollutant primarily responsible for damage to crops and natural vegetation in California. Ozone injury to plants can occur as either acute injury (i.e., tissue death or death of the whole plant) at moderate to high concentrations (0.15 parts per million [ppm] and above for two to eight hours), or as chronic injury (e.g., reduced crop yield or impaired ecosystem stability) resulting from repeated exposure to ozone at low to moderate concentrations (0.04 to 0.2 ppm for a few days to several months) (EIP Associates 2007).

The causes of the violation of air quality standards for ozone are complex. Unlike many air pollutants, ozone is not emitted directly into the atmosphere, but is produced in the atmosphere by a complex series of photochemical reactions involving ROG and NO_x. No single source accounts for most of the ROG and NO_x emissions because many sources are spread throughout an air basin (EIP Associates 2007).

CARBON MONOXIDE

Pollutant	Potential Human Health Effects
Carbon Monoxide (CO)	▪ The health threat from lower levels of CO is most serious for those who suffer from heart disease. For a person with heart disease, a single exposure to CO at low levels may cause chest pain and reduce that person's ability to exercise; repeated exposures may contribute to other cardiovascular effects.
	▪ Healthy people can be affected by high levels of CO as well. People who breathe high levels of CO can develop vision problems, reduced ability to work or learn, reduced manual dexterity, and difficulty performing complex tasks. At extremely high levels, CO is poisonous and can cause death.
	▪ CO contributes to the formation of ground-level ozone, which can trigger serious respiratory problems.

Carbon monoxide is an odorless, invisible gas usually formed as the result of incomplete combustion of organic substances. High levels of CO can impair the transport of oxygen in the bloodstream, thereby aggravating cardiovascular disease and causing fatigue, headaches, and dizziness.

In contrast to ozone, CO is a localized problem because CO is a non-reactive pollutant with one major source, motor vehicles. Ambient CO distributions closely follow the spatial and temporal distributions of vehicular traffic, and are strongly influenced by meteorological factors such as wind speed and atmospheric stability (EIP Associates 2007).

PARTICULATE MATTER

Pollutant	Potential Human Health Effects
Particulate Matter (PM_{10}, $PM_{2.5}$)	▪ Particle pollution, especially fine particles, contains microscopic solids or liquid droplets that are so small that they can get deep into the lungs and cause serious health problems. Numerous scientific studies have linked particle pollution exposure to a variety of problems, including: o Increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing o Decreased lung function, aggravated asthma, development of chronic bronchitis o Irregular heartbeat, nonfatal heart attacks o Premature death
	▪ Particles can be carried over long distances by wind and then settle on ground or water. The effects of this settling include: making lakes and streams acidic; changing the nutrient balance in coastal waters and large river basins; depleting the nutrients in soil; damaging sensitive forests and farm crops; and affecting the diversity of ecosystems.

Particulate matter is a mixture of solid particles and liquid droplets found in the air. Particulate matter may be produced by natural causes (e.g., pollen, ocean salt spray, and soil erosion) and by human activity (e.g., road dust, agricultural operations, fuel combustion products, wood burning, rock crushing, cement production and motor vehicles) (SVAQEEP 2009). The California EPA and the Federal EPA regulate "respirable" particulate at the 10-micron level (PM_{10}) and "fine" particles at the 2.5-micron level ($PM_{2.5}$). Agricultural activities (e.g., plowing, tilling, harvesting) are exempt from air quality regulations.

Exposure to particle pollution is linked to increased frequency and severity of asthma attacks and bronchitis, and even premature death in people with existing cardiac or respiratory disease. Both coarse and fine particles are of health concern because they can penetrate into the sensitive regions of the respiratory tract (SVAQEEP 2009). When particle levels in the air increase, so do reports of adverse health outcomes. Those most sensitive to particle pollution include people with existing respiratory and cardiac problems, children, and the elderly. Prolonged and repeated exposure can also have adverse impacts. Life expectancy is somewhat lower in areas with high particle levels (SVAQEEP 2009).

The major components of particulate matter are elements such as carbon and metals; compounds such as nitrates, sulfates and organics; and complex mixtures such as diesel exhaust and soil. Particulate matter is directly emitted into the atmosphere as a by-product of fuel combustion, wind erosion of soil, and unpaved agricultural roads. Small particles are also created in the atmosphere through chemical reactions (EIP Associates 2007).

OXIDES OF NITROGEN

Pollutant	Potential Human Health Effects
Oxides of Nitrogen (NO_x)	▪ One of the main ingredients involved in the formation of ground-level ozone, which can trigger serious respiratory problems.
	▪ Reacts to form nitrate particles, acid aerosols, as well as NO_2, which also cause respiratory problems.
	▪ Contributes to formation of acid rain; to nutrient overload that deteriorates water quality; and to atmospheric particles that cause visibility impairment.
	▪ Reacts to form toxic chemicals and contributes to global warming.

Nitrogen dioxide (NO_2), a toxic reddish-brown gas, and nitric oxide (NO), a colorless gas, comprise NOx (oxides of nitrogen). Because NO_x is an ingredient in the formation of ozone, it is referred to as a precursor to ozone. NO_2 is associated with adverse health effects and is formed in the atmosphere when NO is oxidized to NO_2 (SVAQEEP 2009). NO_2 also forms quickly from emissions from cars and trucks, and off-road equipment.

The EPA's National AAQS address the entire group of NO_x, nitrogen dioxide (NO_2) is the component of greatest interest and the indicator for the larger group of nitrogen oxides. In addition to contributing to the formation of ground-level ozone, and fine particle pollution, NO_2 is linked with a number of adverse effects on the respiratory system (EPA 2012).

NO_x is an air quality concern because it acts as a respiratory irritant. NO_x react with ammonia, moisture, and other compounds to form small particles. These small particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death. Children, the elderly, people with lung diseases such as asthma, and people who work or exercise outside are at risk for adverse effects from ozone (EPA 2012). Current scientific evidence links short-term NO_2 exposures, ranging from 30 minutes to 24 hours, with adverse respiratory effects including airway inflammation in healthy people and increased respiratory symptoms in people with asthma (EPA 2012).

3.10.1.3 AMBIENT AIR QUALITY IN THE ACTION/PROJECT AREA

Existing air quality conditions can be characterized in terms of the ambient air quality standards that the Federal and State governments have established for various pollutants and by monitoring data collected in the region. Because the standards are often based on average values over a period of time, a measured exceedance does not necessarily represent a violation (Butte County 2010). Federal and State ambient air quality standards for criteria pollutants are presented in Section 3.10.2.4.

The status for Glenn and Butte counties have changed over time as the areas have seen improvements or declines in air quality conditions. **Table 3.10-1** provides air quality status information for the Action/Project Area, and air quality conditions for criteria pollutants at the monitoring stations in Glenn and Butte counties is summarized in **Table 3.10-2**.

As shown in Table 3.10-2, during the 3-year reporting period (2009-2011), 1-hour ozone concentrations did not exceed the State standard in either Butte or Glenn counties. Federal 8-hour ozone concentrations were exceeded five times in Glenn County and three times in Butte County during the same period. CO concentrations have remained below State and Federal standards during the three-year reporting period. In Butte County, PM_{10} concentrations have exceeded the State standard 24.4 times during the three-year reporting period, but have not exceeded the Federal standard. In Glenn County, PM_{10} concentrations have exceeded the State standard 11.8 times during the three-year reporting period, but have not exceeded the Federal standard. During the 3-year reporting period, $PM_{2.5}$ concentrations have exceeded Federal standards 36.5 times in Butte County and did not exceed Federal standards in Glenn County.

With respect to GHG emissions in California, the CARB recently updated the 2020 estimates of GHG emissions to account for new estimates for future fuel and energy demand, the recent economic recession, and other factors. The updated GHG inventory forecast for California is shown in **Figure 3.10-1**, which presents the total GHG emissions for California during 1990, the 2002-2004 average, and 2020 projections that would be expected to occur if actions are not taken to reduce emissions.

Table 3.10-1. Air Quality Status.

Pollutant	Designation	
	Federal	**California**
Glenn County		
Carbon Monoxide	Unclassified/Attainment	Unclassified
Sulfur Dioxide	Unclassified/Attainment	Attainment
Nitrogen Dioxide	Unclassified/Attainment	Attainment
PM_{10}	Unclassified	Nonattainment
$PM_{2.5}$	Unclassified/Attainment	Unclassified
1-Hour Ozone	---	Nonattainment
8-Hour Ozone	Unclassified/Attainment	Nonattainment
Butte County		
Carbon Monoxide	Unclassified/Attainment	Attainment
Sulfur Dioxide	Unclassified/Attainment	Attainment
Nitrogen Dioxide	Unclassified/Attainment	Attainment
PM_{10}	Unclassified	Nonattainment
$PM_{2.5}$	Nonattainment	Nonattainment
1-Hour Ozone	---	Nonattainment
8-Hour Ozone	Attainment	Nonattainment

Source: CARB Website 2012a; EPA Website 2011
PM_{10} = particulate matter smaller than or equal to 10 micrometers in diameter
$PM_{2.5}$ = particulate matter smaller than or equal to 10 micrometers in diameter

Table 3.10-2. Summary Statistics for Air Quality Data in Butte and Glenn Counties (CARB 2012).

Year	Pollutant†	Number of Days Exceeding Federal Standards		Number of Days Exceeding State Standards		PM_{10} and $PM_{2.5}$ Annual Average (µg/m3) (Federal)		PM_{10} and $PM_{2.5}$ Annual Average (µg/m3) (State)	
		Butte County**	Glenn County**	Butte County	Glenn County	Butte County	Glenn County	Butte County	Glenn County
2011	Ozone (1-hour)	N/A	N/A	0	0	N/A	N/A	*	*
	Ozone (8-hour)	0	0	0	1	*	*	*	*
	CO (8-hour)	0	*	0	*	*	*	*	*
	PM_{10} (24-hour)	0	0	24.4	0	21.5	19.0	22.4	19.1
	$PM_{2.5}$ (24-hour)	36.5	*	*	*	12.1	*	14.6	8.9
2010	Ozone (1-hour)	N/A	N/A	0	0	N/A	N/A	*	*
	Ozone (8-hour)	0	0	1	0	*	*	*	*
	CO (8-hour)	0	*	0	*	*	*	*	*
	PM_{10} (24-hour)	0	0	0	0	16.7	16.5	17.0	16.7
	$PM_{2.5}$ (24-hour)	0	*	*	*	8.0	*	10.9	8.4
2009	Ozone (1-hour)	N/A	N/A	0	0	N/A	N/A	*	*
	Ozone (8-hour)	0	0	2	4	*	*	*	*
	CO (8-hour)	0	*	0	*	*	*	*	*
	PM_{10} (24-hour)	0	0	0	11.8	19.5	20.0	20.1	20.2
	$PM_{2.5}$ (24-hour)	0	*	*	*	10.0	*	13.0	*

† See Table 3.10-3 for Federal and State air quality standards.

** Butte County data reported for the Chico-Manzanita Avenue monitoring station. Glenn County data reported for the Willows monitoring station located at 720 N. Colusa Street.

* = Insufficient data is available to determine the value.

N/A = Not applicable (no Federal standard for 1-hour ozone)

3.10.2 REGULATORY SETTING

The following section describes applicable laws, regulations, and standards of air quality in the Action/Project Area and surrounding environment. Additionally, the statutory and regulatory landscape affecting GHG emissions and climate planning in California has evolved considerably over the past few years. While there are numerous regulations related to air quality and emission in California standards, several regulations specifically address issues surrounding GHG emissions and climate change. A description of these regulations also is provided below.

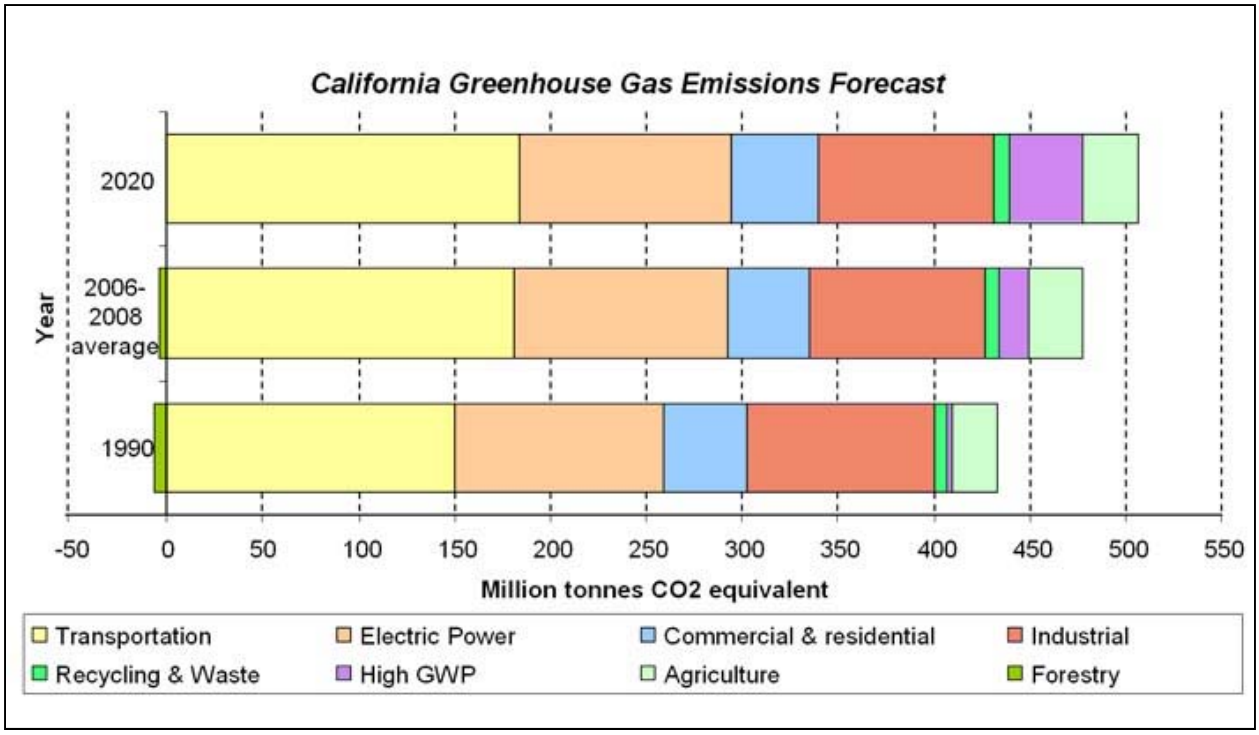

Figure 3.10-1. California Greenhouse Gas Emissions Forecast through 2020 (CARB 2012b).

3.10.2.1 FEDERAL

FEDERAL CLEAN AIR ACT

The Federal CAA requires the EPA to establish and maintain standards for common air pollutants. These standards are used to manage air quality across the country, and regions are evaluated for compliance with the standards. Federal designations for criteria pollutants are defined as follows (see Section 107 (d)(1) of the CAA):

- **Non-attainment –** Any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant.
- **Attainment –** Any area (other than an area identified as non-attainment above) that meets the national primary or secondary ambient air quality standard for the pollutant.
- **Unclassifiable –** Any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant.

An area can be designated as a moderate, severe, serious, or extreme non-attainment area depending upon the level of pollutant concentrations. Glenn County classified as attainment or unclassified for all national standards (Table 3.10-1).

On November 3, 1993, the EPA issued the General Conformity Rule, stating that Federal actions must not cause or contribute to any violation of a National AAQS or delay timely attainment of air quality standards. A conformity determination is required for each pollutant where the total of direct and indirect emissions caused by a Federal action in a nonattainment area or maintenance area exceeds *de minimus* threshold levels listed in the rule (40 CFR 93.153). The EPA has issued two sets of conformity guidelines: (1) transportation conformity rules that apply to transportation plans and projects; and (2) general conformity rules that apply to all other Federal actions. Thresholds established by the EPA are as follows.

Pollutant	Emission Rate (Tons Per Year)
Ozone (ROG or NO_X)	
Maintenance Areas	100
Serious Nonattainment Areas	50
Severe Nonattainment Areas	25
Extreme Nonattainment Areas	10
ROG	50
NO_X	100
CO	
Maintenance Areas	100
All Nonattainment Areas	100
PM_{10}	
Moderate Nonattainment Areas	100
Serious Nonattainment Areas	70
$PM_{2.5}$	
Direct Emissions (Maintenance Areas)	100
Direct Emissions (Nonattainment Areas)	100
Source: 40 CFR 51.853	

Under the conformity provisions of the Federal CAA, no Federal agency may approve a project unless the project has been demonstrated to conform to Federal AAQS. However, a conformity determination[11] is only required for the alternative that is ultimately approved and selected. In addition, according to 40 CFR 51.853(c)(2)(Ix), the above requirements do not apply to maintenance dredging and debris disposal where no new depths are required, applicable permits

[11] A conformity determination is a process that demonstrates how an action would conform to the applicable implementation plan. If the emissions cannot be reduced sufficiently, and if air dispersion modeling cannot demonstrate conformity, then either a plan for mitigating or a plan for offsetting the emissions must be pursued.

are secured, and disposal will be at an approved disposal site, which would result in no emissions increase or an increase in emissions that is clearly *de minimis*.

FEDERAL CLIMATE CHANGE ACTION PLAN

In October 1993, President Clinton announced his Climate Change Action Plan, which had a goal to return GHG emissions to 1990 levels by the year 2000 (AEP 2007). This was to be accomplished through 50 initiatives that relied on innovative voluntary partnerships between the private sector and government aimed at producing cost-effective reductions in greenhouse gas emissions.

According to the U.S. Department of State (2005), the United States government has established a comprehensive policy to address climate change that includes slowing the growth of emissions; strengthening science, technology, and institutions; and enhancing international cooperation. To implement this policy, the Federal government is using voluntary and incentive-based programs to reduce emissions and has established programs to promote climate technology and science. The U.S. Department of Energy (2009) reports that the Federal government has established a target for reducing GHG emissions in the range of 17 percent below 2005 levels by 2020. However, there presently are no adopted Federal policies, regulations, or laws directly regulating GHG emissions.

NEPA guidance (CEQ 2010) suggests that if a proposed action would be reasonably anticipated to cause direct emissions of 25,000 metric tons or more of CO_2-equivalent GHG emissions on an annual basis, Federal agencies should consider this an indicator that a quantitative and qualitative assessment may be meaningful to decision makers and the public. CEQ does not propose this as an indicator of a threshold of significant effects, but rather as an indicator of a minimum level of GHG emissions that may warrant some description in the appropriate NEPA analysis for agency actions involving direct emissions of GHGs. The reference point of 25,000 metric tons of direct CO_2-equivalent GHG emissions may provide agencies with a useful indicator – rather than an absolute standard of insignificant effects – for action-specific evaluation of GHG emissions and disclosure of that analysis in an agency's NEPA document. CEQ does not propose this reference point value as an indicator of a level of GHG emissions that may significantly affect the quality of the human environment, but notes that it serves as a minimum standard for reporting emissions under the Clean Air Act (CEQ 2010).

3.10.2.2 STATE

The State of California has also adopted standards for criteria pollutants. State designations for criteria pollutants are defined as follows (CCR Title, 17 §70303, §70304):

- **Attainment –** (1) Data for record show that no State standard for that pollutant was violated at any site in the area; and (2) data for record meet representativeness and completeness criteria for a location at which the pollutant concentrations are expected to be high based on the spatial distribution of emission sources in the area and the

relationship of emissions to air quality. Data representativeness criteria are set forth in "Criteria for Determining Data Representativeness" contained in Appendix 1 to the CCR, Title 17, Division 3, Chapter 1, Subchapter 1.5, Article 3. Data completeness criteria are set forth in "*Criteria for Determining Data Completeness*" contained in Appendix 3 to this article, (see CCR Title 17, §70304).

- **Non-attainment –** (1) Data for record show at least one violation of a State standard for that pollutant in the area, and the measurement of the violation meets the representativeness criteria set forth in "*Criteria for Determining Data Representativeness*" contained in Appendix 1 to the CCR, Title 17; or (2) limited or no air quality data were collected in the area, but the State board finds, based on meteorology, topography, and air quality data for an adjacent non-attainment area, that there has been at least one violation of a State standard for that pollutant in the area being designated. An area will not be designated as non-attainment if the only recorded exceedance(s) of that State standard were based solely on data for record determined to be affected by a highly irregular or infrequent event. Data affected by a highly irregular or infrequent event will be identified as such by the executive officer in accordance with the "*Air Resources Board Procedure for Reviewing Air Quality Data Possibly Affected by a Highly Irregular or Infrequent Event*," set forth in Appendix 2 to Title 17, Division 3, Chapter1, Subchapter 1.5, Article 3 (CCR Title, 17 §70303).
- **Unclassified –** A pollutant is designated unclassified if the data are incomplete and do not support a designation of attainment or non-attainment.

EXECUTIVE ORDER S-3-05

The Governor of California signed Executive Order S-3-05 on June 1, 2005. The Order recognizes California's vulnerability to climate change, noting that, among other things, increasing temperatures could potentially reduce snowpack in the Sierra Nevada Mountains, which serve as one of the State's primary sources of water. Additionally, according to the Order, climate change could influence human health, coastal habitats, microclimates, and agricultural yield. To address these potential impacts, the Order mandates GHG emission reduction targets. More specifically, by 2010, GHG emissions were expected to be reduced to 2000 levels; by 2020, emissions are expected to reach 1990 levels; and by 2050, emissions are expected to be 80 percent below 1990 levels. The Secretary of the California EPA is responsible for overseeing the reduction program targets and coordinating efforts to meet these provisions with numerous State agencies. The Secretary also provides biannual reports to the Governor and the State Legislature regarding: (1) progress toward meeting the GHG emissions targets; (2) the ongoing impacts of global warming in the State, including impacts to water supply and the environment; and (3) potential mitigation and adaptation plans to combat these impacts. In order to achieve the climate change emission targets, the Secretary formed the Climate Action Team in June 2005, which is comprised of administrators from numerous State agencies.

ASSEMBLY BILL 32 – CALIFORNIA GLOBAL WARMING SOLUTIONS ACT OF 2006 (HEALTH AND SAFETY CODE §38501 ET SEQ.)

The California Global Warming Solutions Act of 2006 (Assembly Bill [AB] 32) was enacted to regulate emissions of GHGs that contribute to climate change. The CARB, in coordination with State agencies as well as members of the private and academic communities, is charged with adopting regulations to require the reporting and verification of statewide GHG emissions and to monitor and enforce compliance with this program. Similar to Executive Order S-3-05, under the provisions of the bill, the State aims to reduce GHG emissions to 1990 levels by 2020 - a reduction of approximately 30 percent (CARB 2012). To achieve the 2020 reduction goal, the CARB shall adopt emission limits and reduction measures, which may include a system of market-based declining annual aggregate emission limits for sources or categories of sources that emit greenhouse gases. A Climate Change Scoping Plan that included recommended actions and emission reduction measures was released in 2008. Following additional environmental review, the plan was re-approved by the CARB in August 2011.

SENATE BILL 97 – MODIFICATION TO PUBLIC RESOURCES CODE (2007)

In 2007, the California legislature passed SB 97, which amended the CEQA statute to specifically establish that GHG emissions and their impacts are appropriate subjects for CEQA analysis. The law directed the State Resources Agency to "certify and adopt guidelines prepared and developed by the Office of Planning and Research (OPR)" "for the mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions" on or before January 1, 2010 (Public Resources Code §21083.05(a)-(b)). However, SB97 does not address the evaluation and determination of "significance." Pursuant to the SB 97 directive, OPR developed, and the Resources Agency adopted certain amendments to the CEQA Guidelines addressing the analysis and mitigation of GHG emissions on December 30, 2009 (Public Resources Code §21000 et seq.). On March 18, 2010, the amendments to the CEQA Guidelines became effective.

The amendments to the CEQA Guidelines include changes to, or additions of, fourteen sections of the existing Guidelines, as well as changes to appendices addressing energy conservation and the CEQA Environmental Checklist Form (California Natural Resources Agency 2009). OPR's CEQA Amendments Section 15064.4 provides that lead agencies should "make a good faith effort, based on available information to describe, calculate, or estimate" GHG emissions and notes that an agency may identify emissions either by selecting a "model or methodology" to quantify the emissions or relying on "qualitative or other performance based standards."

The CEQA Guidelines do not establish thresholds of significance for potential environmental impacts, nor did SB97 authorize the development of a statewide significance threshold for GHG emissions (or climate change). Amendments to the CEQA Environmental Checklist address whether a Proposed Project would: (1) generate GHG emissions, either directly or indirectly, that may have a significant effect on the environment; and (2) conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHG. Additionally, nothing

stated in either AB 32 or SB 97 requires a finding of significance for any particular level of increase in GHG emissions (California Natural Resources Agency 2009).

CALIFORNIA AIR RESOURCES BOARD (CARB)

The California Air Resources Board (CARB) is the State air quality management agency responsible for ensuring implementation of the California Clean Air Act (CCAA). It regulates mobile emissions sources and oversees the activities of County APCDs and regional AQMDs. The CARB regulates local air quality indirectly by State standards and vehicle emission standards, by conducting research activities, and through its planning and coordinating activities. California has adopted ambient standards that are in some cases more stringent than the Federal standards for the criteria air pollutants. Under the CCAA, patterned after the Federal CAA, areas have been designated as attainment or nonattainment with respect to State standards (Table 3.10-1).

The Federal CAA requires states with non-attainment areas to develop plans, known as State Implementation Plans (SIPs), describing the measures the State will take to achieve attainment with national ambient air quality standards. Local air districts and other agencies prepare SIP elements for the areas under their regulatory jurisdictions, and submit these elements to CARB for review and approval. CARB incorporates the individual air district plans into a statewide SIP and the plan is then submitted to EPA for approval and publication in the Federal Register.

As a result of a 1998 SIP revision approved by EPA, Butte County (Chico urbanized area) was redesignated from non-attainment to attainment with a Maintenance SIP for CO (Butte County Association of Governments 2008). In 2007, the 1998 Maintenance SIP was updated by ARB and approved by EPA for the second decade of the maintenance period. Conformity applies for CO through 2018. The current emission budget is for the second Maintenance SIP. Butte County's emissions budget of 80 tons per day is specified in the *2004 Revision to the California State Implementation Plan for Carbon Monoxide*. EPA published a direct final rulemaking approving the plan on November 20, 2005, effective January 30, 2006. Based on the designated maintenance status, Butte County needs to demonstrate that vehicular emissions forecasts will not exceed 80 tons/day and are consistent with the applicable SIP (Butte County Association of Governments 2008).

In 2012, the BCAQMD submitted a SIP for $PM_{2.5}$ to CARB, which documents how air quality standards for $PM_{2.5}$ will be attained in Butte County. On October 18, 2012, CARB approved the Chico, CA/Butte County (partial) $PM_{2.5}$ Emission Inventory submittal to the SIP. The $PM_{2.5}$ Emission Inventory was submitted to the EPA on November 15, 2012 (CARB 2012c).

Idling Limit Regulation

On June 15, 2008, CARB adopted a regulation for off-road diesel vehicles. The regulation is designed to reduce toxic air contaminants from diesel-powered construction vehicles operating in California. Fleet owners are subject to retrofit or accelerated replacement/repower requirements

for which CARB must obtain authorization from EPA prior to enforcement (13 CCR 2449(d)(3)). The regulation also imposes idling limitations on owners, operators, and renters or lessees of offroad diesel vehicles. The idling limits became effective on June 15, 2008 and require an operator of applicable off-road vehicles (self-propelled diesel-fueled vehicles of 25 horsepower and greater that were not designed for on-road driving) to limit idling to no more than five minutes.

State Tailpipe Emission Standards

To reduce emissions from off-road diesel equipment, on-road diesel trucks, and harbor craft, the CARB established a series of increasingly strict emission standards for new engines. New construction equipment used for the project, including heavy duty trucks, off-road construction equipment and barges, would be required to comply with the standards.

3.10.2.3 LOCAL

NORTHERN SACRAMENTO VALLEY AREA AIR QUALITY ATTAINMENT PLAN

Air districts in the Northern Sacramento Valley Planning Area (NSVPA) prepared the "*Northern Sacramento Valley Planning Area Air Quality Attainment Plan*" in 1994, and since then have completed updates ever three years, with the most recent update completed in 2012 (SVAQEEP 2012). Their goal is to prepare a uniform air quality attainment plan that identifies programs for achieving and maintaining healthful air quality throughout the air basin and presents the latest monitoring data and issues with air quality in the valley. The plan discusses compliance with the 1994 SIP for ozone and addresses basic requirements identified by the State to achieve healthful air quality (USFWS and CDFG 2012). Ozone is a seasonal problem in the NSVPA, typically occurring from May through October (SVAQEEP 2009).

BUTTE COUNTY AIR QUALITY MANAGEMENT DISTRICT (BCAQMD) AND GLENN COUNTY AIR QUALITY MANAGEMENT DISTRICT (GCAQMD) POLICIES AND PLANS

The Butte County Air Quality Management District and Glenn County Air Pollution Control District have established local rules and regulations that require air quality permits for various activities in each county and that provide a means to manage and regulate air emissions in the counties. BCAQMD rules that would be applicable to the Proposed Project include:

- ***District Rule 200 – Nuisance.*** No person shall discharge from any non-vehicular source such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public or which endanger the comfort, repose, health or safety of any such persons or the public or which cause or have a natural tendency to cause injury or damage to business or property.
- ***District Rule 201 – Visible Emissions.*** Visible emissions from stationary diesel-powered equipment are not allowed to exceed 40 percent opacity for more than three minutes in any one-hour, as regulated under District Rule 201.

- ***District Rule 202 – Particulate Matter Concentration.*** A person shall not discharge into the atmosphere from any source particulate matter in excess of 0.3 grains per cubic foot of gas at standard conditions. When the source involves a combustion process, the concentration must be calculated to 12 percent carbon dioxide (CO_2).
- ***District Rule 205 – Fugitive Dust Emissions.*** The purpose of District Rule 205 is to reduce ambient concentrations and limit fugitive emissions of fine particulate matter (PM_{10}) from construction activities, bulk material handling and storage, unpaved parking lots, unpaved staging areas, unpaved roads, inactive disturbed land, disturbed open areas, and windblown dust.
- ***District Rules 1000 (State Airborne Toxic Control Measures) and 1002 (Airborne Toxic Control Measure for Stationary Compression Ignition Engines Used at Stationary Sources)*** – Recent amendments to District Rule 1000 update the current list of State Airborne Toxic Control Measures (ATCMs) that the BCAQMD has incorporated by reference per Health and Safety Code Section 39666. The updates include amendments to the ATCM for Diesel Particulate Matter from Portable Engines Rated at 50 Horsepower and Greater. District Rule 1002 is intended to reduce health risks caused by diesel particulate matter from non-agricultural engines, and requires the reduction of diesel particulate matter from new and in-use non-agricultural engines consistent with the amended State ATCM.

Additionally, in 2008, Butte County developed an air quality handbook for providing direction on air quality analyses in CEQA documents. The handbook identifies measures that may be applicable to projects to reduce emissions and pollutants during construction and operation. The 2008 handbook is presently in the process of being updated and a new version is anticipated for release around April 2013 (A. Kamian, BCAQMD, 2013, pers comm.).

3.10.2.4 AIR QUALITY STANDARDS

Both the EPA and the CARB have established ambient air quality standards for common pollutants. These ambient air quality standards are levels of contaminants which represent safe levels that avoid specific adverse health effects associated with each pollutant. The ambient air quality standards cover what are called "criteria" pollutants because the health and other effects of each pollutant are described in criteria documents.

The Federal and State ambient air quality standards are summarized in **Table 3.10-3** for important pollutants. The Federal and State ambient standards were developed independently with differing purposes and methods, although both processes attempted to avoid health-related effects. As a result, the Federal and State standards differ in some cases. In general, the California State standards are more stringent. This is particularly true for ozone and PM_{10}.

Table 3.10-3. Ambient Air Quality Standards.

Pollutant	Averaging Time	California Standards[1]	National Standards[2]	
		Concentration	Primary[3,4]	Secondary[3,5]
Carbon Monoxide (CO)	1 hour	20 ppm	35 ppm	--
	8 hour	9 ppm	9 ppm	--
Sulfur Dioxide (SO_2)	24 hour	0.04 ppm	0.14 ppm (see footnote 6)	--
	3 hour	--	--	0.5 ppm (see footnote 6)
	1 hour	0.25 pmm	75 ppb (see footnote 6)	--
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.030 ppm	0.053 ppm (see footnote 7)	Same as primary standard
	1 hour	0.18 ppm	100 ppb (see footnote 7)	--
Respirable Particulate Matter (PM_{10})	Annual Arithmetic Mean	20 µg/m^3	--	Same as primary standard
	24 hour	50 µg/m^3	150 µg/m^3	
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 µg/m^3	12 µg/m^3	Same as primary standard
	24 hour	No separate standard	35 µg/m^3	
Ozone (O_3)	1 hour	0.09 ppm	--	Same as primary standard
	8 hour	0.070 ppm	0.075 ppm	

1. California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, suspended particulate matter—PM_{10}, $PM_{2.5}$, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.
2. National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8- hour concentration measured at each site in a year, averaged over 3 years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m^3 is equal to or less than one. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard. Contact the U.S. Environmental Protection Agency (EPA) for further clarification and current Federal policies.
3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.
4. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.
5. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
6. On June 2, 2010, the EPA established a new 1-hour SO2 standard, effective August 23, 2010, which is based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. EPA also proposed a new automated Federal Reference Method (FRM) using ultraviolet technology, but will retain the older pararosaniline methods until the new FRM have adequately permeated State monitoring networks. The EPA also revoked both the existing 24-hour SO2 standard of 0.14 ppm and the annual primary SO2 standard of 0.030 ppm, effective August 23, 2010. The secondary SO2 standard was not revised at that time; however, the secondary standard is undergoing a separate review by EPA. Note that the new standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the new primary national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.
7. To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm. Note that the EPA standards are in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national standards to the California standards the units can be converted from ppb to ppm. In this case, the national standards of 53 ppb and 100 ppb are identical to 0.053 ppm and 0.100 ppm, respectively.

ppm = parts per million; ug/m3 = micrograms/per cubic meter. Source: CARB Website 2012a

3.10.3 ENVIRONMENTAL CONSEQUENCES

3.10.3.1 ASSESSMENT METHODOLOGY

AIR QUALITY

Construction-related activities associated with the Proposed Project would result in the temporary generation of reactive organic gases (ROG), oxides of nitrogen (NO_x), and particulate matter smaller than or equal to 10 micros in diameter (PM_{10}). Construction-related emissions would result from fugitive dust from soil disturbance, construction equipment exhaust and construction worker commute trips.

Projected vehicle emissions for each of the criteria pollutants (ROG, NO_x, carbon monoxide (CO), PM_{10} and $PM_{2.5}$) were calculated using the Roadway Construction Emission Model developed by the Sacramento Metropolitan AQMD, which calculates off-road construction equipment emissions. The maximum emission estimates from the model represent a "worst case" scenario, where all equipment is assumed to be operating each day during the entire project period. Model outputs were compared to the GCAPCD and BCAQMD thresholds of significance for criteria pollutants of concern.

The Proposed Action/Project and the No Action Alternative primarily would result in potential impacts to air quality due to construction-related equipment emissions. For analytical purposes in this Draft EA/IS, emissions associated with the Proposed Action/Project (dredging operations and revetment maintenance) and the No Action Alternative (revetment removal) are considered to be construction-related emissions. Once the respective activities are completed, no additional or ongoing emissions (i.e., operational emissions) would be generated by the Proposed Action/Project or the No Action Alternative. A summary of the construction equipment that would be used during work activities associated with the Proposed Action/Project and the No Action Alternative is provided in **Table 3.10-4** and **Table 3.10-5**, respectively. **Table 3.10-6** and **Table 3.10-7** shows the data input categories and assumptions used for the Roadway Construction Emission Model (Version 7.1.2).

GREENHOUSE GAS EMISSIONS

Prominent GHGs of primary concern include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Construction projects typically include the following sources of GHG emissions.

- Construction activities resulting in exhaust emissions of GHGs from fuel combustion for mobile heavy-duty diesel- and gasoline-powered equipment, portable auxiliary equipment, material delivery trucks, and worker commuter trips
- Motor vehicle trips (e.g., vehicles arriving and leaving the project site)

Table 3.10-4. Construction Equipment that would be used for the Proposed Action/Project.

Equipment	Hours/day in Operation	Number of Days in Operation
Dredging Operations		
Crane	2 hrs/day (setup and demobilization only)	2 days
Dredge Boat	10 hrs/day	107 days
Skiff boat (2)	8 hrs/day for 4 days 4 hrs/day for 107 days	—
Bulldozer	6 hrs/day	107 days
Trap Belt Loader	6 hrs/day	107 days
Irrigation Pump (2)	10 hrs/day	107 days
Generator*	8 hrs/day	107 days
Pick-up Truck (2)	0.5 hrs/day (roundtrip from Chico, CA to the dredging site)	137 days
Rock-toe and Tree Revetment Maintenance		
Front End Loader	8 hrs/day	7 days
End Dump Truck (1)	8 hrs/day	7 days
Dragline	10 hrs/day	7 days
Water Truck	4 hrs/day	7 days
Grader	4 hrs/day	7 days
Pick-up Truck (2)	1 hr/day (roundtrip from Chico, CA to the revetment site)	7 days
*A 10 kW generator would be contained within a light plant, similar to the self-contained units used by Caltrans.		

Table 3.10-5. Construction Equipment that would be Used for the No Action Alternative.

Equipment	Hours/day in Operation	Number of Days in Operation
Rock-toe and Tree Revetment Removal		
Front End Loader	8 hrs/day	35 days
End Dump Truck (4)	8 hrs/day	35 days
Dragline	8 hrs/day	35 days
Water Truck	4 hrs/day	35 days
Grader	4 hrs/day	35 days
Pick-up Truck (3)	1 hr/day (roundtrip from Chico, CA to the revetment site)	35 days

Table 3.10-6. Proposed Action/Project Inputs to the Roadway Construction Emission Model.

Equipment	Equipment Description Used in Model	Hours/Day in Model	Number of Days in Operation
Crane	Crane	2 hrs/day	2 days
Dredge Boat	Other General Industrial Equipment	10 hrs/day	107 days
Skiff boat	Other General Industrial Equipment	8 hrs/day	107 days
Bulldozer	Crawler Tractor	6 hrs/day	107 days
Trap Belt Loader	Other Material Handling Equipment	6 hrs/day	107 days
Irrigation Pump	Pump	10 hrs/day	107 days
Generator	Generator Sets	8 hrs/day	107 days
Front End Loader	Rubber Tired Loader	8 hrs/day	7 days
End Dump Truck	Off-Highway Truck	8 hrs/day	7 days
Dragline	Crane	10 hrs/day	7 days
Water Truck	Off-Highway Truck	4 hrs/day	7 days
Grader	Grader	8 hrs/day	7 days

Table 3.10-7. No Action Alternative Inputs to the Roadway Construction Emission Model.

Equipment	Equipment Description Used in Model	Hours/Day in Model	Number of Days in Operation
Front End Loader	Rubber Tired Loader	8 hrs/day	35 days
End Dump Truck	Off-Highway Truck	8 hrs/day	35 days
Dragline	Crane	10 hrs/day	35 days
Water Truck	Off-Highway Truck	4 hrs/day	35 days
Grader	Grader	4 hrs/day	35 days

The Roadway Construction Emissions Model, a spreadsheet-based model capable of using basic project information (e.g., total construction months, project type) will be used to quantify GHG emissions from heavy-duty construction equipment.

3.10.3.2 SIGNIFICANCE CRITERIA

The significance criteria used to evaluate potential impacts on aesthetics and visual resources were based on and incorporate guidance contained in Section 1508.27 of the CEQ NEPA regulations regarding significance determinations; the mandatory findings of significance, as listed in Section 15065 of the State CEQA Guidelines (Title 14, Chapter 3 of the CCR); and criteria derived from Appendix G of the State CEQA Guidelines (for additional detail, see Section 3.3.3.2).

AIR QUALITY

Because the Proposed Project is subject to NEPA, a quantitative evaluation of construction and operational emissions was conducted and evaluated against the Federal *de minimis* thresholds (see Section 3.10.2.1) to determine whether the Proposed Project would be considered to have an adverse effect to air quality under NEPA.

The criteria used for determining CEQA significance of an impact to air quality were derived from Appendix G of the State CEQA Guidelines, which require lead agencies to make specific factual inquiries regarding the potential significance of impacts. For the purposes of this analysis, the Proposed Project would be considered to have a significant impact on air quality if it would contribute to any one of the following.

- Conflict with or obstruct implementation of the applicable air quality plan.
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation.
- 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).
- Expose sensitive receptors to substantial pollutant concentrations.
- Create objectionable odors affecting a substantial number of people.

Under CEQA, the GCAPCD has no published thresholds for the assessment of air quality impacts. The county has previously deferred to Shasta County Air Quality Management District's thresholds of significance for the evaluation of air quality impacts within Glenn County (Glenn County Planning and Public Works Agency 2008), which are presented in **Table 3.10-8**.

Table 3.10-8. GCAPCD Emission Thresholds for Criteria Pollutants of Concern (SCAQMD 2004 in Glenn County Planning and Public Works Agency 2008).

Pollutant	Level A	Level B
ROG	≤ 25 lbs/day	> 137 lbs/day
NO_x	≤ 25 lbs/day	> 137 lbs/day
PM_{10}	≤ 80 lbs/day	> 137 lbs/day

If a project would result in emissions that are less than the Level A thresholds, then only feasible standard mitigation measures are required (Glenn County Planning and Public Works Agency 2008). If a project's emissions would exceed the Level A thresholds, the project applicant must apply all feasible mitigation measures for construction and/or operation from lists of recommended standard mitigation measures and appropriate best available mitigation measures (BAMMs), as determined by Glenn County. If a project has emissions that exceed the Level B

thresholds, the project applicant must apply special BAMMs, in addition to the required standard mitigation measures and BAAMs (Glenn County Planning and Public Works Agency 2008). The emission thresholds in Table 3.10-8 are applied to evaluate potential construction- and operations-related impacts, and also are consistent with the CEQA significance thresholds identified by the BCAQMD.

The BCAQMD's *CEQA Air Quality Handbook Guidelines for Assessing Air Quality Impacts for Projects Subject to CEQA Review* (2008) provides project-level thresholds of significance for ROG, NO_x, and PM_{10} (**Table 3.10-9**) and identifies mitigation measures to reduce air quality impacts.

Table 3.10-9. Emission Thresholds of Significance for Criteria Pollutants of Concern (BCAQMD 2008).

Pollutant	Level A	Level B	Level C
ROG	≤ 25 lbs/day	>25 lbs/day	> 137 lbs/day
NO_x	≤ 25 lbs/day	>25 lbs/day	> 137 lbs/day
PM_{10}	≤ 80 lbs/day	>80 lbs/day	> 137 lbs/day

Construction- and operations-related emissions should be evaluated separately, and those that equal or exceed the Butte County designated threshold levels are considered potentially significant and should be mitigated. The BCAQMD has not identified separate emission thresholds to evaluate cumulative impacts (A. Kamian, BCAQMD, 2013, pers comm.). Therefore, the emission thresholds listed in Table 3.10-9 are applied to both project-specific and cumulative air quality analyses in this Draft EA/IS. As shown in the Table 3.10-9 above, the level of analysis and mitigation recommended follows a tiered approach based on the overall amount of emissions generated by a Proposed Project. The three tiers are described below.

- **Level A:** Any project which has the potential to emit the Level A thresholds would be subject to standard mitigation measures. Standard mitigation measures are recommended to reduce air quality impacts to a level of insignificance.
- **Level B: Greater than 25 lbs/day of ROG and/or NO_x, and greater than 80 lbs/day of PM_{10}**. Projects that exceed Level B thresholds have the potential to cause significant air quality impacts, and should be submitted to the BCAQMD for review. Projects proponents should select as many BAMM as necessary, in addition to the recommended list of standard mitigation measures. If all feasible mitigation measures are incorporated into the project and emissions can be reduced to less than Level B, air quality impacts are reduced to a level of insignificance. If all feasible mitigation measures are incorporated into the project and emissions are still greater than Level B, then the BCAQMD may recommend that an EIR be prepared. Additional mitigation measures, including off-site mitigation, may be required depending on the level and scope of identified air quality impacts.

- **Level C: Greater than 137 lbs/day of Emissions**. If emissions from a project will exceed the Level C thresholds, then an EIR should be prepared and submitted to the BCAWMD for review. Depending upon the level and scope of air quality impacts identified in the EIR, mitigation measures, including off-site mitigation measures following the BCAQMD guidelines, may be required to reduce the overall air quality impacts of the project to a level of insignificance.

The aforementioned CEQA significance thresholds identified by the GCAPCD and the BCAQMD may be applied to address both project-specific and cumulative impacts to air quality.

GREENHOUSE GAS EMISSIONS

NEPA has no explicit requirement to analyze a proposed action's GHG emissions (CEQ and OPR 2013). However, nothing precludes a Federal agency from analyzing greenhouse gases. In fact, CEQ and OPR (2013) suggest that if a project will have emissions, a good NEPA analysis would analyze these impacts regardless of CEQA requirements. For the purposes of this analysis, the Proposed Project would be considered to have an adverse effect under NEPA and a significant impact under CEQA on GHG emissions if it would contribute to any one of the following.

- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.
- Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHGs.

Emissions that equal or exceed the designated threshold levels are considered potentially significant and should be mitigated.

The Roadway Construction Emissions Model is a spreadsheet-based model capable of using basic project information (e.g., total construction months, project type) to quantify GHG emissions from heavy-duty construction equipment. Model output results are provided in **Appendix H – Air Quality Emissions Modeling Results** and summarized below.

3.10.3.3 IMPACT ANALYSIS

The evaluations below describe the types of effects that could occur on air quality and GHG emissions as a result of the Proposed Project under the following three scenarios.

- No Action Alternative Compared to Existing Conditions (NEPA Analysis)
- Proposed Action/Project Compared to Existing Conditions (CEQA Analysis)
- Proposed Action/Project Compared to the No Action Alternative (NEPA Analysis)

Following the presentation of technical information, a conclusion is made at the end of each analytical comparison regarding whether the scenario evaluated, relative to the basis of

comparison, would have an adverse effect under NEPA or a significant impact under CEQA, as appropriate.

NO ACTION ALTERNATIVE RELATIVE TO EXISTING CONDITIONS (NEPA ANALYSIS)

Removal of the Temporary Rock-toe and Tree Bank Revetment

***AQ-1**: Potential for revetment removal to generate short-term vehicle or equipment emissions or air pollutants that could affect local or regional air quality.*

Construction activities associated with revetment removal would result in temporary, short-term impacts to air quality, including generation of ROG, NO_x, and PM_{10}. Air quality impacts associated with revetment removal were previously evaluated in the 2007 Final EA/IS (CDFG and USFWS 2007) and authorized in NEPA and CEQA decision documents approved by USFWS and CDFW for the 2007 project. However, in consideration of changed regulatory conditions and the types of heavy equipment that would be utilized to remove the revetment, construction emission estimates for the No Action Alternative were developed using the Roadway Construction Emission Model are provided in Appendix H, and are summarized below.

Table 3.10-10 summarizes the estimated maximum daily emissions (in pounds per day) and the total tons for the project. Based on the emissions modeling results, the construction activities associated with revetment removal would not exceed the ROG or PM_{10} Level A thresholds identified by GCAPCD and BCAQMD. The NO_x emissions would exceed the GCAPCD Level A threshold (≤ 25 lbs/day) and the BCAQMD Level B threshold (≥ 25 lbs/day), but would not exceed the BCAQMD Level C threshold (> 137 lbs/day). Construction emissions of ROG, PM_{10} and NO_x would each be less than the *de minimis* thresholds established by the EPA for conformity analyses. The Action/Project Area is not located near any sensitive receptors, and the No Action Alternative would not create objectionable odors that would threaten residential areas or sensitive receptors.

Table 3.10-10. Summary of Air Quality Emissions Associated with the No Action Alternative.

Emission Estimates	ROG (lbs/day)	CO (lbs/day)	NO_x (lbs/day)	Total PM_{10} (lbs/day)	Total $PM_{2.5}$ (lbs/day)	CO_2 (lbs/day)
Rock-toe and Tree Revetment Removal						
Maximum (pounds/day)	**2.8**	**11.8**	**34.5**	**1.4**	**1.3**	**3,370.1**
Total (tons/construction project)	**0.0**	**0.2**	**0.5**	**0.0**	**0.0**	**44.5**

ROG = reactive organic gases; CO = carbon monoxide; NO_x = oxides of nitrogen; PM_{10} = particulate matter smaller than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter smaller than or equal to 2.5 micrometers in diameter CO_2 = carbon dioxide.

Although construction activities associated with revetment removal would incorporate standard mitigation measures, the No Action Alternative potentially could adversely affect air quality conditions related to NO_x emissions exceeding 25 pounds per day during the 35-day construction period.

Sources of GHGs associated with the No Action Alternative would be limited to exhaust from heavy equipment and other construction vehicles operating during the construction time period. Construction activities associated with revetment removal would result in temporary, short-term GHG emissions. Modeled short-term construction emission estimates, including CO_2 and NO_x, are provided in Appendix H and are summarized above.

According to *Recommendations by the Association of Environmental Professionals on How to Analyze GHG Emissions and Global Climate change in CEQA Documents* (March 5, 2007) (AEP 2007a), an individual project does not generate enough GHG emissions to significantly influence global climate change. Rather, global climate change is a cumulative impact. There would be no increase of long-term emissions (i.e., permanent sources) of GHGs from the No Action Alternative. Long-term emissions in Butte and Glenn counties would be the same with or without this alternative. The No Action Alternative would not conflict with any statewide or local goals with regard to reduction of GHG. BMPs and implementation of the standard construction mitigation measures as recommended by BCAQMD and GCAQMD would reduce GHG emissions through the same processes that reduce total NO_x and PM_{10} emissions. Additionally, the No Action Alternative would involve permanent removal of vegetation that has established over the past five years, which may result in a small degree of potential impact due to the loss of GHG sequestration opportunity associated with vegetation removal. However, removal of the revetment within five years was previously evaluated and approved in CDFG and USFWS (2007).

Overall, the minor amount of loss of GHG sequestration opportunity associated with vegetation removal under the No Action Alternative would not be expected to result in adverse effects to GHG emissions. For additional information, see the cumulative analysis in Chapter 4 – Other Impact Considerations.

PROPOSED ACTION/PROJECT RELATIVE TO EXISTING CONDITIONS (CEQA ANALYSIS)

In-river Dredging and Spoils Disposal

AQ-2*: Potential for dredging operations to generate short-term vehicle or equipment emissions or air pollutants that could affect local or regional air quality.*

Construction activities associated with the dredging and spoils disposal would result in temporary, short-term impacts to air quality, including generation of ROG, NO_x, and PM_{10}. For the purposes of this analysis, the one-time emissions that would be generated by the proposed dredging operations are analogous to traditional "construction" activities and, thus, are characterized as construction-related emissions. Once the in-river dredging is completed, no

additional emissions would be generated by the Proposed Action/Project. Construction emission estimates for the Proposed Action/Project are provided in Appendix H and are summarized in **Table 3.10-11**.

Table 3.10-11. Summary of Air Quality Emissions Associated with the Proposed Action/Project.

Emission Estimates	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM_{10} (lbs/day)	Total $PM_{2.5}$ (lbs/day)	CO_2 (lbs/day)
Mobilization and Demobilization	1.3	4.7	12.6	0.7	0.7	911.7
Dredging Operations	4.3	36.5	43.8	2.3	2.1	6,449.3
Rock-toe and Tree Revetment Maintenance	3.3	14.1	39.9	1.8	1.6	3,870.3
Maximum (pounds/day)	**4.3**	**36.5**	**43.8**	**2.3**	**2.1**	**6,449.3**
Total (tons/construction project)	**0.2**	**1.5**	**2.0**	**0.1**	**0.1**	**273.0**

ROG = reactive organic gases; CO = carbon monoxide; NO_x = oxides of nitrogen; PM_{10} = particulate matter smaller than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter smaller than or equal to 2.5 micrometers in diameter; CO_2 = carbon dioxide.

Based on the emissions modeling results, the construction activities associated with dredging and spoils disposal would not exceed the ROG or PM_{10} Level A thresholds identified by GCAPCD and BCAQMD.

Butte and Glenn counties are in attainment for the State and Federal NO_x ambient air quality standard. However, the NO_x emissions would exceed the GCAPCD Level A threshold (≤ 25 lbs/day) and the BACQMD Level B threshold (≥ 25 lbs/day), but would not exceed the BCAQMD Level C threshold (> 137 lbs/day). Construction emissions of ROG, PM_{10} and NO_x would each be less than the *de minimis* thresholds established by the EPA for Federal conformity analyses.

The Roadway Construction Emission Model results represent a "worse case" scenario where all equipment is assumed to be operating full-time each day during the entire project period. However, the construction equipment used for the dredging and spoils disposal would be operated less frequently than is characterized as data inputs into the model. Therefore, the model provides an overestimate of the actual anticipated air quality emissions.

The Proposed Action/Project would not conflict with or obstruct implementation of applicable air quality plans. The Action/Project Area is not located near any sensitive receptors, and the Proposed Action/Project is not anticipated to create any objectionable odors.

If the need for the Proposed Project is to be met, then there is no practical alternative to using a hydrocarbon (primarily fossil fuel) powered dredge. If two dredge cycles are required before a long-term solution is completed, the quantities of air quality emissions would be similar for each

dredge cycle; therefore the amount of emissions released into the atmosphere during the second dredge cycle would be similar to the amount released during the first dredge cycle.

Related to NO_x emissions, potentially significant air quality effects have been identified. To address these potential air quality concerns, the Proposed Action/Project has been designed to incorporate measures to minimize the total quantity of air quality pollutants emitted during dredging and spoils disposal operations. BMPs, standard mitigation measures and BAMMs, as defined by the BCAQMD in the *CEQA Air Quality Handbook* (January 2008), are incorporated into the Proposed Action/Project. With implementation of ***Environmental Commitments AQ-1*** and ***AQ-2,*** and ***Mitigation Measure AQ-1***, suction dredging and spoils disposal activities associated with the Proposed Action/Project would have a less than significant impact on air quality.

As with the air quality pollutants of concern discussed above, potential sources of GHG emissions associated with the Proposed Action/Project would be limited to exhaust from construction vehicles and equipment (see above for modeled construction emission estimates including CO_2 and NO_x). Construction activities associated with the dredging and spoils disposal would result in temporary, short-term GHG emissions that would be limited to the construction time period.

According to *Recommendations by the Association of Environmental Professionals on How to Analyze GHG Emissions and Global Climate change in CEQA Documents* (AEP 2007), an individual project does not generate enough GHG emissions to significantly influence global climate change. Global climate change is a cumulative impact. A project may participate in a potential cumulative impact through its incremental contribution combined with the contributions of all other sources of GHG. In assessing cumulative impacts, it must be determined if a project's incremental effect is "cumulatively considerable." To make this determination the incremental impacts of the project must be compared with the effects of past, current, and probable future projects. Therefore, potential impacts to GHG emissions associated with the Proposed Action/Project are addressed in the cumulative impacts section in Chapter 4 of this Draft EA/IS.

Bank Revetment Monitoring and Maintenance

AQ-3*: Potential for revetment monitoring and maintenance to generate short-term vehicle or equipment emissions or air pollutants that could affect local or regional air quality.*

Maintenance of the revetment would be conducted consistent with the approach described in Chapter 2. Although not anticipated to occur frequently, equipment associated with the maintenance activities would result in temporary, short-term air quality emissions over a 7-day work period, as shown in Table 3.10-11.

Based on the emissions modeling results, construction activities associated with revetment maintenance would not exceed the ROG or PM_{10} Level A thresholds identified by GCAPCD and

BCAQMD. However, the NO_x emissions would exceed the GCAPCD Level A threshold (≤ 25 lbs/day) and the BACQMD Level B threshold (≥ 25 lbs/day), but would not exceed the BCAQMD Level C threshold (>137 lbs/day). Potentially significant air quality effects have been identified for NO_x emissions. To the extent feasible, BMPs, standard mitigation measures and BAMMs are incorporated into the Proposed Action/Project to reduce the total quantity of air quality pollutants emitted during construction-related revetment maintenance activities to a less than significant level. Construction emissions of ROG, PM_{10} and NO_x would each be less than the *de minimis* thresholds established by the EPA for Federal conformity analyses.

Because maintenance would occur over a 7-day period, the Proposed Action/Project would not contribute on a long-term basis to existing or projected air quality violations, nor would it expose sensitive receptors to substantial pollutant concentrations.

With implementation of ***Environmental Commitments AQ-1*** and ***AQ-2***, and ***Mitigation Measure AQ-1***, rock-toe and tree revetment maintenance associated with the Proposed Action/Project would have a less than significant impact on air quality.

GHG emissions associated with maintenance of the rock-toe and tree revetment also would be limited to construction equipment exhaust. However, the construction activities would not result in substantial increases in emission levels, particularly for constituents of concern for which Glenn and Butte counties are in nonattainment. As discussed above, an individual project does not generate enough GHG emissions to significantly influence global climate change, which is generally considered to be a cumulative impact. Therefore, potential construction-related greenhouse gas emissions impacts associated with the Proposed Action/Project are addressed in Chapter 4 in this Draft EA/IS. Additionally, because the Proposed Action/Project would not involve permanent removal of vegetation, the loss of GHG sequestration opportunity associated with vegetation removal would not occur.

Overall, standard mitigation measures and construction BMPs are incorporated as part of the Proposed Action/Project and, thus, potential project-specific impacts would be reduced to a less than significant level.

PROPOSED ACTION/PROJECT RELATIVE TO THE NO ACTION ALTERNATIVE (NEPA ANALYSIS)

For additional NEPA analysis purposes, this section presents those considerations under the Proposed Action/Project, relative to the No Action Alternative.

In-river Dredging and Spoils Disposal

AQ-4*: Potential for dredging operations to generate short-term vehicle or equipment emissions or air pollutants that could affect local or regional air quality.*

The emissions released from dredging-related construction equipment would be greater than those released under the No Action Alternative. However, to address potential air quality concerns, the Proposed Action/Project has been designed to incorporate measures to minimize

the total quantity of air quality pollutants emitted during up to two cycles of dredging and spoils disposal operations (see Section 2.2.3). Therefore, with mitigation incorporated, potential air quality impacts associated with the Proposed Action/Project would be less than significant.

Bank Revetment Monitoring and Maintenance

AQ-5*: Potential for revetment monitoring and maintenance to generate short-term vehicle or equipment emissions or air pollutants that could affect local or regional air quality.*

Construction activities associated with revetment maintenance under the Proposed Action/Project and revetment removal under the No Action Alternative would not exceed the ROG or PM_{10} Level A thresholds identified by GCAPCD and BCAQMD. Modeled maximum daily NO_x emissions associated with rock-toe and tree revetment maintenance under the Proposed Action/Project and revetment removal under the No Action Alternative are very similar, as shown below in **Table 3.10-12**.

Table 3.10-12. Comparison of NOx Emissions Expected to Occur Under the Proposed Action/Project and the No Action Alternative.

	Proposed Action/Project (Revetment Maintenance)	No Action Alternative (Revetment Removal)
Equipment (NO_x lbs/day)	32.85	28.50
Commuter (NO_x lbs/day)	0.05	0.074
Soil Hauling (NO_x lbs/day)	7.00	6.0
NO_x Total Pounds/Day	**39.90**	**34.57**
NO_x Total Tons	**0.12**	**0.48**

Although revetment maintenance would be of a shorter duration than revetment removal, emissions are slightly higher than those associated with removal under the No Action Alternative. For the Proposed Action/Project, rock material may need to be obtained from a local quarry and transported to the project site if revetment maintenance becomes necessary. The Nordic Vina Quarry is the nearest rock quarry, located about 35 miles from the project site. It is assumed that four 70-mile round trips could occur between the project site and the Nordic Vina Quarry each day over the 7-day maintenance period, which accounts for a large component of the NO_x emissions under the Proposed Action/Project.

Because revetment-related construction activities associated with both the Proposed Action/Project (7 days) and the No Action Alternative (35 days) would occur over a relatively short period of time, neither scenario would contribute to existing or projected air quality violations on a long-term basis, nor would they expose sensitive receptors to substantial pollutant concentrations.

For the reasons described in the previous analyses, and in consideration of the impact avoidance and mitigation measures that would be implemented as part of the Proposed Action/Project, potential impacts to air quality and GHG emissions would be less than significant.

3.10.4 ENVIRONMENTAL COMMITMENTS AND MITIGATION MEASURES

Construction-related impacts to air quality are short-term in duration and would not result in long-term adverse conditions. The impact avoidance, minimization and mitigation requirements discussed in Chapter 2 (see Section 2.2.3) are the same for both the Proposed Action/Project and the No Action Alternative.

Impact avoidance and reduction of construction equipment exhaust focuses on strategies that reduce NO_x, ROG, and PM_{10} emissions. Four factors contribute to carbon emissions from trucks and other equipment: (1) amount of fuel used; (2) type of fuel used; (3) engine maintenance and condition; and (4) number of vehicle miles traveled. To the extent feasible, standard mitigation measures and best available mitigation and management practices described in the BCAQMD's 2008 CEQA Air Quality Handbook would be implemented to minimize carbon emissions and reduce impacts to air quality and GHG emissions to a less than significant level. A summary of the air quality- and GHG emission-related environmental commitments and a description of the applicable mitigation measures is provided below.

- ***Environmental Commitment AQ-1****: Reduce potential air quality impacts by implementing standard mitigation measures and best available construction management practices.*
- ***Environmental Commitment AQ-2****: Prepare and implement a dust control plan.*
- ***Mitigation Measure AQ-1***: *Prepare an Air Quality Control Plan to reduce NO_x emissions.*

  Because potentially significant air quality impacts related to NO_x emissions have been identified, mitigation measures will be implemented to reduce NO_x emissions when GCAPCD and BCAQMD thresholds are exceeded. Projects that exceed a BCAQMD Level B threshold (i.e., > 25 lbs per day of NO_x) should be submitted to the BCAQMD for review (BCAQMD 2008). Therefore, the contractor will provide a plan for review and approval by GCAPCD and BCAPCD and the Lead Agencies demonstrating that construction activities will not exceed 25 lbs/day of NO_x. The plan also will demonstrate that the heavy-duty (equal to or greater than 50 horsepower) off-road equipment to be used during construction, including owned, leased and subcontractor vehicles, will achieve a project-wide fleet-average 20 percent NO_x reduction compared to the most recent CARB fleet average at time of construction. To reduce NO_x emissions for the Proposed Action/Project, the contractor shall employ one or more of the following measures:

  - Require injection timing retard of 2 degrees on all diesel vehicles, where applicable.

- Install high-pressure injectors on all vehicles, where feasible.
- Encourage the use of reformulated diesel fuel.
- Electrify equipment, where feasible.
- Maintain equipment in tune with manufacturer's specifications.
- Install catalytic converters on gasoline-powered equipment.
- Substitute gasoline-powered for diesel-powered equipment where feasible.
- Use compressed natural gas or on-site propane mobile equipment instead of diesel-powered equipment, where feasible.

The contractor will submit to the Lead Agencies and all relevant air quality management districts a comprehensive inventory of all off-road construction equipment equal to or greater than 50 horsepower that will be used an aggregate of 40 or more hours during any portion of the construction project. The inventory shall include the horsepower rating, engine production year, and projected hours of use or fuel throughput for each piece of equipment. At least 48 hours prior to the use of subject heavy-duty off-road equipment, the contractor shall provide the relevant air quality management districts with the anticipated construction timeline, including start date and the name and phone number of the project manager and on-site foreman.

Acceptable options for reducing emissions also may include use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, after treatment products, provide funds for air district offsite mitigation projects, and/or other options as they become available. The GCAPCD and BCAQMD will be contacted to discuss plan details and potential alternative measures, if necessary.

3.11 HAZARDS AND HAZARDOUS MATERIALS

Under Title 22 of the CCR, the term hazardous substance refers to both hazardous materials and hazardous wastes, and both are classified according to four properties: toxicity, ignitability, corrosiveness, and reactivity (CCR Title 22, Chapter 11, Article 3). A hazardous material is defined as a substance or combination of substances that may cause or significantly contribute to an increase in serious, irreversible, or incapacitating illness, or may pose a substantial presence or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed. Hazardous wastes are hazardous substances that no longer have practical use, such as materials that have been discarded, discharged, spilled, or contaminated or are being stored until they can be disposed of properly (CCR Title 22, Chapter 11, Article 2, Section 66261.10).

Factors that influence the health effects of exposure to hazardous material include the dose to which the person is exposed, the frequency of exposure, the exposure pathway, and individual

susceptibility. Sensitive receptors to hazardous materials are generally facilities where sensitive receptor population groups (children, the elderly, the acutely ill, and the chronically ill) are likely to be located, which may include residences, schools, parks, playgrounds, hospitals, day care facilities, and health care facilities. Local land uses around the project site include agriculture, open water, and a wildlife refuge, such that no sensitive receptors are located within 1 mile of the Action/Project Area.

3.11.1 AFFECTED ENVIRONMENT/ENVIRONMENTAL SETTING

3.11.2 REGULATORY SETTING

The Butte County Public Health Department, Environmental Health Division, was certified by the California EPA as the Certified Unified Program Agency (CUPA) for Butte County in 2005. The Unified Program is the consolidation of six State hazardous materials management programs into one program. The CUPA inspects businesses or facilities that handle or store hazardous materials; generate and/or treat hazardous waste; own or operate underground storage tanks; store petroleum in aboveground tanks over State thresholds; and store Federal regulated hazardous materials over State thresholds. In addition to the oversight of the State certified programs, Butte County CUPA additionally assists with performing oversight of emergency response for hazardous material spills. The Glenn County APCD is the Administering Agency and the CUPA for Glenn County with responsibility for regulating hazardous materials handlers, hazardous waste generators, underground storage tank facilities, above ground storage tanks, and stationary sources handling regulated substances.

In addition to hazardous materials, wildfires also pose a threat to both persons and property in many areas of California. The California Department of Forestry and Fire Protection, the Glenn County Office of Emergency Services, the Glenn County Fire Department, the Butte County Office of Emergency Management, and the Butte County Fire Department manage and provide fire protection and emergency response services within Glenn and Butte counties.

3.11.3 ENVIRONMENTAL CONSEQUENCES

3.11.3.1 ASSESSMENT METHODOLOGY

Potential hazardous effects are considered in relation to the type and quantities of hazardous materials to be used and generated by construction, as well as the potential for workers to be exposed to such materials. The evaluation includes consideration of the amount of hazardous materials as well as hazardous material storage handling and disposal procedures.

3.11.3.2 SIGNIFICANCE CRITERIA

The significance criteria used to evaluate potential impacts related to hazards and hazardous materials were based on and incorporate guidance contained in Section 1508.27 of the CEQ NEPA regulations regarding significance determinations; the mandatory findings of significance,

as listed in Section 15065 of the State CEQA Guidelines (Title 14, Chapter 3 of the CCR); and criteria derived from Appendix G of the State CEQA Guidelines (for additional detail, see Section 3.3.3.2).

Hazards, hazardous materials and worker safety impact indicators and evaluation criteria were developed based on the types of hazardous materials that would be used and stored on site. For the purposes of this analysis, the Proposed Project would be considered to have an adverse effect under NEPA and a significant impact under CEQA on hazards, hazardous materials and worker safety if it would contribute to any one of the following within the Action/Project Area.

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

Because some of the hazards-related indicators of significance listed in Appendix G of the CEQA Guidelines are not applicable to the Proposed Project, they are not used for analytical purposes in this Draft EA/IS. Specifically, the Proposed Project: (1) will not emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school; (2) is not located on a site included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5; (3) is not located within the vicinity of a private airstrip, an airport land use plan or, within two miles of a public airport or public use airport where such a plan has not been adopted, and (4) would not impair implementation of, or physically interfere with an adopted emergency response plan or emergency evacuation plan.

3.11.3.3 IMPACT ANALYSIS

The evaluations below describe the types of hazards, hazardous materials and worker safety effects that could occur as a result of the Proposed Project under the following three scenarios.

- No Action Alternative Compared to Existing Conditions (NEPA Analysis)
- Proposed Action/Project Compared to Existing Conditions (CEQA Analysis)
- Proposed Action/Project Compared to the No Action Alternative (NEPA Analysis)

Following the presentation of technical information, a conclusion is made at the end of each analytical comparison regarding whether the scenario evaluated, relative to the basis of comparison, would have an adverse effect under NEPA or a significant impact under CEQA, as appropriate.

NO ACTION ALTERNATIVE RELATIVE TO EXISTING CONDITIONS (NEPA ANALYSIS)

Removal of the Temporary Rock-toe and Tree Bank Revetment

***HAZ-1**. Potential for release of hazardous materials into the environment or increased fire risk due to revetment removal, resulting in increased exposure to hazards or hazardous materials.*

During revetment removal, there would be a remote possibility of accidental spills of fuel or oil from the construction equipment that may be used. Additionally, temporary fire risks may be associated with vehicular/equipment use in grass areas, with a low potential of sparks causing ignition of dry brush or vegetation. Best construction practices and protective measures (e.g., spill prevention and recovery plan) for hazardous materials would be incorporated into the No Action Alternative (similar to ***Environmental Commitment HAZ-1***) and potential adverse effects would be minimal.

PROPOSED ACTION/PROJECT RELATIVE TO EXISTING CONDITIONS (CEQA ANALYSIS)

In-river Dredging and Spoils Disposal

***HAZ-2**. Potential for release of hazardous materials into the environment or increased fire risk due to dredging operations, resulting in increased exposure to hazards or hazardous materials.*

Under the Proposed Action/Project, the potential for hazards and hazardous material impacts would be localized. Although limited quantities of miscellaneous hazardous substances, such as gasoline, diesel fuel, and hydraulic fluid, would be handled on the construction site, there would be no routine transport, use, or disposal of hazardous materials associated with the Proposed Action/Project. Daily refueling of the barge will occur in compliance with the spill prevention plan and other safety considerations. Additionally, no radioactive or biological hazardous materials would be utilized or transported during the construction or maintenance phases of the Proposed Action/Project. The use of the existing stockpile area for spoils disposal will reduce the need for transport of materials during construction. Thus, the Proposed Action/Project would not create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials.

Operation of equipment used on the project site, such as the barge, dozers, and trap belt loader would not significantly increase the potential risk for fire. Additionally, as a construction best management practice and precautionary measure, construction work crews would be required to carry sufficient fire suppression equipment to ensure that any fire resulting from construction activities could be immediately extinguished. Therefore, the Proposed Action/Project would not 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.

During construction activities associated with the Proposed Action/Project, there would be a remote possibility of accidental spills of fuel or oil from the equipment used. Hazmat cleanup

equipment and materials (i.e., absorbent pads) would be available on site to ensure proper management of hazardous materials used during construction or encountered unexpectedly during construction. Best construction practices for hazardous materials and a spill prevention and response plan, provided by the contractor, would be in place prior to the onset of construction activities, and any persons involved with construction of the project will be trained to comply with the plan. Therefore, the Proposed Action/Project would not 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.

Overall, with the implementation of ***Environmental Commitments HAZ-1*** and **HAZ-*2***, the risk to health and worker safety due to exposure to hazards and hazardous materials associated with the Proposed Action/Project would be less than significant.

Bank Revetment Monitoring and Maintenance

HAZ-3*. Potential for release of hazardous materials into the environment or increased fire risk due to revetment monitoring and maintenance, resulting in increased exposure to hazards or hazardous materials.*

During revetment maintenance, there would be a remote possibility of accidental spills of fuel or oil from the construction equipment that may be used. Additionally, temporary fire risks may be associated with vehicular/equipment use in grass areas, with a low potential of sparks causing ignition of dry brush or vegetation. As discussed above, ***Environmental Commitments HAZ-1*** and ***HAZ-2*** are incorporated into the Proposed Action/Project that would reduce the risk to health and worker safety due to exposure to fire hazards and hazardous materials from revetment maintenance. Therefore, the Proposed Action/Project would not: (1) create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials; (2) 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; or (3) 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. Consequently, with the implementation of ***Environmental Commitments HAZ-1*** and ***HAZ-2***, the risk to health and worker safety due to exposure to hazards and hazardous materials associated with the Proposed Action/Project would be less than significant.

PROPOSED ACTION/PROJECT RELATIVE TO THE NO ACTION ALTERNATIVE (NEPA ANALYSIS)

For additional NEPA analysis purposes, this section presents those considerations under the Proposed Action/Project, relative to the No Action Alternative.

In-river Dredging and Spoils Disposal

HAZ-4*. Potential for release of hazardous materials into the environment or increased fire risk due to dredging operations, resulting in increased exposure to hazards or hazardous materials.*

For this alternatives comparison, potential impacts associated with dredging and spoils disposal under the Proposed Action/Project would be short-term in nature and similar to those previously discussed. Therefore, for the reasons described in the previous analyses, and in consideration that impact avoidance and minimization measures would be implemented as part of the Proposed Action/Project and the No Action Alternative, potential impacts associated with hazards and hazardous materials would be less than significant.

Bank Revetment Monitoring and Maintenance

HAZ-5*. Potential for release of hazardous materials into the environment or increased fire risk due to revetment monitoring and maintenance, resulting in increased exposure to hazards or hazardous materials.*

The Proposed Action/Project involves the rock-toe and tree revetment remaining in place and being maintained until a long-term solution is developed and completed. Under the No Action Alternative, the 1,520 feet of rock and tree revetment would be removed.

Under this alternatives comparison, potential impacts associated with short-term exposure to the transport, use, or disposal of hazardous materials and fire risk from construction activities would be similar to those previously discussed. Therefore, for the reasons described in the previous analyses, and in consideration that impact avoidance and minimization measures would be implemented as part of the Proposed Action/Project and the No Action Alternative, potential impacts associated with hazards and hazardous materials would be less than significant.

3.11.4 ENVIRONMENTAL COMMITMENTS

Protective measures to address hazards and hazardous materials would be the same for both the Proposed Action/Project and the No Action Alternative. By implementing ***Environmental Commitments HAZ1*** and ***HAZ-2*** (see Section 2.2.3 and Appendix I – Mitigation Monitoring and Reporting Program), the risk of fire and hazardous materials spills or upset would be less than significant. A summary of these measures is provided below.

- ***Environmental Commitment HAZ-1:*** *Prepare and Implement a Hazardous Materials Control, Spill Prevention and Response Plan*
- ***Environmental Commitment HAZ-2:*** *Implement fire risk reduction measures.*

3.12 TRAFFIC AND CIRCULATION

3.12.1 AFFECTED ENVIRONMENT/ENVIRONMENTAL SETTING

Regional access to the Action/Project Area would occur primarily from State Route (SR) 45. SR 45 is a two-lane road (classified as a Rural Minor Arterial) located west of the Sacramento River, and it is the major north-south connection east of I-5 within Glenn County. According to the Draft 2009/2010 Glenn County Regional Transportation Plan Update, SR 45 primarily serves the "farm-to-market" commerce of the rural areas in the County (Glenn County Transportation Commission 2009). Daily traffic volumes on SR 45 in Glenn County serve less than 2,500 vehicles per day (Glenn County Transportation Commission 2009). As an alternate route, SR99 runs north-south and connects Butte County with Yuba City and Sacramento to the south, and Red Bluff to the northwest. The California Department of Transportation has the primary responsibility for the operation and maintenance of State routes.

The Action/Project Area is located in a rural agricultural area with light traffic. The primary roads in the area are Chico River Road, River Road, and Sutter Avenue – all two lane roads with narrow shoulders (Jones and Stokes 1996). Local access to the project site is provided via County maintained and private roadways.

Because of the largely rural nature of the area, local roadways generally operate at a free-flowing level of service during peak driving hours. For the purposes of this analysis, it is assumed that vehicle and truck trips originating from the communities of Willows, Hamilton City and Chico would access the study area from County Road (CR) 23 via SR45 and River Road. CR23 and River Road operate at a free-flowing level of service during peak hours. From the 2-lane access roads, access to the site is reached via restricted access levee and agricultural roads.

3.12.2 REGULATORY SETTING

The following section describes applicable laws, regulations, and standards associated with traffic and circulation in the vicinity of the Proposed Project.

3.12.2.1 COMMERCIAL MOTOR CARRIER SAFETY ASSISTANCE PROGRAM (49 CFR 350-399)

The Federal Highway Administration provides guidance on the transportation of goods and materials under Title 49 of the Code of Federal Regulations (CFR). Federal laws that may be applicable to the Proposed Project include the Commercial Motor Carrier Safety Assistance Program (49 CFR 350-399) and Appendices A through G of the Federal Motor Carrier Safety Regulations, which provide safety considerations for the transportation of goods, materials, and substances over public highways.

3.12.2.2 CALIFORNIA VEHICLE CODE

The California Department of Transportation has the discretionary authority to issue special permits for the movement of vehicles and loads exceeding the statutory limitations on the size, weight, and loading contained in Division 15 of the California Vehicle Code. If oversize vehicles or loads need to access the project area using the State highway system, a transportation permit may be required.

3.12.2.3 BUTTE AND GLENN COUNTY GENERAL PLANS

The Butte and Glenn County General Plans provide goals and policies emphasize the provision of a safe and efficient transportation system (Butte County 2010, Glenn County 1993). The Counties encourage interagency coordination when planning roadways to meet the needs of multiple land uses. Butte County also promotes reductions in vehicle emissions, provides for and encourages the use of alternative forms of transportation, and establishes and manages the road and highway system in the county to serve travelers.

3.12.3 ENVIRONMENTAL CONSEQUENCES

3.12.3.1 ASSESSMENT METHODOLOGY

The analysis of traffic and circulation impacts is based on a review of applicable management plans, road conditions in and near the Action/Project Area and an evaluation of the Proposed Project's potential to increase traffic or affect circulation on nearby roads and highways. The analysis includes an estimate of the number of trips expected during construction, but the resulting impacts on the road network and circulation are discussed qualitatively.

3.12.3.2 SIGNIFICANCE CRITERIA

The significance criteria used to evaluate potential impacts on traffic and circulation were based on and incorporate guidance contained in Section 1508.27 of the CEQ NEPA regulations regarding significance determinations; the mandatory findings of significance, as listed in Section 15065 of the State CEQA Guidelines (Title 14, Chapter 3 of the CCR); and criteria derived from Appendix G of the State CEQA Guidelines (for additional detail, see Section 3.3.3.2).

For the purposes of this analysis, the Proposed Project would be considered to have an adverse effect under NEPA and a significant impact under CEQA on traffic and circulation if it would contribute to any one of the following within the Action/Project Area.

- Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit.

- Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways.
- Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks.
- Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).
- Result in inadequate emergency access.
- Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.

3.12.3.3 IMPACT ANALYSIS

The evaluations below describe the types of traffic and circulation effects that could occur as a result of the Proposed Project under the following three scenarios.

- No Action Alternative Compared to Existing Conditions (NEPA Analysis)
- Proposed Action/Project Compared to Existing Conditions (CEQA Analysis)
- Proposed Action/Project Compared to the No Action Alternative (NEPA Analysis)

Following the presentation of technical information, a conclusion is made at the end of each analytical comparison regarding whether the scenario evaluated, relative to the basis of comparison, would have an adverse effect under NEPA or a significant impact under CEQA, as appropriate.

NO ACTION ALTERNATIVE RELATIVE TO EXISTING CONDITIONS (NEPA ANALYSIS)

Removal of the Temporary Rock-toe and Tree Bank Revetment

***T-1**. Potential for revetment removal to increase traffic or affect long-term circulation patterns on nearby roads and highways, or to conflict with adopted traffic management plans.*

Construction activities would temporarily result in an increase in traffic levels from worker commutes and transportation of construction equipment and materials. Trucks and other construction equipment required for the removal of the rock-toe and tree revetment would access the project site from CR23, which can be accessed from SR45. Rural Minor Arterial roads in Glenn County, such as SR45, are classified as having a level of service designation of “B”, which equates to a maximum daily traffic volume of 3,300 vehicles (Glenn County Transportation Commission 2009). Daily traffic volumes on SR45 in Glenn County presently serve less than 2,500 vehicles per day (Glenn County Transportation Commission 2009). Although the roadways in the area are narrow, roadway safety problems should be minimal

because the existing roadways are adequate for automobiles and trucks, and existing traffic levels in the area are light.

Equipment needed during revetment removal would be transported to the project site at the beginning of the construction period, stored on-site in designated staging areas, and removed from the site when it is no longer needed. At least 30 days in advance of any proposed construction work, the private landowner to the south of the USFWS Capay Unit would be notified to obtain landowner permission and develop an access agreement prior to the commencement of equipment transport and construction activities.

Rock and other material removed from the revetment would be transported a distance of 15 miles and temporarily stockpiled at the M&T Chico Ranch for a specified period of time to be utilized by the agencies (CDFW and USFWS) or for other public interests to be determined by CDFW. If the rock was not removed within that time period, then it would be used for projects on the ranch. Transport of the 9,120 tons of material used to construct the temporary revetment would be conducted using four end dump trucks, each having a 23-ton net capacity, and would require about 397 30-mile round-trips between the USFWS Capay Unit and the M&T Chico Ranch over a 35-day work period. It is anticipated that each of the four end dump trucks that would be in operation would make up to 8 trips per day, travelling a total of 240 miles per day. Given the time required to load and unload each truck, it is unlikely that all four trucks would be travelling simultaneously. Additionally, the construction crew would commute to and from the City of Chico and the project site daily, assuming up to three pickup trucks would each make one 33-mile round-trip per day during the 35-day removal period. These trips generally would take place during business hours of 7:00 a.m. to 5:00 p.m., however, most trips would occur during off-peak traffic hours, from 9:00 a.m. to 4:00 p.m. Due to its temporary nature and the fact that revetment removal would occur on the Capay Unit and the Stile property, the No Action Alternative is not anticipated to result in inadequate emergency access.

Although the additional construction traffic associated revetment removal under the No Action Alternative would not be sufficient to exceed existing level of service designations, heavy equipment access to the project site from CR23 and through the USFWS Capay Unit could have the potential to degrade unpaved roads or create unsafe driving conditions. Temporary traffic delays could also occur along roads in the vicinity of the project site as trucks hauling materials are entering and leaving these areas. For additional safety purposes, traffic control measures (e.g., signs, flaggers), as appropriate, would be used on access roads to inform travelers of potential delays and use of large trucks and equipment in the area. Given the number of truck trips that would occur, and consistent with the traffic analyses conducted in CDFG and USFWS (2007), potential effects on traffic and circulation are considered to be potentially significant, and would require the preparation of a traffic control plan to minimize potentially adverse affects (see ***Environmental Commitments TRAF-1*** through ***TRAF-3*** in Section 2.2.3).

PROPOSED ACTION/PROJECT RELATIVE TO EXISTING CONDITIONS (CEQA ANALYSIS)

In-river Dredging and Spoils Disposal

***T-2**. Potential for dredging operations to increase traffic or affect long-term circulation patterns on nearby roads and highways, or to conflict with adopted traffic management plans.*

Construction activities would temporarily result in a slight increase in traffic levels from worker commutes and transportation of construction equipment and materials. Construction equipment required for the dredging and spoils disposal would access the project site from an unnamed dirt road off of River Road. SR99 is the closest major highway to River Road. Trucks and other equipment would then utilize the eastern levee road traveling north to the gravel bar access road. Once dredging equipment and machinery are on-site, it would remain on-site until completion of construction activities. The exceptions would be the 18-wheeler truck used to transport the dredge to the site, as well as the crane used to place the dredge in the Sacramento River. Both vehicles would be brought to the project site at the beginning of the in-river work period to launch the dredge, and would return to remove the dredge boat. Although roadway safety problems should be minimal, traffic control measures (e.g., signs, flaggers), as appropriate, would be used on access roads for additional safety purposes. Due to its temporary nature and the fact that most activities will occur in the Sacramento River and on M&T Chico Ranch property, the Proposed Action/Project is not anticipated to result in inadequate emergency access.

The dredging crew would be comprised of four people. For the duration of the dredging operation, the crew would stay in the City of Chico and would use personal vehicles to commute daily to and from the dredge site. It is assumed that two pickup trucks would each make one 15-mile round-trip per day during the construction period. The addition of the crew vehicles to the local circulation system is not anticipated to create any changes to the level of service standards within the area.

Given that the Action/Project Area is located in a rural area, and activities associated with the Proposed Action/Project are temporary in nature, the Proposed Action/Project would not be anticipated to: (1) conflict with any plans, ordinances or policies establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit; (2) conflict with any applicable congestion management programs; or (3) result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks.

Additionally, as discussed above under Section 3.5 – Recreation and Navigation Safety, the dredging operations have the potential to interfere with Sacramento River boat traffic movement in the vicinity of the Action/Project Area. A detailed discussion of the recreational boat traffic considerations and impact avoidance measures are presented in Section 3.5.

With the implementation of ***Environmental Commitments TRAF-1*** through ***TRAF-3***, suction dredging operations associated with the Proposed Action/Project would have a less than significant impact on traffic and circulation.

Bank Revetment Monitoring and Maintenance

T-3. *Potential for revetment monitoring and maintenance to increase traffic or affect long-term circulation patterns on nearby roads and highways, or to conflict with adopted traffic management plans.*

Construction activities associated with the revetment maintenance are anticipated to occur infrequently over the duration of the project, and would include placement of rock and/or tree material consistent with the installation approach described in CDFG and USFWS (2007). For impact assessment purposes, it is assumed that revetment maintenance activities would be conducted within a 7-day period.

Trucks and other construction equipment required for the periodic maintenance of the rock-toe and tree revetment would access the project site from CR23, which can be accessed from SR45. There would be a limited number of trucks and/or equipment entering the site to deliver construction materials as necessary. If additional rock was required as part of revetment maintenance repairs, it would likely be obtained from the Nordic Vina Quarry in Tehama County, which is the nearest quarry located about 35 miles from the project site. The average round-trip haul time from the Nordic Vina Quarry to the project site is about two hours. In consideration of the time that would be required to travel to and from the Nordic Vina Quarry, including loading and unloading material, it is assumed that four 70-mile round trips could occur each day during the 7-day maintenance period. Temporary traffic delays could occur along roads in the vicinity of the project site as trucks hauling materials are entering and leaving the project areas. As discussed below in Section 3.12.4, a traffic control plan would be prepared by the contractor and traffic control measures (e.g., signs, flaggers) would be used, as needed, on access roads to inform travelers of potential delays and use of large trucks and equipment in the area. Due to its temporary nature and the fact that most activities will occur on the Capay Unit and Stile property, the Proposed Action/Project is not anticipated to result in inadequate emergency access.

The construction crew would be comprised of between four and six people that would commute to and from the City of Chico and the project site daily. It is assumed that the crew would consolidate into two pickup trucks that would each make one 33-mile round-trip commute per day during the 7-day maintenance period.

If revetment maintenance requires access to the southernmost 245 feet of the revetment, the private landowner to the south of the USFWS Capay Unit would be notified to obtain landowner permission and develop an access agreement at least 30 days prior to the commencement of any construction activities in this area.

Because the Action/Project Area is located in a rural area, and activities associated with the Proposed Action/Project are temporary in nature, the Proposed Action/Project would not be anticipated to: (1) conflict with any plans, ordinances or policies establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit; (2) conflict with any applicable congestion management programs; or (3) result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks.

Because protective measures have been incorporated to minimize and avoid potential traffic-related impacts (see ***Environmental Commitments TRAF-1*** through ***TRAF-3)***, and maintenance activities would be limited in effort and duration, the Proposed Action/Project would result in a less than significant impact to traffic and circulation.

PROPOSED ACTION/PROJECT RELATIVE TO THE NO ACTION ALTERNATIVE (NEPA ANALYSIS)

For additional NEPA analysis purposes, this section presents those considerations under the Proposed Action/Project, relative to the No Action Alternative.

In-river Dredging and Spoils Disposal

T-4*. Potential for dredging operations to increase traffic or affect long-term circulation patterns on nearby roads and highways, or to conflict with adopted traffic management plans.*

Once equipment and machinery necessary for dredging are on-site, it would remain on-site until the completion of construction activities under the Proposed Action/Project. Traffic control measures would be used as appropriate, and the temporary addition of the construction crew vehicles to the local circulation system is not anticipated to create any changes to the level of service standards. Implementation of the No Action Alternative would avoid potential short-term traffic-related effects but would not achieve project objectives.

Bank Revetment Monitoring and Maintenance

T-5*. Potential for revetment monitoring and maintenance to increase traffic or affect long-term circulation patterns on nearby roads and highways, or to conflict with adopted traffic management plans.*

Traffic-related effects associated with maintenance of the rock-toe and tree revetment under the Proposed Action/Project would be similar to effects associated with revetment removal under the No Action Alternative. However, the number of truck trips and the duration of time necessary to complete work associated with revetment maintenance (one truck, four 70-round-trips per day, for seven days) would be less than those associated with revetment removal (four trucks, eight 30-mile round trips per day, for up to 35 days).

3.12.4 ENVIRONMENTAL COMMITMENTS

The impact avoidance and minimization measures for potential project effects on traffic and circulation are described in Section 2.2.3 and are fully detailed in the Mitigation Monitoring and Reporting Program (Appendix I). Protective measures to address potential project effects on traffic and circulation associated with dredging operations and revetment maintenance under the Proposed Action/Project or revetment removal under the No Action Alternative would be the same. A summary of these measures is provided below.

- ***Environmental Commitment TRAF-1:*** *Prepare and Implement a Traffic Control Plan.*
- ***Environmental Commitment TRAF-2:*** *Implement Measures to Address Potential Traffic Flow and Access Issues.*
- ***Environmental Commitment TRAF-3:*** *Construction-related Traffic Measures.*

3.13 NOISE

Noise is defined as unwanted or excessive sound, such as traffic from a nearby road. Sound is defined as any pressure variation in air that the ear can detect (CDFFP 2012). If the pressure variations occur frequently enough, at least 20 times per second, they can be heard by the human ear and called "sound". The number of pressure variations per second is called the frequency of sound, and is expressed as cycles per second, called Hertz (Hz). The relative loudness or intensity of sound energy is measured in decibels (dB). A decibel is a logarithmic unit of sound energy that represents the smallest variance in sound that the human ear can detect (CDFFP 2012).

Because the human ear is not equally sensitive to sound at all frequencies, a frequency-dependent rating scale has been devised to interpret noise levels relative to the sensitivity of human hearing (CDFFP 2012). Environmental noise is usually measured in "A-weighted" decibels (dBA) and typically fluctuates over time. An 'A-weighted' decibel (dBA) is a decibel corrected for the variation in frequency response of the typical human ear at commonly encountered noise levels (CDFFP 2012). Various noise descriptors have been developed to describe time-varying noise levels. The following noise descriptors are commonly used to estimate environmental noise:

- **Equivalent Sound Pressure Level (L_{eq})** – describes a receiver's cumulative noise exposure from all events, measured during a specific time period.
- **Day-Night Sound Level (L_{dn})** – describes a receiver's cumulative noise exposure from all events over a full 24 hours. It is calculated using the energy average of the A-weighted sound levels occurring over a 24-hour period, with 10 dBA added to the A-weighted sound levels occurring during the hours of 10 pm and 7 am to account for the greater nocturnal noise sensitivity of people.

- **Sound Exposure Level (SEL) -** describes a receiver's cumulative noise exposure from a single noise event. It can be used as an intermediate descriptor in the measurement and calculation of both L_{eq} and L_{dn}.
- **Community Noise Equivalent Level (CNEL)** – the energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring between 10:00 p.m. and 7:00 a.m. and 5 dB added to the A-weighted sound levels occurring between 7:00 p.m. and 10:00 p.m.

Noise levels from a source diminish as distance to the receptor increases. A rule of thumb for traffic noise is that for every doubling of distance from the road, the noise level is reduced by 3 to 4.5 dBA (CDFFP 2012; U.S. Department of Transportation 1995). For a single source of noise (i.e. stationary equipment), the noise is reduced by 6dBA for each doubling of distance away from the source. Noise levels can also vary with the presence of structures that can reflect sound and either intensify or diminish the noise level. Community reaction to a change in noise levels varies, depending upon the magnitude of the change. In general, a difference of 3 dBA is a minimally perceptible change, while a 5 dBA difference is the typical threshold that would cause a noticeable change in human response. A 10-dBA change represents a tenfold increase in physical intensity, and is subjectively heard as approximately a doubling in loudness, which may cause an adverse effect. However, because the decibel scale is based on logarithms, two noise sources do not combine in a simple additive manner. As an example, if two identical noise sources produce noise levels of 50 dBA, the combined sound level would be 53 dBA, rather than 100 dBA.

In the urban setting, street and traffic noise can be considered background noise. Noises in the rural setting can seem amplified if there are no barriers to the source, but noise levels also are reduced by increasing distance, air density, wind, and obstructions (trees, buildings, and natural landscape features).

NEPA and CEQA provide a broad basis for evaluating and abating traffic and construction-related noise effects, and the intent of these laws is to promote the general welfare and to foster a healthy environment.

3.13.1 AFFECTED ENVIRONMENT/ENVIRONMENTAL SETTING

Within Glenn County, typical non-transportation/industrial noise sources include, but are not limited to, agricultural processing, industrial manufacturing, aggregate mining and miscellaneous agricultural operations. Because Glenn County is predominately rural in nature, with 24% of land Federally owned and 66% of land used for agricultural croplands and pasture (Glenn County Transportation Commission 2009), farming operations are common. Some of the more common noise sources associated with farming operations include tractors, harvesting equipment and spray equipment. Noise levels associated with common farm equipment are shown in **Table 3.13-1** and represent a range of levels that may be expected. The only other non-transportation noise sources in the Action/Project Area are those associated with mobile noise from agricultural

operations on lands zoned for agricultural uses. These activities are exempt from noise ordinances.

Transportation noise sources are defined as traffic on public roadways, railroad line operations, and aircraft in flight. Noise created by new transportation noise sources are mitigated so as not to exceed the specified noise ordinance levels.

Table 3.13-1. Average Noise Levels and Recommended Exposure Limits for Common Farm Equipment.

Equipment	Noise Level at the Ear Average (and Range) L_{eq} (dBA)	Recommended Limit of Exposure without the Use of Hearing Protection†
Farm Trucks	85dB (83dB – 88dB)	8 hrs (4 - 8 hrs)
Forklifts	84dB (81dB – 88dB)	8 hrs (4 - 8 hrs)
Harvesters	83dB (75dB – 91dB)	8 hrs (2 - 8 hrs+)
Irrigation Pumps	100dB (96dB – 104dB)	15 mins (5 -30 mins)
Tractors		
Tractor with cabin (10 yrs +)	81dB (77dB – 84dB)	8 hrs (8 - 8 hrs+)
Tractor without cabin	92dB (90dB – 93dB)	1.5 hrs (1 - 2 hrs)

† Noise exposure risk for each activity in the day is cumulative toward the overall noise exposure risk.

The noise level standards for Glenn County are the average noise level for a one hour period (A-weighted scale). For industrial activities during the day (7 a.m. - 10 p.m.), Glenn County's threshold for significance is 65 dB(A) L_{dn}. The Glenn County Planning Division enforces the noise level standards in Glenn County and determines the land use boundary lines, which determines the noise level standards. The noise level standards are established to protect the quality of human health in Glenn County (Glenn County 2003).

The Butte County General Plan Noise Element (noise element) was adopted in January 1977. In the noise element, noise is considered to be a minor problem with respect to unincorporated areas of the County because most of the significant noise problems are within cities, which are required to have their own noise elements and noise ordinances.

The noise standards contained in the Butte County General Plan do not differentiate between transportation, ambient, or temporary noise. Therefore, there are no standards specifically developed for dredging and construction-related activities. The only noise standard cited in the County Noise Element which is applicable to residential uses is a 60 dB(A) L_{dn} standard described above. Because it is not specified, it is inferred that this standard applies to residential uses affected by all types of noise sources.

Local noise standards do not apply to the construction site sounds between 7:00 a.m. and 7:00 p.m. The local noise standards also do not apply to agricultural equipment when operated on property zoned for agricultural activities provided standard, reasonable practices are being followed.

Existing intermittent and seasonal ambient noises in the Action/Project Area may be generated from agricultural operations, combined with existing noise from traffic on nearby roads and by motorized recreation on the Sacramento River, primarily during the summer. Results from 24-hour community noise measurements taken by Butte County at three locations near the M&T Chico Ranch in 2000 are listed in **Table 3.13-2**. There are no sensitive receptors, including schools, day care and senior housing, in the vicinity of the Action/Project Area.

Table 3.13-2. Butte County Community Noise Measurement Results (Butte County 2007).

Location	Date	Measured Sound Level (dB)		Measured L_{dn} (dB)
		L_{eq}	L_{max}	
M&T Chico Ranch Area (Site L)	September 2, 2000	Daytime = 50.3 Nighttime = 46.4	Daytime = 64.1 Nighttime = 57.4	53.6
	September 3, 2000	Daytime = 45.0 Nighttime = 44.0	Daytime = 60.7 Nighttime = 58.4	50.6
	September 4, 2000	Daytime = 46.2 Nighttime = 45.9	Daytime = 63.6 Nighttime = 56.0	52.4
	September 5, 2000	Daytime = 71.7 Nighttime = 47.1	Daytime = 67.5 Nighttime = 59.2	69.7
M&T Chico Ranch Area (Site M)	September 2, 2000	Daytime = 42.2 Nighttime = 38.8	Daytime = 56.5 Nighttime = 50.3	45.9
	September 3, 2000	Daytime = 50.4 Nighttime = 38.1	Daytime = 60.3 Nighttime = 53.7	49.6
	September 4, 2000	Daytime = 45.9 Nighttime = 40.3	Daytime = 64.1 Nighttime = 51.6	48.1
	September 5, 2000	Daytime = 44.4 Nighttime = 44.1	Daytime = 60.1 Nighttime = 58.6	50.5
M&T Chico Ranch Area (Site M)	September 2, 2000	Daytime = 40.0 Nighttime = 37.4	Daytime = 53.5 Nighttime = 47.6	44.3
	September 3, 2000	Daytime = 37.6 Nighttime = 34.4	Daytime = 55.3 Nighttime = 44.2	41.4
	September 4, 2000	Daytime = 43.9 Nighttime = 38.3	Daytime = 61.9 Nighttime = 48.3	46.1
	September 5, 2000	Daytime = 39.7 Nighttime = 36.0	Daytime = 55.3 Nighttime = 46.9	43.2

3.13.2 REGULATORY SETTING

The following section describes applicable laws, regulations, and standards pertaining to noise associated with the Proposed Project.

3.13.2.1 FEDERAL REGULATIONS

Federal regulations establish noise limits for medium and heavy trucks (more than 4.5 tons, gross vehicle weight rating) under 40 Code of Federal Regulations (CFR), Part 205, Subpart B. The

Federal truck pass-by noise standard is 80 dBA at 15 meters from the vehicle pathway centerline. These controls are implemented through regulatory controls on truck manufacturers. Regulation of all other in-use vehicles must be done by State or local governments.

3.13.2.2 STATE REGULATIONS

California Code of Regulations has guidelines for evaluating the compatibility of various land uses as a function of community noise exposure. The State of California also establishes noise limits for vehicles licensed to operate on public roads. For heavy trucks, the State pass-by standard is consistent with the Federal limit of 80 dBA. The State pass-by standard for light trucks and passenger cars (less than 4.5 tons, gross vehicle rating) is also 80 dBA at 15 meters from the centerline. These standards are implemented through controls on vehicle manufacturers and by legal sanction of vehicle operators by State and local law enforcement officials.

3.13.2.3 LOCAL REGULATIONS

In California, local regulation of noise involves implementation of general plan policies and noise ordinance standards. Local general plans identify general principles intended to guide and influence development plans, and noise ordinances set forth specific standards and procedures for addressing particular noise sources and activities.

General plans recognize that different types of land uses have different sensitivities toward their noise environment; residential areas are considered to be the most sensitive type of land use to noise, and industrial/commercial areas are considered to be the least sensitive.

Presently, Butte County does not have a noise ordinance or other noise enforcement code. Although the updated Butte County General Plan 2030 was adopted in October 2010 and became effective on November 30, 2010, establishment of a noise ordinance was listed as a future action in the plan. Therefore, the Butte County General Plan Health and Safety Element of the General Plan is used to determine acceptable noise levels. Applicable Butte County General Plan policies include the following.

- HS-P1.7 – Applicants for discretionary permits shall be required to limit noise-generating construction activities located within 1,000 feet of residential uses to daytime hours between 7:00 a.m. and 6:00 p.m. on weekdays and non-holidays.
- HS-P1.9 – The following standard construction noise control measures shall be required at construction sites in order to minimize construction noise impacts.
    a. Equip all internal combustion engine driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.
    b. Locate stationary noise-generating equipment as far as possible from sensitive receptors when sensitive receptors adjoin or are near a construction project area.

c. Utilize quiet air compressors and other stationary noise generating equipment where appropriate technology exists and is feasible.

The Butte County General Plan Health and Safety Element contains maximum noise exposure standards for various land uses affected by transportation noise sources. In non-urban and agricultural areas, the policy does not seek to protect the entire properly, rather it is meant to protect a residence (and its occupants) and 100 feet from the residence from excessive noise levels. The County's average maximum allowable noise exposure level (Ldn) for residential outdoor activity areas is 60 dB. For "non-urban" designation areas (e.g., agriculture, resource conservation areas), the maximum allowable noise exposure to non-transportation sources (i.e., stationary) is 60 dB during the day (7 a.m. to 7 p.m.), 55 dB during the evening (7 p.m. to 10 p.m.) and 50 dB at night (10 p.m. to 7 a.m.). The maximum allowable hourly L_{eq} for noise exposure is 50 dB during the day (7 a.m. to 7 p.m.), 45 dB during the evening (7 p.m. to 10 p.m.) and 40 dB at night (10 p.m. to 7 a.m.).

Applicable Glenn County General Plan policies include the following: PSP-52 – Require that noise mitigation measures necessary to achieve compliance with land use compatibility guidelines and noise level standards be incorporated into site planning and project design.

3.13.3 ENVIRONMENTAL CONSEQUENCES

3.13.3.1 ASSESSMENT METHODOLOGY

Noise impacts are typically assessed based on a comparative analysis of the noise levels resulting from the alternatives considered and the noise levels occurring under baseline, or Existing Conditions. The analysis of temporary construction-related noise effects was based on typical construction equipment noise levels and attenuation of those noise levels due to distances between sensitive receptors in the project vicinity and the construction activity. Non-transportation-related noise impacts were assessed by examining the proposed uses on the project site.

3.13.3.2 SIGNIFICANCE CRITERIA

The significance criteria used to evaluate potential impacts on noise were based on and incorporate guidance contained in Section 1508.27 of the CEQ NEPA regulations regarding significance determinations; the mandatory findings of significance, as listed in Section 15065 of the State CEQA Guidelines (Title 14, Chapter 3 of the CCR); and criteria derived from Appendix G of the State CEQA Guidelines (for additional detail, see Section 3.3.3.2).

For the purposes of this analysis, the Proposed Project would be considered to have an adverse effect under NEPA and a significant impact under CEQA on noise if it would contribute to any one of the following.

- 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.

Glenn County

- Noise level standards for Glenn County are the average noise level for a one hour period. For industrial activities during the day (7 a.m. to 10 p.m.), Glenn County's threshold for significance is 65 dB.

Butte County[12]

- The average maximum allowable noise exposure level for residential outdoor activities is 60 dB.
- In "non-urban" areas, the maximum allowable noise exposure level is: (1) 60 dB during the day (7 a.m. to 7 p.m.); (2) 55 dB during the evening (7 p.m. to 10 p.m.); and (3) 50 dB at night (10 p.m. to 7 a.m.). The maximum allowable hourly Leq for noise exposure is: (1) 50 dB during the day (7 a.m. to 7 p.m.); (2) 45 dB during the evening (7 p.m. to 10 p.m.); and (3) 40 dB at night (10 p.m. to 7 a.m.). In these areas, the exterior noise level standards shall be applied at a point 100 feet away from a residence, and shall be measured only on property containing a noise sensitive land use.

- ❑ Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.
- ❑ A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- ❑ A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Because some of the noise-related indicators of significance found in Appendix G of the CEQA Guidelines are not applicable to the Proposed Project, they are not used for analytical purposes in this Draft EA/IS. Specifically: (1) the Proposed Project is not located within an airport land use plan or, within two miles of a public airport or public use airport where such a plan has not been adopted; and (2) the Proposed Project is not within the vicinity of a private airstrip that would expose people residing or working in the project area to excessive noise levels.

[12] Although these criteria are applied herein as a guideline for analytical purposes, local noise standards in Butte County do not apply to construction site sounds between 7:00 a.m. and 7:00 p.m. provided that standard, reasonable practices are being followed (Butte County 2010).

3.13.3.3 IMPACT ANALYSIS

The evaluations below describe the types of noise-related effects that could occur as a result of the Proposed Project under the following three scenarios.

- No Action Alternative Compared to Existing Conditions (NEPA Analysis)
- Proposed Action/Project Compared to Existing Conditions (CEQA Analysis)
- Proposed Action/Project Compared to the No Action Alternative (NEPA Analysis)

Following the presentation of technical information, a conclusion is made at the end of each analytical comparison regarding whether the scenario evaluated, relative to the basis of comparison, would have an adverse effect under NEPA or a significant impact under CEQA, as appropriate.

NO ACTION ALTERNATIVE RELATIVE TO EXISTING CONDITIONS (NEPA ANALYSIS)

Removal of the Temporary Rock-toe and Tree Bank Revetment

***N-1**. Potential for revetment removal to generate noise above acceptable standards and expose sensitive receptors to substantial noise levels.*

Construction activities associated with revetment removal under the No Action Alternative would involve excavation, grading, and earth movement, which would result in short-term increases in ambient noise. Heavy construction equipment also would temporarily increase noise and vibration levels along access routes and near the project site on the USFWS Capay Unit. Construction associated with revetment removal would occur during daylight hours between 7:00 a.m. and 7:00 p.m. There is one residence located approximately 1,200 feet from the edge of the Action/Project Area. The riverbank that lies between the Sacramento River and the residence is about 15-feet high, providing some screening from the noise generated. Additionally, there is a dense riparian forest and orchard trees that provide for some attenuation of the noise.

EPA (1971) reports that noise levels at 50 feet from earthmoving equipment generally range from about 73 to 96 dBA. The U.S. Department of Transportation Federal Highway Administration *Construction Noise Handbook* also provides a list of example construction-related noise levels associated with various types of equipment. Although not all pieces of equipment to be utilized during construction is enumerated in the *Construction Noise Handbook*, the document does provide noise levels associated with many of the machines, which provides a reasonable range of anticipated noise levels. Anticipated noise associated with individual pieces of equipment generally range from approximately 77 dB to 85 dB (Federal Highway Administration 2006). Typical noise levels generated from construction equipment that may be used for implementing this alternative are presented in **Table 3.13-3**.

Table 3.13-3. Noise Levels for Construction Equipment Associated with Revetment Removal Under the No Action Alternative.

Construction Equipment	Typical Noise Level (dBA) 50 Feet from Source
Bucket Loader	81
Dump Truck	80-85
Excavator	85-88
Grader	80-93
Water Truck	75
Sources: Federal Transit Administration 1995; EPA 1971.	

Construction noise would fluctuate, depending on the equipment type and duration of use, distance between noise source and receptor, and presence or absence of barriers between noise source and receptor. Equipment (bulldozers, heavy trucks, loaders, excavators, and backhoes) typically used in the removal of bank protection features generate peak noise levels ranging from 80 dB above reference noise, adjusted (dBA) to 90 dBA at a reference distance of 50 feet. Rock dumping may generate the highest levels, however, possibly reaching 100 dBA. Noise produced by these activities would be reduced over distance at an average rate of about 6 dB per doubling of distance in open landscapes. Assuming an attenuation rate of 6 dBA per doubling of distance, construction equipment noise in the range of 80 to 90 dBA at 50 feet would generate noise levels of 74 to 84 dBA at 100 feet from the source. Where the existing river bank, orchard trees and riparian forest serve as sound barriers, it would be expected to reduce noise at nearby residences by up to an additional 15 dB (CDFG and USFWS 2007). Materials hauled by trucks on the roadways would typically be the source of noise and vibration having the greatest potential to disturb neighboring residents because this activity is not necessarily shielded by the levee. Hauling by trucks would be intermittent, and haul speed limits would be imposed in order to reduce noise and vibration levels. Considering these factors, intermittent peak sound levels of 65 dBA would be expected at the nearest residence (CDFG and USFWS 2007), which would be in compliance with Glenn County's noise threshold of 65 dB.

Although construction equipment may cause a noticeable increase in ambient noise levels near the staging area and along the revetment area in the USFWS Capay Unit, any noise increases would be short-term and intermittent. Local Butte County noise standards do not apply to construction site sounds occurring between 7:00 a.m. and 7:00 p.m. (Butte County 2010). Nonetheless, although the 60 dB threshold for residential outdoor activities may be exceeded at the construction site on the Capay Unit (which is in Glenn County), there are no residences within 1,000 feet of the Action/Project Area. Because noise-generating construction activities would take place during daytime hours and would not occur within 1,000 feet of residential uses, revetment removal activities would not exceed the noise standards stated in Butte County Policy HS-P1.7. Evening and nighttime maximum allowable noise exposure levels would not be

exceeded because construction is limited to daylight hours. In consideration of the short-term nature of construction, the No Action Alternative would not be expected to create excessive groundborne vibration or noise, result in a substantial permanent increase in ambient noise levels in the project vicinity, or result in a substantial temporary or period increase in ambient noise levels in the project vicinity above levels existing without the project. Overall, the No Action Alternative would not result in long-term adverse noise-related effects.

PROPOSED ACTION/PROJECT RELATIVE TO EXISTING CONDITIONS (CEQA ANALYSIS)

In-river Dredging and Spoils Disposal

***N-2**. Potential for dredging operations to generate noise above acceptable standards and expose sensitive receptors to substantial noise levels.*

Dredging operations associated with the Proposed Action/Project would temporarily increase noise and vibration levels along access routes and near the project site on the M&T Chico Ranch property. The dredge barge and heavy construction equipment would be used to dredge gravel, transport material to Containment Area #1, and distribute the spoils material on the existing stockpile. Short-term, temporary increases in noise would occur in the vicinity of the dredging operations and staging/dewatering activities.

Noise associated with the Proposed Action/Project would be generated by the operation of construction equipment, and primarily due to engine noise. As a general rule, a diesel engine will produce noise levels of 75-85 dB at approximately 50 feet (Glenn County 1993). Sources of noise include the dredging equipment, dewatering equipment, generators, loaders, and the dozer used to transport the dewatered material for placement.

Construction activities generally result in variations in noise levels throughout the day and over the duration of the project. Construction work would occur for 10 hours per day, during daylight hours. Although equipment maintenance and other non-dredging work may occur for up to two additional hours, noise generating activities would be limited to normal working hours (e.g., between 7 a.m. and 7 p.m.). Anticipated timeframes for equipment operation is provided in Table 3.10-4 (see Section 3.10.3.1, Air Quality above). Although several activities would occur simultaneously, much of the equipment would be operated as needed (e.g., operation of the skiff boat as the dredge barge makes forward progress), which would minimize the total noise level at the site. Stationary equipment, such as pumps, electric powered generators and air compressors, generally run continuously at relatively constant power and speed.

Noise levels generated by the dredging operation will vary according to the size and type of the equipment used, and more importantly, the size and type of the engines. All equipment used will be required to meet regulatory requirements for mufflers and other sound suppression techniques. However, like any construction activity, the operations will generate some noise.

Regarding the two motor boats used to support dredging operations, California boating law prohibits operation of any motorboat in or upon the inland waters of the State with excessive

noise levels. For engines manufactured after 1978, excessive noise levels measured at a distance of 50 feet from the motor boat are described as exceeding 82 dBA. However, the contractor will maintain the motor boats in good running order, which should minimize or avoid exceedance of this level. Noise levels associated with gravel extraction and stockpiling activities at 50 feet have been reported as 72 dB and 66.5 dB, respectively (Reclamation 2008).

The EPA generated a fact sheet on noise for dredging associated with the Hudson River PCBs Superfund Site, which provides a useful comparison of noise from dredging and sediment/gravel dewatering activities compared to other routine noise levels, and identified the following levels of loudness (compared to 70 dB):

dB Levels of Loudness

- < 60 = quiet
- 60 to 90 = moderate
- 90 to 110 = very loud
- 110 = uncomfortable

Dredging activities are at the lower end of the moderate noise levels, although trucks and heavy equipment that may be used to transport and distribute spoils material are somewhat louder. Generally, hydraulic dredges generate noise at around 60 to 80 dB at 50 feet, depending on size of dredge, engine, and other characteristics. 70 dB is used as a reasonable mid-range, representative of smaller to mid-size dredges. For illustration purposes, **Figure 3.13-4** provides an example of how outdoor noise levels associated with a hydraulic dredging operation decrease with distance. Noise from pumps and dewatering equipment typically produce less noise, operating are at the low end of around 50 to 60 dB (EPA 1971).

Figure 3.13-4. Typical Dredging-related Outdoor Noise Level Reductions Over Distance (Columbia Association 2010).

	Distance from Noise Source					
	50 feet	**100 feet**	**200 feet**	**400 feet**	**800 feet**	**1,600 feet**
Hydraulic Dredge*	70 dB moderate	64 dB moderate	58 dB quiet	52 dB quiet	46 dB quiet	40 dB quiet
*70 dB is used as a reasonable mid-range, representative of the smaller to mid-size dredges.						

Although the construction equipment used for the dredging and spoils disposal would result in temporary, short-term increases in ambient noise levels, the existing river bank, orchard trees, and riparian forest within and around the Action/Project Area would serve as sound barriers, damping noise in the surrounding areas. As previously discussed, the Action/Project Area is dominated by agricultural uses. No new sensitive receptors or sensitive land uses have been established near the Action/Project Area. The contractor also will maintain all construction equipment in good running order. Consistent with Butte County Policy HS-P1.9, equipment will

be outfitted with intake and exhaust mufflers, as appropriate, that are in good condition and appropriate for the equipment.

Butte County (2007) noise measurement results suggest that baseline L_{dn} (dB) noise levels near the M&T Chico Ranch area typically ranged from about 41.4 dB to 53.6 dB. Although construction equipment may cause a noticeable increase in ambient noise levels at the M&T Chico Ranch property along the Sacramento River, any noise increases would be short-term and intermittent. In consideration of the sound levels generated by the equipment that would be used, as described above, and sound-related attenuation factors (e.g., for each doubling of the distance away from a single stationary source, sound levels are reduced by 6 dB), it is unlikely that sound levels in the vicinity of the Action/Project Area would exceed Glenn County's noise threshold of 65 dB.

Similarly, although local Butte County noise standards do not apply to construction site sounds occurring between 7:00 a.m. and 7:00 p.m. (Butte County 2010), it is unlikely that the 60 dB threshold for residential outdoor activities would be exceeded in such a manner as to adversely affect the nearest residence located about 1,200 feet from the Action/Project Area. Because noise-generating construction activities would take place during daytime hours and would not occur within 1,000 feet of residential uses, the Proposed Action/Project would not exceed the noise standards stated in Butte County Policy HS-P1.7. Evening and nighttime maximum allowable noise exposure levels also would not be exceeded because construction is limited to daylight hours.

In consideration of the type of work involved and the short-term nature of construction, the Proposed Action/Project would not be expected to create excessive groundborne vibration or noise, result in a substantial permanent increase in ambient noise levels in the project vicinity, or result in a substantial temporary or period increase in ambient noise levels in the project vicinity above levels existing without the project.

Therefore, for the reasons discussed above, the Proposed Action/Project would result in less than significant noise-related impacts.

Bank Revetment Monitoring and Maintenance

N-3 *Potential for revetment monitoring and maintenance to generate noise above acceptable standards and expose sensitive receptors to substantial noise levels.*

Noise generated by construction activities will not significantly differ from that of the normal agricultural or maintenance activities in the area. There are no human sensitive noise receptors, such as residential uses, motels and hotels, schools, or churches, near the project site. Heavy construction equipment needed for rock-toe and tree revetment maintenance would temporarily increase noise and vibration levels along access routes and near the project site on the USFWS Capay Unit. Construction equipment may be used to import rock and embankment materials,

prepare river banks, place rock on the toe of the bank, and place trees atop and within the revetment as IWM.

Construction equipment (bulldozers, heavy trucks, loaders, excavators, and backhoes) that would be used to maintain the revetment, should repairs become necessary, would be similar to that which was used during construction in 2007 (see CDFG and USFWS 2007), which generates peak noise levels ranging from 80 dB above reference noise, adjusted (dBA) to 90 dBA at a reference distance of 50 feet. Rock dumping may generate the highest levels, however, possibly reaching 100 dBA. Although exact quantities are unknown, the volume of materials (e.g., rock, woody material) required to maintain the revetment are anticipated to be substantially less than the amount of material utilized to construct the revetment.

Noise produced by these activities would be reduced over distance at an average rate of about 6 dB per doubling of distance in open landscapes. Where the existing river bank, orchard trees and riparian forest serve as sound barriers, it would be expected to reduce noise at nearby residences by up to an additional 15 dB. Materials hauled by trucks on the roadways would typically be the source of noise and vibration having the greatest potential to disturb neighboring residents because this activity is not necessarily shielded by the levee. Hauling by trucks would be intermittent, and haul speed limits would be imposed in order to reduce noise and vibration levels.

Although construction equipment may cause a noticeable increase in ambient noise levels near the staging area and along the revetment area in the USFWS Capay Unit, any noise increases would be short-term and intermittent. As previously discussed, Butte County (2007) noise measurement results suggest that baseline L_{dn} (dB) noise levels near the M&T Chico Ranch area typically ranged from about 41.4 dB to 53.6 dB, and noise levels from a source diminish as distance to the receptor increases. For a single source of noise (i.e. stationary equipment), the noise is reduced by 6 dB for each doubling of distance away from the source. In consideration of the sounds generated by equipment that would be used, as described above, and sound-related attenuation factors, it is unlikely that sound levels in the vicinity of the Action/Project Area would exceed Glenn County's noise threshold of 65 dB. Considering these factors, intermittent peak sound levels of up to 65 dBA are unlikely at the nearest residence located about 1,200 feet away from the Action/Project Area. Similarly, although local Butte County noise standards do not apply to construction site sounds occurring between 7:00 a.m. and 7:00 p.m. (Butte County 2010), it is also unlikely that the 60 dB threshold for residential outdoor activities would be exceeded in such a manner as to adversely affect the nearest residence located about 1,200 feet from the Action/Project Area. Evening and nighttime maximum allowable noise exposure levels also would not be exceeded because construction is limited to daylight hours.

Given that noise and vibration would be limited to daytime hours and would not subject residences to prolonged noise exposure above 55 to 65 dBA (occasionally peaking at 65 dBA) or severe noise levels above 80 dBA, and construction equipment and practices would be in

compliance with to Federal and State requirements, potential noise effects are considered less than significant.

The contractor will maintain all construction equipment used in the maintenance of the revetment in good running order. Consistent with Butte County Policy HS-P1.9, equipment will be outfitted with intake and exhaust mufflers, as appropriate, that are in good condition and appropriate for the equipment.

In consideration of the type of work involved and the short-term nature of construction, the Proposed Action/Project would not be expected to create excessive groundborne vibration or noise, result in a substantial permanent increase in ambient noise levels in the project vicinity, or result in a substantial temporary or period increase in ambient noise levels in the project vicinity above levels existing without the project.

Therefore, for the reasons discussed above, the Proposed Action/Project would result in less than significant noise-related impacts.

PROPOSED ACTION/PROJECT RELATIVE TO THE NO ACTION ALTERNATIVE (NEPA ANALYSIS)

For additional NEPA analysis purposes, this section presents those considerations under the Proposed Action/Project, relative to the No Action Alternative.

In-river Dredging and Spoils Disposal

***N-4**. Potential for dredging operations to generate noise above acceptable standards and expose sensitive receptors to substantial noise levels.*

The No Action Alternative would avoid short-term temporary noise effects resulting from dredging operations, but it would not achieve project objectives. Potential noise-related impacts associated with dredging and spoils disposal under the Proposed Action/Project would be short-term in nature and similar to those previously discussed. Overall, there would be no long-term adverse noise-related effects.

Bank Revetment Monitoring and Maintenance

***N-5**. Potential for revetment monitoring and maintenance to generate noise above acceptable standards and expose sensitive receptors to substantial noise levels.*

Noise-related effects associated with maintenance of the rock-toe and tree revetment under the Proposed Action/Project would be similar to noise-related effects associated with revetment removal under the No Action Alternative. However, it is assumed that the duration of time and level of activities associated with revetment maintenance would be less than those associated with revetment removal. Overall, there would be no long-term adverse noise-related effects.

3.13.4 ENVIRONMENTAL COMMITMENTS

Because no significant effects regarding noise are expected to occur under either the Proposed Action/Project or the No Action Alternative, NEPA noise abatement measures or CEQA impact avoidance, minimization and mitigation measures are not required.

4.0 OTHER IMPACT CONSIDERATIONS

4.1 CUMULATIVE EFFECTS

Cumulative effects are defined under CEQA as "*two or more individual effects which, when considered together are considerable," and may "result from individually minor but collectively significant projects taking place over a period of time*" (CEQA Guidelines §15355). When assessing whether a cumulative effect may require that an EIR be prepared, a lead agency must consider whether the cumulative effect is significant and whether the potential effects of a project are cumulatively considerable. An EIR must be prepared if the cumulative effect may be significant and the project's incremental effect, though individually limited, is cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (CEQA Guidelines §15064(h)(1)).

In an initial study, a lead agency may determine that a proposed project's contribution to a significant cumulative effect will be rendered less than cumulatively considerable and, thus, not significant. When a project might contribute to a significant cumulative effect, but the contribution will be rendered less than cumulatively considerable through mitigation measures set forth in a mitigated negative declaration, the initial study should briefly explain how the contribution has been rendered less than cumulatively considerable (CEQA Guidelines §15064(h)(2)).

The CEQ NEPA regulations require all Federal agencies to consider the cumulative effects of all proposed agency actions. In an EA, a cumulative effects assessment should be conducted if it is determined necessary through scoping to make a determination of significance of a proposed action (USFWS 1999a). When a cumulative effects analysis is included in an EA, the analysis only need be sufficient for the decision maker to reach a conclusion on the significance of the impact in order to determine if the preparation of an EIS is required. The following discussions in Sections 4.1.1 and 4.1.2 are provided, beyond what is required for an EA by the USFWS NEPA Reference Handbook, to offer a broader perspective on the potential effects of reasonably foreseeable projects and their relationship to the effects of the proposed project. For this Draft EA/IS, a list-based approach is used (see Section 4.1.2). Although in most NEPA/CEQA documents the list of projects of concern in the cumulative context is focused on reasonably foreseeable *future* projects, in this EA/IS the list below also includes past and present projects, as the effects of those latter projects have already influenced the existing environmental setting.

4.1.1 OTHER LOCAL PROJECTS

4.1.1.1 THE NATURE CONSERVANCY SACRAMENTO RIVER PROJECT

The long-term goal for TNC's Sacramento River Project is to establish and sustain a healthy floodplain ecosystem with functioning natural, political, social and economic processes to support the diversity of natural communities and native species along the Sacramento River. Over the past decade, TNC and its partners have secured over 15,000-acres for conservation within the 100-year floodplain of the Sacramento River and restored 2,200 of those acres to native riparian vegetation. TNC has been funded by Bay-Delta Authority to implement the "Sacramento River – Chico Landing Subreach Habitat Restoration Project" (CBDA and TNC 2005). Part of this project involves the restoration of about 576-acres (including 80-acres of elderberry savannah) within the Capay Unit of the SRNWR.

4.1.1.2 USFWS SACRAMENTO RIVER NATIONAL WILDLIFE REFUGE

Authorized by Congress in 1989, the SRNWR is one of five wildlife refuges in the USFWS SRNWR Complex, which consists of a land management and habitat restoration program that covers about 35,500 acres. Additional acres held in easements expand the Complex to 59,000-acres in the Sacramento Valley. The USFWS owns lands within and adjacent to the Action/Project Area that are included the SRNWR. The USFWS SRNWR CCP, completed in 2005, defines management objectives, goals, and a 15-year plan for the entire 18,000 acre, 77 miles of river riparian zone protected as SRNWR, which extends from Red Bluff to Princeton. The 26 properties host important habitat for many listed species and the plan seeks to address the needs of wildlife and rare habitat while managing the public use requirements of the refuge system.

4.1.1.3 SACRAMENTO RIVER FLOODPLAIN ACQUISITION AND MONITORING

TNC, the California Wildlife Conservation Board, CDFW, and the USFWS requested funds for the acquisition and management of fee title or permanent conservation easement interests on floodplain lands within the conservation area (as defined by 1986 legislation known as SB1086) of the Sacramento River between Keswick Dam and Verona. Riparian restoration along the Sacramento River has involved several primary actions, including land acquisition, horticultural restoration, levee removal and setback (Shilling et al. 2011). Through grants to TNC, River Partners and other organizations, CALFED has funded 5,683 acres of habitat protection between Red Bluff and Colusa in the SRCAF Inner River Zone, with 15,000 total acres of protected habitat called for under ERP Milestone 60 (Shilling et al. 2011). The acquisitions will facilitate the recovery of ecological processes within the floodplain including the regeneration of native riparian habitat. A riparian monitoring and evaluation plan was developed to monitor the effectiveness of these actions in restoring riparian system function (Shilling et al. 2011).

4.1.1.4 CDFW SACRAMENTO RIVER WILDLIFE AREA

The Sacramento River Wildlife Area is composed of a series of separate properties that extend from RM 145, one mile north of the City of Colusa, to RM 215, approximately three miles south of Woodson Bridge. Located within Colusa, Glenn, and Butte counties, the Wildlife Area is comprised of 13 Units of fee title ownership, which total 3,770 acres and are managed by CDFW. The Units are titled for geographic reference, utilizing names that historically applied to the general vicinity of each Unit. There also are three conservation easements held by the CDFW, which total 188 acres. The conservation easements are referenced by the approximate River Mile at which they are located. These three easements apply to private property and do not include the right of public access. Restoration activities within the Sacramento River Wildlife Area that are located near the Action/Project Area occurred on CDFW's Pine Creek North, Pine Creek East, and Pine Creek West units between approximate RM 194 and RM 198.

In 2004, CDFW completed a Wildlife Area Management Plan, which included goals focusing on renewing natural ecological and hydrological cycles that contribute to a continuously evolving and meandering channel, as well as objectives for protecting listed and threatened species and habitat provided by the Sacramento River Wildlife Area. CDFW published a final report in December 2004 which described the progress made towards project milestones and restoration goals for the Pine Creek Unit of the Sacramento River Wildlife Area. Overall, the program restored 235 acres of farmland into mixed riparian, which showed use by birds and other wildlife similar to that of the surrounding existing riparian areas. The final report highlighted the benefits that restoration on the Pine Creek Unit has provided to wildlife and the community, and that the unit was well under way to becoming a self-sustaining native plant community (CDFG 2004).

4.1.1.5 HAMILTON CITY FLOOD DAMAGE REDUCTION AND ECOSYSTEM RESTORATION PROJECT

The USACE and DWR propose to increase flood protection and restore the ecosystem near Hamilton City, along the west bank of the Sacramento River, in Glenn County, California, about 85 miles north of the city of Sacramento. An existing private levee, constructed by landowners around 1904 and known as the "J" levee, provides some flood protection to Hamilton City and the surrounding area. Because the "J" levee was not constructed to any formal engineering standards, it is susceptible to erosion and flooding. Flooding due to failure of the "J" levee has occurred twice, and extensive flood control measures have been required numerous times over the past 40 years (USACE 2004a). In April 2012, the U.S. Senate Appropriations Subcommittee on Energy and Water Development released its funding recommendations for Fiscal Year 2013, which included funding to begin construction of the Hamilton City Flood Damage Reduction and Ecosystem Restoration Project (Reclamation District No. 2140 2012). The Hamilton City project will provide enhanced flood protection for Hamilton City by constructing 6.8 miles of setback levee, removing most of the existing "J" levee to reconnect the Sacramento River to the floodplain, and actively restoring about 1,500 acres of native vegetation between a new setback levee and the Sacramento River (USACE 2004a). Once constructed, the new levee will provide

Hamilton City with protection against a 75-year flood event (Reclamation District No. 2140 2012).

4.1.1.6 SACRAMENTO RIVER BANK PROTECTION PROJECT

The Sacramento River Bank Protection Project (SRBPP) is a long-range program authorized under the Flood Control Act of 1960 (PL 86-645). Its purpose is to protect the levees and flood control facilities on the Sacramento River from the Bay-Delta at Collinsville at RM 0 to Chico Landing at RM 194 (CDPR 2008). The SRBPP is subject to Congressional reauthorization that was initiated by the USACE and the Reclamation Board to repair and protect levees from erosion. Phase I was authorized in 1960 to preserve the integrity of the Sacramento River Flood Control Project's levee system, which protects over 1 million acres, 2.2 million people, and $37 billion of property. Phase II of construction was authorized in 1974. Construction activities authorized by the SRBPP account for approximately 152 miles of river bank revetment (CDPR 2008).

Since 2001, one-half mile of erosion control projects have been constructed on the Sacramento River at RM 149 and RM 56.7 (USACE et al. 2012). During 2005 through 2007, construction of 29 critical sites totaling approximately 16,000 linear feet occurred under the Declaration of Flood Emergency by Governor Schwarzenegger (USACE et al. 2012). The SRBPP is an ongoing project, and additional sites requiring maintenance will continue to be identified indefinitely until the remaining authority of approximately 24,000 linear feet is exhausted over the next three years (USACE et al. 2012). The Water Resources Development Act of 2007 (Public Law 110-114) also authorized an additional 80,000 linear feet of bank protection, which was added to Phase II of the SRBPP. In 2009, the USACE and the Central Valley Flood Protection Board issued an NOI/NOP to prepare a joint EIS/EIR for the Sacramento River Bank Protection Project Phase II Supplemental Authority providing for implementation of up to 80,000 linear feet of additional bank protection in the Sacramento River Flood Control Project area, which includes Butte, Colusa, Contra Costa, Glenn, Placer, Sacramento, Solano, Sutter, Tehama, Yolo, and Yuba counties (74 FR 5649, January 30, 2009). Although the 80,000 linear feet of Phase II will consist of individual bank protection sites on Sacramento River Flood Control Project levees, specific sites are not yet identified (USACE 2012).

The SRBPP would help to improve flood protection to residents in the Sacramento area by ensuring the integrity of the levees along the American and Sacramento Rivers, and would also help meet FEMA's 100-year flood criteria for the Sacramento area levee system (USACE et al. 2012).

4.1.1.7 DWR AND USACE LEVEE PROTECTION PROGRAM

In 2006, Governor Arnold Schwarzenegger declared a State of Emergency for California's levee system and commissioned up to $500 million (AB142) to identify repair eroded levee sites on the State and Federal levee system to prevent catastrophic flooding and loss of life. DWR and

USACE share the repair work of critical erosion sites. DWR and USACE identified 71 damaged levee sites in need of immediate repair, and more than 300 sites were deferred for future repairs. Two DWR sites on the Sacramento River (RM 99.5 and RM 182.0) received the highest priority for repair in 2006. At RM 182.0, rock slope protection repairs were made to approximately 4,450 feet on the right (west) bank of the Sacramento River and were composed of rock repair material (DWR 2011).

4.1.1.8 Llano Seco Riparian Sanctuary Unit Restoration and Pumping Plant/Fish Screen Facility Protection Project

USFWS and CDFW have completed the evaluation of a project that includes a combination of measures to restore riparian habitat at the Llano Seco Riparian Sanctuary Unit of the SRNWR and to protect the alignment of the Sacramento River at the water diversion for the Princeton-Codora-Glenn and Provident Irrigation Districts pumping plant and fish screen facility at RM 178 (USFWS and CDFG 2012). The preferred alternative identified in the Final EIS/EIR includes the removal of existing riprap to help restore natural riverine processes along the Sacramento River and provide habitat for bank swallows.

4.1.1.9 Bidwell-Sacramento River State Park Habitat Restoration and Outdoor Recreation Facilities Development Project

The California Department of Parks and Recreation (CDPR), in collaboration with TNC, propose to implement a habitat restoration and outdoor recreation facility development project on two parcels known as the Singh Unit and Nicolaus property along the Sacramento River within and adjacent to the Bidwell-Sacramento River State Park, west of the City of Chico in Butte County, California (CDPR 2007).

The Singh Unit and the Nicolaus property present unique opportunities for habitat restoration because they are located at or near the confluence of the Sacramento River, Big Chico Creek, and Mud Creek and are between the 20-year and 100-year Sacramento River designated floodways (CDPR 2011). One of the primary objectives of the project is to restore natural topography and vegetation on the 43-acre Singh Unit and the Nicolaus property. Activities include removal of two human-made berms on the Singh Unit; the removal of orchards from both properties; the removal of nonnative vegetation (including eucalyptus trees on the Singh Unit adjacent to River Road); and restoration of several natural communities including: (1) cottonwood mixed riparian forest; (2) valley oak savannah; (3) mixed riparian forest; (4) valley oak riparian forest; and (5) native grasslands. In addition to providing public outdoor recreation opportunities, CDPR (2008a) states that the protection and restoration of habitat on these two parcels would aid in the recovery of special-status species, rehabilitate natural processes along the river, protect and restore riparian habitat, and improve water quality.

Although a Draft and Final EIR were released and filed with the State Clearinghouse in January 2008 and October 2008, respectively, funding for restoration construction on the Singh property

was not secured until late 2009 (CDPR 2011). Additionally, as a result of discussions with the CVFPB, CDPR determined that an Addendum to the Final EIR was necessary, which was prepared in January 2011.

In a staff report prepared following an informational briefing to the CVFPB on June 24, 2011, CVFPB staff concluded the proposed Singh Unit Restoration Project, although a potentially good project for the Sacramento River system, required additional hydraulic considerations prior to issuance of an encroachment permit. CDPR requested a continuance in order to hire a facilitator to address concerns raised, and CVFPB staff concurred with this approach (CVFPB 2011). Based upon the information available, it does not appear that any on-the-ground work has yet been initiated.

4.1.1.10 M&T Chico Ranch / Llano Seco Rancho Fish Screen Facility Long-term Protection Project

As described in Chapter 1, the M&T/Llano Seco Pumps Facility was redesigned, upgraded, and relocated from Big Chico Creek to the Sacramento River as part of an effort to reduce the risk of mortality to native anadromous salmonids, including Federally and State listed species in the Sacramento River. The relocated diversion was designed with a state-of-art fish screen system supplying a total capacity of 150 cfs. As part of the relocation, the M&T Chico Ranch and Rancho Llano Seco agreed not to divert 40 cfs of their long-held water right out of Butte Creek (October 1 through June 30) to support Butte Creek fisheries as long as replacement water would be guaranteed by the new diversion located on the Sacramento River.

Since its construction in 1997, local geomorphic changes, including erosion and lateral migration of the west bank of the Sacramento River and related sediment deposition at the mouth of Big Chico Creek and in the vicinity of the screened intakes at the M&T/Llano Seco Pumps Facility have posed a threat to the normal operation and fish protection function of the diversion facility. In addition, the unforeseen geomorphic changes that have occurred in the Sacramento River channel also pose a significant risk to the continued operation of the City's WWTP outfall.

The uncertain rate of river meander and sediment deposition will continue to pose problems to the operations and safety of the M&T/Llano Seco Pumps Facility and the City's WWTP outfall. The rate at which the sediment is accumulating near the fish-screened intake is mostly dependent on the flow conditions in the Sacramento River (i.e., gravel bar growth and rate of migration is accelerated during wet years; deposition tends to occur around the intake during dry years). This condition poses a dilemma between protecting ecosystem functions by accommodating the natural processes of the Sacramento River and also protecting functionality of the M&T/Llano Seco Pumps Facility to provide water for crops, wetlands habitat and waterfowl without presenting a threat to anadromous fish in the Sacramento River (Ducks Unlimited 2005).

In response to these various issues, the Bay-Delta Authority requested that a team of multidisciplinary experts be consulted to collaborate on the best scientific knowledge available that will assess the problem and develop a long-term solution. A Steering Committee also was

formed to guide the investigative process. In response to this request, a panel of technical experts was convened in 2003 to develop and assess a variety of engineering alternatives that could potentially provide long-term solutions to the problem.

Over an eight-year period, an intensive investigative process was undertaken to identify and evaluate numerous potential alternatives and combinations of alternatives. Higher levels of investigation were then applied to those alternatives that passed initial engineering and technical feasibility screening by the expert panel. Between 2009 and 2011, additional studies including fixed and mobile-boundary 2-D modeling as well as 1:100 scaled physical modeling were conducted by Tetra Tech and Colorado State University to further evaluate the identified alternatives. Summaries of the alternatives identified, reviewed and evaluated during six workshops held between November 2003 and October 2011, as well as the supporting studies, are available at: http://www.ducks.org/california/california-projects/m-t-llano-seco-fish-screen-project. As a result of this investigative process, a range of potential alternatives have been developed and are undergoing refinement for consideration as part of a long-term solution.

As described in Chapter 1, because implementation of several of the proposed long-term alternatives would be limited by further erosion of the right river bank opposite the M&T/Llano Seco Pumps Facility, it would be necessary to maintain the temporary revetment installed during 2007 to prevent further erosion and to preserve the existing bank line during the alternative selection and environmental review process for the long-term protection project. The rock-toe and tree revetment is anticipated to remain in the Sacramento River until a long-term solution is identified and implemented. The revetment would either be removed or incorporated as part of the long-term solution. A separate, independent environmental compliance process, including public outreach and scoping, for the long-term protection project will be initiated during 2014.

4.1.2 CUMULATIVE EFFECTS ASSESSMENT

Under NEPA, a cumulative effect is defined as the incremental environmental effect of the Proposed Action, together with impacts of past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR 1508.7). Cumulative effects result when the effects of an action are added to or interact with other effects in a particular place and within a particular time. It is the combination of these effects, and any resulting environmental degradation, that should be the focus of cumulative analysis.

Although cumulative effects analysis is similar in many ways to the analysis of project-specific effects, there are key differences. While effects can be differentiated by direct, indirect (e.g., those that occur later in time or farther removed in distance), and cumulative, the concept of cumulative effects takes into account all disturbances because cumulative effects result in the compounding of the effects of all actions over time. Thus, the cumulative effects of an action can be viewed as the total effects on a resource of that action and all other activities affecting that resource no matter what entity (Federal, non-Federal, or private) is taking the actions (EPA

1999). NEPA and the Council of Environmental Quality (CEQ) regulations indicate that cumulative effects must be evaluated along with direct and indirect effects. The analysis must include the No Action Alternative as a baseline against which to evaluate cumulative effects (CEQ 1997). The range of actions that should be considered includes not only the proposed action but connected and similar actions that could contribute to cumulative effects. Specifically, NEPA requires that all related actions be addressed in the same analysis (CEQ 1997). CEQ (1997) cumulative effects guidance suggests that several analytical steps be considered, including the following.

- Identify resources that potentially could be affected by significant cumulative effect issues. Depending on the project, resources may have different degrees of effects, ranging from none to a significant impact.
- Identify the geographic scope of analysis. The geographic boundary for a cumulative analysis may be broader than the boundaries used to analyze project-specific direct effects.
- Identify the timeframe for the cumulative analysis. The timeframe for the analysis must include the past, present and future. The future temporal boundary should include the useable life of the Proposed Action and other reasonably foreseeable future actions.
- Describe the current condition and historical context for each resource.
- Identify the direct and indirect impacts of the proposed action that may contribute to a cumulative effect on the identified resources.
- Identify important cause-effect relationships between human activities and resources of concern, focusing on important cumulative effects pathways.
- Identify potential direct and indirect project-specific impacts that may contribute to a cumulative effect on the identified resources. The cumulative analysis uses the net impact (i.e., direct or indirect impact minus avoidance, minimization and/or mitigation).
- Incorporate additional past, present, and reasonably foreseeable actions into the analysis as indicated by the cumulative cause-and-effect relationships.
- Determine the magnitude and significance of cumulative effects based on context and intensity of the proposed action to facilitate decision-making.
- Assess the need for mitigation and/or recommendations for actions by other agencies to address a cumulative effect.

According to the CEQA Guidelines (Title 14 CCR 15130(b)), an adequate discussion of significant cumulative effects should contain the following elements:

- A list or summary of related past, present, and future projects or planned developments that would affect resources in the project area similar to those affected by the proposed project.

- Definition of the geographic scope of the area affected by the cumulative effect and a reasonable explanation for the geographic scope used.
- A summary of the expected environmental effects that may be produced by those projects, with specific references to additional information stating where that information is available.
- A reasonable analysis of the cumulative impacts of the relevant projects.

The CEQA Guidelines suggest two possible methods for assessing potential cumulative effects – either a "list" or "projection" approach (Title 14 CCR 15130(b)([1)(A)§15130). The first method is the list-based approach, which considers a list of past, present, and reasonably foreseeable future projects producing related or cumulative effects. The second method is projections-based and uses a summary of projections contained in an adopted general plan or related planning document that is designed to evaluate regional or area-wide conditions.

For this Draft EA/IS, a list-based approach is used. The M&T Chico Ranch/Llano Seco Rancho Fish Screen Facility Short-term Protection Project, in combination with other projects along the Sacramento River, on the Capay Unit of the SRNWR, at the M&T Chico Ranch and on the Llano Seco Rancho, could potentially result in cumulative effects on the resources analyzed in Chapter 3 of this Draft EA/IS. As described in Chapter 2, the Proposed Action/Project is intended to address short-term issues related to in-river sediment deposition and revetment maintenance until a long-term solution is developed and completed. Although a 20-year period is generally considered a standard timeframe[1] for cumulative effects analysis, it is unlikely that the Proposed Action/Project will be in place for 20 years because a long-term solution will have been completed before 2023. Most effects of the Proposed Action/Project would be localized in and around the Action/Project Area, but the combined effects of reasonably foreseeable future projects along the river and on the refuge and nearby private lands could result in regional cumulative effects. Past and present actions are considered to be part of the affected environment described in Chapter 3 because the effects of those actions have already influenced the existing environmental setting. To characterize reasonably foreseeable future projects that may contribute to cumulative effects, this analysis uses a list-based approach (see Section 4.1.1). Factors including the nature of each environmental resource being examined, the location of the project, and its type have been considered to determine which projects to include in the analysis.

Because a cumulative effect is defined in both spatial (i.e., geographic) and temporal terms (i.e., timeframes in which to identify past, present, and reasonably foreseeable actions), the potential for cumulative effects should be considered in terms of the status of the resource. The analysis of the No Action Alternative describes the cumulative effect of past, other present, and reasonably

[1] If a potential impact is permanent and would occur on a resource indefinitely, a time-frame of 20 years is recommended for the cumulative analysis (California Department of Transportation 2012).

foreseeable actions, without the effect of the Proposed Action/Project. The analysis of the Proposed Action/Project includes those same effects (i.e., past, present, reasonably foreseeable future actions), as well as the effects of the Proposed Action/Project and, thus, demonstrates the incremental difference resulting from the Proposed Action/Project.

In summary, the cumulative effects assessment of each resource topic evaluated in this Draft EA/IS uses a two-step approach in order to address both CEQA and NEPA requirements. Under this two-step approach, the first step is to answer the question of whether the combined effects from both the Proposed Project and other past, present, and reasonably foreseeable future actions would be cumulatively significant. To answer this question, the project's incremental impact must be added to anticipated impacts of other actions (*Communities for a Better Environment* v. California Resources Agency (2002) 103 Cal.App.4th 98, 117-121).

If the answer to the first question is in the affirmative, the second step of the approach is to answer the question of whether the Proposed Project's incremental effects are cumulatively considerable (*Communities for a Better Environment, supra,* 103 Cal.App.4th at pp. 120).

The required two-step approach is evident from CEQA Guidelines Section 15064, subdivision (h)(1), which states that *"[w]hen assessing whether a cumulative effect requires an EIR, the lead agency shall consider whether the cumulative impact is significant and whether the effects of the project are cumulatively considerable."*

4.1.2.1 Fisheries and Aquatic Resources

The geographic scope for the cumulative fisheries and aquatic resources analysis includes the Action/Project Area, Big Chico Creek, Butte Creek and the Sacramento River system. This area was identified for the cumulative effects assessment because it encompasses the area for potential direct and indirect effects associated with the Proposed Action/Project and the No Action Alternative. It also includes the Sacramento River system because of past, present, and reasonably foreseeable physical habitat alteration actions, and CVP/SWP operations that affect flow and water temperature regimes – all of which have led to the current status, and projected future status of the fish species of focused evaluation.

Since European settlement of the Central Valley in the mid-1800s, populations of native Chinook salmon and steelhead have declined dramatically (NMFS 2009b). Although the effects of habitat degradation on fish populations were evident by the 1930s, rates of decline for most anadromous fish species increased following construction of major water project facilities. Many of these water development projects completely blocked the upstream migration of Chinook salmon and steelhead to spawning and rearing habitats, and altered flow and water temperature regimes downstream from terminal dams. Numerous other stressors (e.g., overharvest, hatchery production, entrainment, and introduction of competitors, predators and diseases) to anadromous salmonids emerged over time and continue to affect the viability of anadromous salmonids populations in the Central Valley (NMFS 2009b). Cumulative effects also have resulted from the discharge on point and non-point source chemical contaminant discharges, including pesticides

and herbicides associated with discharges related to agricultural and urban activities. Contaminants may injure or kill salmonids by affecting food availability, growth rate, susceptibility to disease, or other physiological processes necessary for survival (NMFS 2006a).

Fish populations also vary due to natural events, such as droughts and poor ocean conditions (e.g., El Niño). However, fish populations in healthy habitats typically recover within a few years after natural events. In the Central Valley, the decline of fish populations has continued through cycles of beneficial and adverse natural conditions, indicating the need to improve habitat (USFWS 2001). As an example, it is likely that the lower reaches of the Sacramento River historically were used as rearing areas (at least during some flow regimes) as juvenile anadromous salmonids moved downstream, but recently they have been less suitable for rearing due to alterations in channel morphology and other environmental conditions (NMFS 2009b).

Past and present actions in the Central Valley and in the Sacramento River in particular have led to the current status of the anadromous salmonid ESUs/DPS and the green sturgeon DPS which, according to NMFS (2009a) can be characterized as either moderate or high risk of extinction.

In the Sacramento River system, high-quality salmonid habitat has been fragmented, and converted from complex nearshore aquatic to simplified habitats. Reach-level cumulative impacts that adversely affect fisheries resources include reductions in habitat availability, changes to sediment and organic material storage and transport, reductions of food-chain production, and reduction in instream woody material (NMFS 2006a).

Projects during the 1960s and 1970s have resulted in the loss of near-shore habitat complexity and habitat function in the Sacramento River. More recently, bank protection and other projects have incorporated long-term beneficial effects on fisheries and aquatic resources by improving instream habitat complexity and SRA habitat availability in the Sacramento River. As an example, the Sacramento River Bank Protection Project incorporates the placement of IWM and planting of native riparian vegetation to compensate for the loss of habitat value associated with levee repairs. The restoration activities initiated by TNC's Sacramento River Project, USFWS SRNWR system, and the Hamilton City "J" Levee Project have resulted in either plans or actions that are anticipated to have beneficial effects to fisheries and aquatic resources of the Sacramento River system.

Nonetheless, past and present actions in the Central Valley and in the Sacramento River in particular have led to the current status of the anadromous salmonid ESUs/DPS and the green sturgeon DPS which, according to NMFS (2009a) can be characterized as at either a moderate or high risk of extinction. Moreover, NMFS (2009a) concluded that long-term (extending to 2030) CVP/SWP operations are likely to jeopardize the continued existence of listed anadromous salmonids and green sturgeon, and are likely to destroy or adversely modify critical habitat. Although NMFS (2009a) identified Reasonable and Prudent Alternatives (RPAs) composed of numerous elements that must be implemented in their entirety to avoid jeopardy and adverse modification of critical habitat, not all of the actions identified in the RPAs for the various divisions of the CVP and SWP have been implemented.

Effects of the Proposed Action/Project will not be sufficient to offset the adverse effects of other past, present, and reasonably foreseeable future actions in the Sacramento River system. Therefore, the Proposed Action/Project combined with other past, present, and reasonably foreseeable future actions would result in cumulatively significant adverse impacts to fisheries and aquatic resources.

As previously discussed in Section 3.3.3 of this Draft EA/IS, the Proposed Action/Project has the potential to result in both construction-related effects, and habitat alteration effects. Direct and indirect potential construction-related impacts (associated with dredging and rock-toe and tree revetment maintenance) to fish species of focused evaluation would be expected to be avoided or minimal under the Proposed Action/Project. This is because of the limited potential exposure of individuals due to the July 1 through October 15 work window and life history periodicity and distribution, as well as protective measures incorporated into the Proposed Action/Project and adherence to BMPs, the SWPPP, and requirements specified through the ESA consultations, the Streambed Alteration Agreement, and the Section 401 Permit. Because the duration of each dredging cycle would be short-term, the dredging cycles would be separated in time, the spatial extent of dredging is relatively small, and the potential impacts associated with each dredging cycle were found to be less-than-significant, the cumulative impacts of up to two dredging cycles on fisheries and aquatic resources, and aquatic habitat, would be less-than-significant.

Habitat alterations associated with the Proposed Action/Project were found (Section 3.3.3) to be less-than significant for fish species of focused evaluation. The Proposed Action/Project will not appreciably diminish or preclude the role of critical habitat in the recovery of the listed fish species, nor will the Proposed Action/Project adversely affect critical habitat primary constituent elements. Under the Proposed Action/Project habitat alterations associated with dredging the deposited sediment would be temporary, and would not adversely affect lifestage-specific habitat function in the Action/Project Area. Also, the favorable bank slope and hydraulics (water depth and velocity), instream woody material (brush clusters), and heterogeneous substrate characteristics associated with the rock-toe and tree revetment would be maintained. Voluntary recruitment of riparian vegetation that has occurred since 2007 in the revetment area on top of the rock-toe, at the base of the bank, and on the lower angle portions of the bank above the rock-toe would be maintained. These conditions provide juvenile salmonid foraging areas, velocity refugia, feeding stations, and predator avoidance/escape cover. The potential impacts of the Proposed Action/Project associated with habitat alteration would be less-than-significant.

In consideration of both construction-related and habitat alteration effects, the Proposed Action/Project will have a less-than-significant impact to fisheries and aquatic resources, will not adversely incrementally contribute to cumulative impacts, and therefore the incremental effect of the Proposed Action/Project is not cumulatively considerable.

4.1.2.2 TERRESTRIAL RESOURCES

The geographic scope for the cumulative terrestrial resources analysis includes the Action/Project Area, as well as the areas that receive water supplied by the M&T/Llano Seco Pumps Facility. These areas were identified for the cumulative effects assessment because they encompass the areas for potential direct and indirect effects associated with the Proposed Action/Project and the No Action Alternative.

Active riverine processes (e.g., flow, erosion and deposition, ecological succession) create and maintain diverse riparian habitats that support healthy populations of riparian-dependent species. These processes help to create a mosaic of landscapes and vegetative diversity that are important to the wildlife habitat value of a river system (CALFED 2007).

California‘s Central Valley once hosted considerable riparian forests along its many large rivers, in dynamic interaction with their river channels and floodplains. Shilling et al. (2011) report that the Sacramento River historically transported 18,000,000 acre-feet of water (Turner 1996) and between 1 and 10 million metric tons of sediment (Wright and Schoellhamer 2004) annually from its tributary rivers to the San Francisco Bay. The river’s meandering channel dynamically interacted with the surrounding landscape and, over time, the deposition of water and sediment, movement of materials, and land re-working made Sacramento River riparian areas very productive both ecologically, and following modifications, agriculturally (Shilling et al. 2011).

Over the past 150 years, development of the Sacramento Valley and human land uses have changed much of the Sacramento River floodplain (CALFED 2007). Large river system processes including flow dynamics, sediment transport regimes and geomorphic activities have been gradually altered throughout the mainstem Sacramento River and riparian areas due to water management, levee construction, and changes in adjacent land-uses and vegetation (Shilling et al. 2011; CALFED 2007). Historically, agricultural conversion was a primary factor contributing to the elimination of riparian habitat (CALFED 2007). Conversion of habitat to agriculture has slowed in recent years, and a number of native species populations (e.g., nesting bank swallow, yellow-billed cuckoo) continue to inhabit portions of the Sacramento River floodplain despite reduced habitat availability and increased habitat fragmentation in the form of discontinuous riparian corridors.

Riparian habitat in California is one of the most productive and valuable habitats for many wildlife species. However, the riparian zone along the Sacramento River has become fragmented over time, and lacks much of its original structure and function (Shilling et al. 2011). While no estimates exist for the total historical extent of riparian habitat in California, there were at least 60,000 miles of streams in the State that were capable of supporting this type of vegetation (Warner and Hendrix 1984). Shilling et al. (2011) reports that road development, water infrastructure, flood control levees, agriculture and urbanization having contributed to the loss of riparian habitat and the separation of the once-continuous riparian forest into fragmented pieces, many of which are also separated from the floodplain. For the Central Valley, current estimates of remaining riparian habitat in the State range from 2% to 7% (Katibah 1984; Dawdy 1989).

The loss of riparian habitats may be the most important cause of population decline among land bird species in western North America (DeSante and George 1994), due in part because fragmentation disrupts movement connections across landscapes among habitat patches needed by individual species (Shilling et al. 2011).

Historically, the complex vegetation mosaic created by the meandering Central Valley river systems provided resources necessary to support an abundance of resident and migrant landbird species (Grinnell 1915; Grinnell and Miller 1944). Birds that historically occupied Central Valley riparian zones relied upon riparian resources for nesting, foraging, juvenile dispersal corridors, and migration stop-over sites, exploiting all possible niches, from oxbow lake edges, to shrubby point bar vegetation, to mature cottonwood-willow and valley oak stands (Small et al. 2000). Central Valley-wide point count surveys conducted from 1993-1999 confirmed that many species (e.g., willow flycatcher, warbling vireo, Least Bell's vireo) no longer breed on the Valley floor (RHJV 1998 and Small et al. 1999, as cited in Small et al. 2000).

Riparian areas in California also have been identified as important habitat for the protection and conservation of songbirds (Manly and Davidson 1993; Davidson 1995), yet these species have declined dramatically over the past 150 years (RHJV 2004). Because Valley-Riparian Forest habitat is known to support a diverse population of neotropical song birds (Gaines 1977), neotropical bird populations and nesting habitat can offer an ecological measure of habitat health along the Sacramento River. Two species of particular importance, nesting bank swallow and yellow-billed cuckoo, have a unique relationship to the riparian system (CALFED 2007). Bank swallows require eroded bank to nest and, therefore, may serve as an indicator species for river habitat (CALFED 2007). Yellow-billed cuckoos require a mixed mosaic of old growth and edge forest habitat and, are therefore, closely related to ecosystem dynamics (CALFED 2007). Over the past 20 to 30 years, biologists have documented alarming declines of many neotropical migrant bird populations. The primary causes of these population declines are believed to be habitat loss and habitat fragmentation resulting from development and other human activities (USFWS 2013).

Bank armoring of levees also has resulted in lower sinuosity, fewer overbank flows, and a modified pattern of channel migration and meander cutoff (Brice 1977; Larsen et al. 1997, 2004; Larsen and Greco 2002). Non-Federal levees and other hardening structures were installed along the Sacramento River in the 1930s and 1940s (USFWS 2001). The Sacramento River's constrained channel meanders much less today compared to historical conditions, and has little opportunity to interact with its true floodplain (Shilling et al. 2011). Consequently, the current riparian ecosystem supports only a fraction of the species, communities and natural processes that were once present (Shilling et al. 2011).

Past and present actions in the Central Valley, and along the Sacramento River in particular, have led to the current status of the riparian and upland habitats adjacent to the river that are used by various wildlife species. Although the viability of these habitats and species populations is presently unknown, current conservation and restoration efforts seek to improve the ecological

condition of the floodplain (CALFED 2007). There has been a movement to restore the river to a more natural system, which includes allowing the Sacramento River to meander and restoring riparian habitat and grasslands that could be used by terrestrial resources. Restoration activities initiated by TNC's Sacramento River Project, USFWS SRNWR system, and the Hamilton City "J" Levee Project have resulted in either plans or actions that will have beneficial effects to terrestrial resources.

The primary cumulative effect on wildlife is related to removal of habitat. It is possible that reasonably foreseeable future levee repair projects proposed along the Sacramento River levee system will result in some loss of riparian habitat as a result of construction and/or implementation of USACE's policy regarding levee vegetation[2] (or other future agreed upon policy). However, these projects will be required to coordinate with USFWS, NMFS, CDFW and local agencies to ensure appropriate compensation for effects to riparian habitat. Many of the species that would be affected by the Proposed Action/Project and other past, present and reasonably foreseeable future projects along the Sacramento River rely on riparian and other habitat associated with the river system. Because these species are protected under applicable State and Federal laws, other projects also would be required to minimize take and compensate for loss of species and their habitats. Nonetheless, potential effects of the Proposed Action/Project will not be sufficient to offset the adverse effects of other past, present, and reasonably foreseeable future actions in the Sacramento River system, despite the beneficial effects of recent and ongoing restoration efforts. Therefore, the Proposed Action/Project combined with other past, present, and reasonably foreseeable future actions would result in cumulatively significant adverse impacts to terrestrial resources.

Project-specific effects on vegetation and wildlife are discussed in Section 3.4. In the reach where the Action/Project Area is located, the Sacramento River is 30 percent revetted between RM 145 and RM 194 (CDFG and USFWS 2007). Until a long-term solution is completed, the Proposed Action/Project would extend the period of time that the bank stabilization on the west bank of the Sacramento River renders this reach no longer subject to lateral migration. The Proposed Action/Project would continue to arrest erosion and reduce further natural recruitment of IWM from the existing riparian area on the bank until a long-term solution is completed. This

[2] In the wake of extensive flooding in New Orleans from Hurricane Katrina, the USACE embarked upon a process of reviewing and improving its levee standards with the goal of improving public safety (DWR 2012). In essence, the policy requires the removal of all vegetation from levees in order to allow for easier inspections and to reduce any potential weakening of or damage to levees from root growth and overturned trees. The USACE clarified national policy that requires the removal of all woody vegetation over two inches in diameter from levee systems throughout the United States (DWR 2012). The most recent descriptions of the USACE's vegetation management policy are contained in the ETL 1110-2-571 "*Guidelines For Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures*" adopted April 10, 2009 (DWR 2012). Levees that the USACE deems to be out of compliance with its vegetation policy without an approved variance will be ineligible for Federal disaster assistance (CSAC 2012).

effect is offset by the 1,520 feet of rock-toe and tree revetment that is presently functioning as IWM and riparian habitat for vegetation and wildlife.

The Bank Swallow Mitigation Plan developed as part of the 2007 Temporary Maintenance Project (Appendix G of CDFG and USFWS 2007) specified establishment of a permanent 1,520-foot long by 600-foot wide bank swallow colony conservation easement. In 2008, a bank swallow mitigation site was established along the east bank of the Sacramento River on the M&T Chico Ranch between RM 191.9 to 192.2 (Silveira et al. 2012).

Within the Action/Project Area, the upper area of the west bank between the top of the revetment and the top of the bank is unlikely to allow for bank swallow recolonization. Bank swallows have not been recorded nesting in the revetment area adjacent to the proposed dredging area since shortly after the habitat modifications in 2007 were completed. Under the No Action Alternative, continued erosion and exposure of silt loam would be anticipated at the Capay Unit with the removal of the rock-toe and tree revetment, thus potentially providing greater amounts of suitable soil textures for bank swallow burrow construction (Silveira et al. 2012). However, survey results from the annual cooperative bank swallow survey show declining trends, locally at the Capay Unit and overall for the Sacramento River along the reaches in the vicinity of the Action/Project Area (see Section 3.4.1.3).

Because bank swallows have not used the site on the west bank of the Sacramento River (where the rock-toe and tree revetment was installed in 2007) for four years, this habitat is presently unoccupied and considered unsuitable for bank swallow nesting under Existing Conditions. Relative to Existing Conditions, the Proposed Action/Project would not have a substantial adverse effect on bank swallows or their habitat. As described in Section 3.4, impacts to potential bank swallow habitat will be minimized during construction activities through the implementation of construction BMPs and avoidance, to the extent feasible, of potential bank swallow habitat areas. In consideration of the potential habitat alteration effects to bank swallows, the Proposed Action/Project will have a less-than-significant impact, and will not adversely incrementally contribute to cumulative impacts. Therefore, the incremental effect of the Proposed Action/Project on bank swallows is not cumulatively considerable.

Field reconnaissance surveys for nesting raptors and giant garter snake habitat, a protocol-level VELB habitat survey, and a vegetation community habitat assessment were conducted in the Action/Project Area during June 2012. The purpose of these field surveys was to re-assess the habitat types and potential for special-status species to occur in the Action/Project Area based upon habitat suitability for those species with the potential to occur at the project site. Based on these investigations and CNDDB/CNPS database searches, no special-status plant species are present in the Action/Project Area, although several species with the potential to occur were identified by the CNDDB and CNPS queries. To confirm that no special-status plant species with the potential to occur are present, a pre-construction floristic survey also will be conducted prior to project implementation, which will follow the methodology described in CDFW's 2009 *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and*

Natural Communities. If revetment maintenance is required, disturbed areas would be vegetated with native plant species, and revegetated areas would monitored for three years following completion of construction. Although the Proposed Action/Project would result in a short-term decrease in riparian vegetation, revegetation of the sites would result in the replacement of riparian vegetation communities until a long-term solution is completed.

Disturbance from construction activities associated with dredging and revetment maintenance could result in temporary impacts to VELB and its habitat, nesting raptors and migratory birds. Potential direct impacts to wildlife species associated with the Proposed Action/Project could include temporary displacement of individuals, injury or mortality of individuals, or loss of habitat (i.e., elderberry shrubs) from construction-related activities at the project site. Potential indirect impacts include degradation of water quality and disruption of individuals (e.g., nesting raptor breeding activities) outside of the project site due to noise, vibration, and other construction-related disturbance. The Proposed Action/Project also incorporates protective measures (see Section 2.2.3) to avoid or reduce the potential for direct and indirect impacts on botanical and wildlife species.

Since the 1997 relocation, the M&T/Llano Seco Pumps Facility has provided a reliable water supply to the M&T Chico Ranch and Llano Seco Rancho, as well as habitat acreage owned and managed by USFWS and CDFW.

As described in Chapter 1, the combined acreage of the M&T and Llano Seco Ranches which is potentially irrigable by the M&T/Llano Seco Pumps Facility is approximately 22,700 ± acres. Portions of this area are developed prime farmland, managed wetlands and conservation easement protected acreage. This includes the eastern portion of the Llano Seco Rancho, most of which is under conservation easement including irrigated pasture that provides habitat for sandhill crane and other species. In addition to serving the ranches, the pumping facility provides water to approximately 2,200 acres in fee title owned and managed by USFWS. Included in these fee title lands, approximately 933 acres has been developed in wetlands and associated habitat. In addition, CDFW owns approximately 1,500 acres in fee title that includes approximately 952 acres developed into wetlands and associated habitat. These habitat areas provide wetland habitat for waterfowl, shorebirds, and other wetland-dependent and special-status species (for additional detail, see Section 1.1).

Under the No Action Alternative, the river would continue to migrate west once the rock-toe and tree revetment was removed, gravel deposition would continue, and M&T Chico Ranch and Llano Seco Rancho would continue to take delivery of their water rights for crop irrigation purposes. However, the available Butte Creek water supply would be sufficient to irrigate only a small portion of farmland, which would result in economic damage to the ranches. Available water supplies from Big Chico and Butte creeks most likely would not be sufficient to maintain the existing managed wetlands. It is assumed that the USFWS and CDFW will limit delivery of Llano Seco's available supplies for wetland habitat management and restoration purposes, as was the practice prior to relocation of the M&T/Llano Seco Pumps Facility (CDFG et al. 1996).

Based upon the actions that occurred historically (i.e., prior to the 1997 relocation of the M&T/Llano Seco Pumps Facility) during drier years when water supply availability was limited, Schild and Cundiff-Gee (1996) report that approximately 80 percent of the wetland areas were functioning at 60 percent efficiency. Consequently, the combined need to provide water to important managed wetland and wildlife areas while also protecting listed fisheries resources in Big Chico and Butte creeks during years of limited water availability has historically resulted in reduced habitat availability and suitability for the wildlife species (e.g., migrating ducks, geese, swans) that benefit from using these areas.

The Proposed Action/Project would enhance the protection of vegetation and wildlife resources in the future by ensuring that the M&T/Llano Seco Pumps Facility can continue to function and provide a reliable water supply to the wildlife refuges, wildlife management areas and wetlands, while meeting NMFS and CDFW fish screen criteria. Although short-term construction-related impacts could potentially occur, the Proposed Action/Project would not result in adverse long-term effects to terrestrial resources due to reduced performance of the M&T/Llano Seco Pumps Facility and subsequent re-initiation of diversions in Butte and Big Chico creeks. Compared to the potential cumulative effects of the No Action Alternative, the long-term beneficial effects to terrestrial resources associated with implementing the Proposed Action/Project would outweigh any remaining temporary and localized construction-related effects that are not minimized or avoided by implementing the protective measures that are incorporated into the project.

In consideration of both construction-related and habitat alteration effects, the Proposed Action/Project will have a less-than-significant impact to terrestrial resources, will not adversely incrementally contribute to cumulative impacts, and therefore the incremental effect of the Proposed Action/Project is not cumulatively considerable.

4.1.2.3 RECREATION AND NAVIGATION SAFETY

The geographic scope for the cumulative recreation and navigation safety analysis includes portions of the Sacramento River and the Capay Unit of the SRNWR where the potential exists for the Proposed Action/Project to temporarily or permanently limit, impede, or result in the loss of recreational opportunities in the Action/Project Area.

Ongoing activities occurring in the vicinity of the Action/Project Area with the potential to contribute to cumulative recreation and/or navigation effects include public use of the Capay Unit, recreational boating and fishing on the Sacramento River, and boaters travelling on the river to obtain access to the Phelan Island Unit of the SRNWR via boat near RM 192 or to Bidwell-Sacramento River State Park near RM 194. The SRNWR and Bidwell-Sacramento River State Park are, and will continue to be managed to enhance opportunities for recreational uses and for protection of natural resources (USFWS 2005; CDPR 2003). Other projects occurring on the river between RM 194 and RM 192, at the Capay Unit or at the Stile property at the same time as the Proposed Action/Project would have the potential to result in a cumulative effect on recreation and navigation in the Sacramento River. However, no past, current, or

reasonably foreseeable future projects were identified in the project vicinity that, when added to project-related impacts, would contribute to a reduction in recreation opportunities or navigation safety or result in a significant cumulative impact that would be cumulatively considerable.

Project-specific effects on recreational opportunities and navigation safety in the Sacramento River and in proximity to the Action/Project Area are described in Section 3.5.

Under the No Action Alternative, recreational uses (e.g., fishing and boating) within the Sacramento River between RM 194 and RM 192 would not be adversely affected because revetment maintenance would be conducted from the shore and dredging would not occur.

As described in Section 3.5, the reduction of recreational opportunities due to the Proposed Action/Project would be temporary and limited to the construction window. The temporary loss of recreational opportunities during dredging and revetment maintenance associated with Proposed Action/Project is not considered significant because the in-river dredge area is relatively small (i.e., each sweeping arc of the cutterhead would remove about 9 feet of material on either side of centerline per pass, or about 18 feet total width) in relation to the Sacramento River and impact avoidance measures (e.g., lighting, noticing, signage) are incorporated into the project that would reduce potential recreation impacts associated with the Proposed Project to less than significant. There would be no long-term loss of recreational opportunities in the Sacramento River or at the Capay Unit of the SRNWR. Therefore, because the project-specific impacts are less than significant, the incremental effect of the Proposed Action/Project on recreation and navigation safety is not cumulatively considerable and, thus, is less than significant.

4.1.2.4 HYDROLOGY AND WATER QUALITY

Potential water quality impacts are considered primarily in relation to the potential impacts of suction dredging and spoils disposal in general, including re-suspension of sediments and metals from dredging activities in the Sacramento River, as well as the subsequent fate and transport of these materials. Therefore, geographic scope for the cumulative hydrology and water quality analysis includes the Sacramento River and floodplain in the vicinity of the Action/Project Area in the vicinity and immediately downstream of planned dredging activities. Section 3.6 identifies the construction-related hydrologic and water quality effects of the Proposed Action/Project, including the potential for increased turbidity due to soil and sediment disturbance.

Natural and human-induced processes have considerably altered the hydrology, water quality and geomorphology of the Sacramento River system. Historically, the Sacramento River was not consistently treated as a comprehensive system, which has led to some of the hydrologic conditions that are experienced today. As an example, the focus on flood management within limited reaches of the Sacramento River without full consideration of the hydraulic effects in upstream and downstream reaches has resulted in modifications to the Sacramento River system that have shifted local problems to other reaches (USACE 2004a). Additionally, the cumulative

effects of habitat restoration projects have the potential to reduce flood conveyance (USACE 2004a).

As one example, the existing infrastructure associated with the Sacramento River Flood Control Project (SRFCP) was largely constructed and operational by 1960 and, beginning that year, efforts were initiated to implement systematic flood control and levee construction activities along the Sacramento River (USACE and The Reclamation Board 2002). The SRFCP presently consists of approximately 980 miles of levees, as well as overflow weirs, pumping plants, and bypass channels that protect communities and agricultural lands in the Sacramento Valley and the Delta (SAFCA 2008). The SRBPP is a continuing construction project that provides protection for the existing levees and flood control facilities of the SRFCP.

More recently, upstream of the Action/Project Area, the Hamilton City Flood Damage Reduction and Ecosystem Restoration Project proposes to increase flood protection and restore the Sacramento River floodplain along the west bank of the river near Hamilton City. This project would involve construction of 6.8 miles of setback levee, removing most of the existing "J" levee that currently protects Hamilton City from Sacramento River flooding to increase Hamilton City's flood protection from a 10-year level of protection to a 75-year level of protection, and restoring about 1,500 acres of native riparian vegetation in the levee setback area (CVFPB 2012). The proposed setback levee north of the Capay Unit would be gradually reduced in height and would become a 3-foot high training dike where it crosses a narrow section of the west side of the Capay Unit. The training dike design is intended to reduce high water velocities during flood events and allow flood waters to flow over the top of the levee and gently spread over the adjacent lands (CBDA 2005). The Hamilton City project's hydraulic modeling included several SRNWR units in addition to those proposed by TNC, and demonstrated some potential for cumulative hydraulic effects to result from the restoration of SRNWR units in proximity to one another (CBDA 2005). While each unit's effects are localized, Ayres (2001 and 2002 in CBDA 2005) reported that vegetation changes at individual units could combine to alter flow patterns and velocities. However, CBDA (2005) further determined that the Hamilton City modeling indicated that the effects of individual SRNWR units are localized and do not extend for long distances upstream or downstream, and that the combined effects of related projects on other SRNWR lands do not result in cumulative impacts to hydrology and water quality.

Localized changes in flood flows also may occur along the Sacramento River due to past levee construction projects, and the cumulative effects of any future levee repair projects could lead to reduced rates of progressive lateral migration and production of new off-channel habitats (Nature Conservancy et al. 2008). Depending on the specific changes to flood flows along the Sacramento River, cumulative effects associated with past, present and reasonably foreseeable future projects could be significant, especially if flood zones change or properties outside of existing flood zones become subject to flooding (USFWS and CDFG 2012). The Proposed Action/Project would not modify flood flows, impede or redirect flood flows, or alter existing drainage patterns in the Sacramento River. Therefore, the Proposed Action/Project combined

with the aggregate of past, present, and reasonably foreseeable future actions would not result in cumulatively significant adverse impacts to hydrology and flooding and, thus, is not cumulatively considerable.

The Proposed Action/Project would not affect groundwater resources and, therefore, there would be no cumulative effects to groundwater quality.

The Proposed Action/Project could result in temporary construction-related impacts on water quality in the Sacramento River, including increased turbidity and potential for hazardous materials spills. Because similar types of water quality effects could result from all land development activities occurring within the local watershed area, cumulative effects could occur if other projects involving in-river or riparian-related construction activities are implemented between RM 194 and RM 192 at the same time as the Proposed Action/Project. Of the reasonably foreseeable future projects identified, the Singh Unit habitat restoration effort (RM194L) immediately upstream of the Action/Project Area has the potential to contribute to cumulative water quality effects downstream, if implemented at the same time as the Proposed Action/Project. However, because hydraulic considerations associated with the Singh Unit are presently undergoing additional study, it is unlikely that the Singh Unit restoration project and the Proposed Action/Project would be implemented simultaneously.

As described in Section 3.6 of this Draft EA/IS, minimizing construction-related water quality effects is required by the CWA. The program for implementing CWA requirements is managed locally by the Central Valley RWQCB, and projects are required to comply with the statewide permit for general construction activity. This typically involves the implementation of site-specific stormwater BMPs to avoid and minimize the release of stormwater to offsite receiving waters. Such BMPs are proposed as mitigation for soil and sediment disturbance under the Proposed Action/Project. Previous and ongoing projects in the vicinity of the Action/Project Area have minimized and/or avoided significant impacts to water quality resulting from construction-related actions by adhering to the CWA requirements. On completion of in-river dredging and revetment maintenance, no additional effects on water quality would occur as part of the Proposed Action/Project. Therefore, because the Proposed Action/Project would implement site-specific mitigation consistent with the CWA and RWQCB programs, the incremental effect of the Proposed Action/Project on water quality is not cumulatively considerable and therefore is considered a less than significant impact.

4.1.2.5 GEOLOGY, GEOMORPHOLOGY AND SOILS

The geographic scope for the cumulative geology, geomorphology and soils analysis includes the areas where the proposed project would expose people or structures to potential substantial adverse effects, which is limited to the Action/Project Area, including the Capay Unit, the existing gravel stockpile, and the Sacramento River within the Action/Project Area. Although not affected by the proposed project, the lower reach of Big Chico Creek also is discussed to address issues raised during the public scoping process.

As described above, the Sacramento River has not been consistently treated as a comprehensive system in the past, which has resulted in modifications to the river system that have shifted local problems to other reaches (USACE 2004a). There also is an overall restoration effort within the SRCA being coordinated under the SRCAF, which includes both riparian restoration and the restoration of the meander zone for the Sacramento River (USACE 2004a).

The cumulative effects of rock revetment in the SRBPP area (RM 8 to RM 157.7) are primarily related to limiting bank erosion (USACE and CVFPB 2009). Secondary effects occur on sediment recruitment, meander migration, point bar formation, and the development of off-channel waterbodies, such as oxbow lakes and sloughs (Larsen et al. 1997, 2004; Larsen and Greco 2002). Numerous studies have illustrated the key physical and biological roles of IWM in rivers of all sizes for habitat formation, sediment and organic-matter storage, bank stability, as well as in maintaining a high degree of spatial heterogeneity (i.e., habitat complexity) (Harmon et al. 1986; Bisson et al. 1987; Hicks et al. 1991; Reeves et al. 1991; Lassettre and Harris 2001). Historical and continued restriction of these processes in the Sacramento River also has limited IWM recruitment and future riparian forest succession by reducing point bar formation for future riparian vegetation colonization (USACE and CVFPB 2009). Bank armoring also may alter local hydraulics, which can affect channel morphology and aquatic habitat by increasing near-shore velocities and depths, promoting channel incision and channel narrowing, and increasing sediment transport (Binns and Eiserman 1979; CDFG 1983; DWR 1994a; Nunally and Sotir 1994; Shields and Hoover 1991).

Native habitat and natural river function in the area was altered by construction of the “J” levee around 1904 and conversion of the floodplain to agriculture and rural development (USACE and Reclamation Board 2003). Construction of the “J” levee and hardening (typically with rock) of the Sacramento River bank and levees in several locations through the years have constrained the ability of the river to meander and overflow its banks, both of which promote propagation and succession of native vegetation. Over time, conversion of the floodplain to agriculture and rural development has reduced the extent of native habitat to remnant patches along the river and in historic oxbows. These ecosystem alterations have reduced the abundance, richness, and complexity of riparian, wetland and floodplain habitat in the area (USACE and Reclamation Board 2003).

As described above, USACE and DWR propose to increase flood protection and restore the Sacramento River floodplain along the west bank of the river near Hamilton City (CDPR 2008a). The proposed setback levee north of the Action/Project Area would be gradually reduced in height and would become a training dike where it crosses a narrow section of the west side of Capay Unit of the SRNWR (CDPR 2008a). Hydraulic modeling used to analyze the J levee project included several SRNWR units (i.e., Pine Creek, Capay, and Dead Man’s Reach Units) proposed for native riparian habitat restoration. The modeling demonstrated some potential for cumulative hydraulic effects from the restoration of SRNWR units near each other (CDPR 2008a). While each unit’s effects are localized, vegetation changes at individual units can

combine to alter flow patterns and velocities (Ayres 2001 and 2002 in CDPR 2008a; CBDA 2005). However, it was determined that the overall combined effects of planned changes in vegetation at the individual SRNWR units are localized and do not extend for long distances upstream or downstream, and that the combined effects of related projects on other SRNWR lands do not result in cumulative impacts (Ayres 2001 and 2002 in CDPR 2008a; CBDA 2005).

Project-specific effects on geology, geomorphology and soils are evaluated and discussed in Section 3.7. Revetment removal under the No Action Alternative would allow for continued erosion of the west bank of the Sacramento River in the Action/Project Area, thereby promoting potential future sediment recruitment, meander migration, and point bar formation.

The Proposed Action/Project would not affect surface fault rupture, increase potential geologic hazards, or result in the loss of a unique geographical feature of statewide or national significance. Potential geomorphic effects associated with the Proposed Action/Project are of a temporary nature. Because revetment maintenance (if needed) would repair the revetment to the original design that is presently in place under Existing Conditions, the Proposed Action/Project would not change the geomorphologic conditions that are presently occurring in the Sacramento River. As previously discussed, the Proposed Action/Project would temporarily prevent further bank erosion and river migration until a long-term solution to the ongoing sedimentation and retreat of the west bank of the Sacramento River affecting the M&T/Llano Seco Pumps Facility can be completed. When the long-term solution is completed, the revetment will either be removed or incorporated as part of a long-term solution, which will undergo separate detailed evaluation.

Despite ongoing efforts to protect habitat in the SRCA Inner River Zone, coupled with the beneficial effects of recent and ongoing restoration efforts occurring along the Sacramento River, the potential temporary effects of the Proposed Action/Project will not be sufficient to offset the adverse geomorphological effects of other past, present, and reasonably foreseeable future actions in the Sacramento River system. Therefore, in consideration of geomorphological effects, the Proposed Action/Project combined with other past, present, and reasonably foreseeable future actions would result in cumulatively significant adverse impacts to geology, geomorphology and soils.

Two previous gravel excavation projects have been conducted in the Action/Project Area, changing the local hydraulic conditions in the area of the river channel and the former gravel bar. Sediment movement in the river is a very dynamic process. Material from upstream reaches of the Sacramento River has continued to move downstream into the Action/Project Area, and will continue to do so in the future, as part of natural river processes. In-river dredging and ground disturbing activities associated with the Proposed Action/Project would temporarily increase the potential for erosion and sedimentation rates above existing levels.

Additionally, the Proposed Action/Project would not cause soils to become unstable as a result of the project, or result in on or off-site landslides, lateral spreading, subsidence, liquefaction or collapse. Project-related construction could result in the erosion of soil, which would be

deposited in the Sacramento River and receiving waters in a similar scope and effect as previous projects in the vicinity. A cumulative increase in erosion and sedimentation could occur if other projects involving in-river or riparian-related construction activities are implemented between RM 194 and RM 192 at the same time as the Proposed Action/Project. However, ground-disturbing activities are required to stabilize soils upon completion of construction. Previous and ongoing projects in the vicinity of the Action/Project Area have minimized and/or avoided significant impacts to water quality resulting from construction-related actions by adhering to the CWA requirements. The potential for erosion and sedimentation resulting from the Proposed Action/Project and other projects in the area would be limited because each project would be required to implement BMPs for reducing soil and sediment disturbance and a SWPPP (see Section 3.6). Consequently, any cumulative effects of erosion and sedimentation would be temporary and minimal, and therefore less than significant.

On completion of in-river dredging and revetment maintenance, no additional effects on soil erosion or sedimentation would occur as part of the Proposed Action/Project. With implementation of the environmental commitments identified in Section 2.2.3, erosion and sedimentation resulting from construction-related ground disturbance and dredging operations associated with the Proposed Action/Project would not result in substantial effects. Therefore, because the Proposed Action/Project would implement site-specific mitigation consistent with the CWA and RWQCB programs, the incremental effect of the Proposed Action/Project on geomorphology and soils is not cumulatively considerable and is therefore less than significant.

4.1.2.6 AESTHETICS/VISUAL RESOURCES

The cumulative effects analysis for aesthetics/visual resources is limited to the area where the Proposed Project/Action has the potential to affect the visual character and quality of the surrounding area. Therefore, the analysis is limited to the riparian vegetation communities in the immediate vicinity looking upstream and downstream of the revetment area located along the west bank of the Sacramento River on the Capay Unit of the SRNWR and on the M&T Chico Ranch property along the east bank of river, which are the primary components of the existing aesthetic/visual resources in the Action/Project Area.

Cumulative effects to visual resources are typically limited to other projects that occupy the same field of view as the proposed project. Thus, visual impacts from other projects in the general area are not additive, as long as the visual impacts from those other projects cannot be seen by the same viewer groups along the Sacramento River corridor at the same time as they would see the potential visual impacts of the proposed project.

Project-specific effects on aesthetics/visual resources are described in Section 3.8. Although potential effects generally would result in minimal changes to the visual character of the Action/Project Area, the No Action Alternative would allow continued erosion and river meander, which could create a more naturally appearing river system for some recreationalists. Additionally, restoration activities completed on the Capay Unit of the SRNWR in 2010 will

continue to mature and appear more like a natural valley-foothill riparian and annual grassland ecosystem, thus providing a higher quality visual character (i.e., high vividness, intactness, and unity) in the Action/Project Area. The Proposed Action/Project would not have a significant impact on aesthetics or visual resources due to: (1) the limited area that can be viewed by looking both upstream and downstream of the Sacramento River within the Action/Project Area; (2) the localized, temporary nature of the physical activities associated with project, which would not substantially change the character of views from the area; and (3) because no other reasonably foreseeable future projects are expected to occur in the immediate vicinity of the Action/Project Area (e.g., RM 192.5) at the same time as the Proposed Action/Project. The incremental effect of the Proposed Action/Project on aesthetic/visual resources would not be cumulatively considerable and therefore would be less than significant.

4.1.2.7 CULTURAL RESOURCES

The geographic scope for the cumulative cultural resources analysis includes the Action/Project Area due to the potential for project-related ground disturbing activities to uncover previously undiscovered important historic or cultural resources. Project-specific effects on cultural resources are described in Section 3.9. No other projects have been identified that would contribute to a reduction or destruction of cultural resources in the Action/Project Area.

Cultural resources generally are not considered subject to cumulative effects because they are either individually directly or indirectly affected in a way that changes the significance of a property or they are not affected in a way that changes the significance of a property.

No historic or cultural resources were previously uncovered during the construction of the rock-toe and tree revetment. Ground disturbing activities associated with revetment removal under the No Action Alternative would occur on the same site that was previously disturbed when the revetment was constructed during 2007.

In the event of an unanticipated discovery of a historic or cultural resource during construction activities, the Proposed Action/Project has a potential to impact cultural resources and to uncover unknown or undocumented buried cultural resources. With implementation of the environmental commitments identified in Section 2.2.3, the incremental effect of the Proposed Action/Project is not cumulatively considerable on cultural resources and is therefore less than significant.

4.1.2.8 AIR QUALITY AND GREENHOUSE GAS EMISSIONS

As described in BCAQMD (2008), a cumulative impact analysis should evaluate the combined air quality impacts of the proposed project and impacts from existing and proposed future development in the area. For localized construction-type emissions, the “area” at issue should encompass all planned construction activities within one mile of the project. Project emissions that are not consistent with the AQAP, SIP or exceed BCAQMD thresholds will have a significant cumulative impact, unless offset (BCAQMD 2008).

More generally, the geographic scope for the cumulative air quality analysis includes the Action/Project Area, Butte County, Glenn County and other areas of the Northern Sacramento Valley Planning Area (i.e., Colusa, Shasta, Sutter, Tehama and Yuba counties). The courts have recognized, however, that where air pollution control districts or air quality management districts have recommended significance thresholds for cumulative impacts, the use of such thresholds as part of cumulative impact analyses can obviate the need for long discussions of all activities within an air shed that might over time contribute to cumulative impacts.

With respect to the Northern Sacramento Valley Planning Area, existing ambient air quality for ozone and particulate matter are already in excess of State standards in the affected air basins. Therefore, relatively small additional emissions of these pollutants would be potentially significant and cumulative unless they come under the applicable cumulative significance thresholds recommended by one or more relevant air pollution control districts or air quality management districts.

Construction activity in general within the air basin would generate criteria pollutants such as NO_x, ROG, PM_{10}, and CO that contribute to current air quality violations in the same way as the Proposed Action/Project. As described in Section 3.10, emissions associated with the Proposed Action/Project (dredging operations and revetment maintenance) and the No Action Alternative (revetment removal) are considered to be construction-related emissions. Once the respective activities are completed, no additional or ongoing emissions (i.e., operational emissions) would be generated by the Proposed Action/Project or the No Action Alternative. The Proposed Action/Project and the No Action Alternative could contribute to the generation of GHG emissions through short-term construction activities in the Action/Project Area. Short-term air pollution in the form of particulate matter (fugitive dust), CO_2 and NO_x may be caused by construction activity, including truck and equipment movement and dredging operations.

Although Butte and Glenn counties are non-attainment areas for ROG and $PM_{10,}$ the minimal quantities of these pollutants that would be generated by construction-related activities under the Proposed Action/Project would occur over a brief, temporary period of time, and would not exceed GCAPCD or BCAQMD significance thresholds for criteria pollutants. PM_{10}, also would be controlled using dust control measures.

The Proposed Action/Project has the potential to generate air quality emissions containing criteria pollutants such as NO_x, ROG, PM_{10} and CO in the Northern Sacramento Valley Planning Area. These emissions would occur on a temporary basis during construction activities associated with in-river dredging, spoils disposal and revetment maintenance. On completion of in-river dredging and revetment maintenance, no additional air quality effects would occur as part of the Proposed Action/Project. Nonetheless, the Proposed Action/Project combined with the aggregate of past, present, and reasonably foreseeable future actions could result in potentially significant cumulative effects to air quality in the Northern Sacramento Valley Planning Area.

As previously discussed in Section 3.10, an individual project does not generate enough GHG emissions to significantly influence global climate change. Global climate change is a cumulative impact, which means that a project may participate in a potential impact through its incremental contribution combined with the contributions of all other sources of GHG. Transportation currently accounts for a large fraction of overall GHG emissions, mostly in the form of CO_2 (Bemis 2007).

As shown in Figure 3.10-1, the California GHG average 2006/2008 emissions forecast was about 475 million tons of CO_2 equivalent (CO_2e), and the emissions forecast through 2020 is projected to exceed 500 million tons of CO_2 equivalent if actions are not taken to reduce emissions. The BCAQMD does not have an established threshold for greenhouse gas emissions identified within their *CEQA Air Quality Handbook Guidelines for Assessing Air Quality Impacts For Projects Subject to CEQA Review* (BCAQMD 2008). In the Helena Chemical Nelson Terminal Draft EIR (Butte County 2012), the County reviewed the adopted and proposed thresholds of other jurisdictions and identified a commonly utilized threshold summarized as follows:

Criteria Air Pollutants and Precursors	Maximum Annual
GHGs – Stationary Sources	Maximum Annual Emissions of 10,000 metric tons of CO_2 equivalent
GHG – All Sources (includes transportation, construction, and operational emissions).	30 percent reduction in comparison to projected "Business as Usual" 2020 emissions (i.e., >500 million tons).

Lacking locally promulgated plans or regulations, these thresholds were determined by Butte County to be the best available standard at the time to evaluate a project's contribution to GHG emissions (Butte County 2012). While no Federal or State agency has established thresholds of significance for GHG or other impacts to global climate change, some APCDs and AQMDs have adopted thresholds. For example, the Bay Area AQMD adopted a numeric threshold of significance of 10,000 MTCO2e per year for industrial projects, as well as a threshold of 1,100 MTCO2e per year for land use projects, but was recently found to have failed to comply with CEQA when it adopted such thresholds (see California Building Industry Association v. Bay Area Air Quality Management District, Alameda County Superior Court, Case No. RG10-548693 (March 5, 2012). Consequently, the Bay Area AQMD is no longer recommending that its GHG emission thresholds be used to evaluate the significance of a project's environmental impacts (Poloncarz et al. 2012). More recently, the San Luis Obispo APCD approved thresholds of significance for the evaluation of project-related increases of GHG emissions, as described below.

Project	GHG Threshold[1]
Projects Other than Stationary Sources	▪ Compliance with Qualified GHG Reduction Strategy; or ▪ 1,150 MTCO2e/year; or ▪ 4.9 MTCO2e/SP/year (residents + employees)
Stationary Sources (Industrial)	10,000 MTCO2e/year
Construction	Amortized over the life of the project and added to operation GHG emissions
[1] Source: SLOAPCD 2012. Thresholds were adopted by SLOAPCD's Board on March 28, 2012.	

The two examples of thresholds above provide context to the scale for the Proposed Action/Project. The Proposed Action/Project is estimated to produce a maximum of about 6,449 pounds per day of CO_2 and a total of about 273 tons of CO_2 emitted during the 137-day construction period. This value is well below the maximum annual emissions thresholds suggested above (i.e., 1,150 million tons emitted per year). Because the Proposed Action/Project's contribution to annual CO_2 emissions would be very minor and of short-term duration, however, the Proposed Action/Project is not expected to significantly influence global climate change because it would not be anticipated to result in a significant increase in annual emissions of GHGs.

Butte and Glenn counties are in attainment for the State and Federal NO_x ambient air quality standard. However, air quality modeling results suggest that the Proposed Action/Project would exceed the significance threshold identified by the GCAPCD and the BCAQMD regarding the maximum pounds per day of NO_x. The increment of NO_x that would exceed 25 pounds per day could temporarily result in a cumulatively considerable net increase in a criteria pollutant. To address potential air quality concerns, the Proposed Action/Project has been designed to incorporate measures to minimize emissions, including NO_x. Mitigation for the Proposed Action/Project consists of implementing BMPs, standard mitigation measures, and BAMMs, including requirements for the construction contractor to properly tune and maintain construction equipment. Consequently, temporary air emissions would not be expected to cause a cumulatively considerable contribution to any significant cumulative impact on air quality in the Northern Sacramento Valley Planning Area.

If the need for the proposed project is to be met, then there is no practical alternative to using a hydrocarbon (primarily fossil fuel) powered dredge. If two dredge cycles are required before a long-term solution is completed, the quantities of emissions would be similar for each dredge cycle; therefore the amount of GHGs released into the atmosphere during the second dredge cycle would be similar to the amount released during the first dredge cycle. The GHGs released from dredging-related machinery would be greater than those released under the No Action Alternative. To address potential air quality concerns, the Proposed Action/Project has been designed to incorporate measures to minimize the total quantity of GHGs emitted during up to two cycles of dredging and spoils disposal operations. Mitigation for the Proposed

Action/Project consists of implementing BMPs, which include dust control and requiring the construction contractor to properly tune and maintain construction equipment. Although modeling suggests that an air quality threshold (NO_x) would be exceeded under the Proposed Action/Project prior to mitigation, implementation of the environmental commitments and the mitigation measure identified in Section 2.2.3 would reduce potential NO_x-related impacts to a less-than-significant level.

Meeting regional air quality district significance thresholds through construction equipment modifications or providing off-site mitigation for any violations of standards, if necessary, would contribute to GHG reduction. In comparison to the overall amount of annual GHG emissions being produced, and due to the relatively short duration of the construction period, the Proposed Action/Project is not expected to significantly influence GHG emissions.

With the implementation of ***Environmental Commitments AQ-1, AQ-2*** and ***GHG-1***, and ***Mitigation Measures AQ-1*** (see Section 2.2.3), the incremental effect of the Proposed Action/Project on air quality is not cumulatively considerable and is therefore less than significant. Therefore, due to the size and short-term construction emissions the additive effect of the Proposed Action/Project's GHG emissions would not result in a reasonably foreseeable cumulatively considerable contribution to global climate change.

4.1.2.9 HAZARDS AND HAZARDOUS MATERIALS

The geographic scope for the cumulative hazards and hazardous materials analysis includes the Action/Project Area, which is the area where potentially hazardous materials will be used and generated by construction and the area where the potential for workers to be exposed to such materials exists, as well as the Sacramento River immediately downstream of the Action/Project Area.

Cumulative effects could occur if other projects involving in-river or riparian-related construction activities are implemented in the Action/Project Area or areas upstream (e.g., between RM 194 and RM 192) at the same time as the Proposed Action/Project.

The potential impacts of the Proposed Action/Project related to hazards and hazardous materials are addressed in Section 3.11. During construction activities, fuels, lubricants, and other potentially hazardous materials have the potential to be released into the environment and result in environmental and/or human exposure to these hazards. Under both the No Action Alternative and the Proposed Action/Project, potential hazards-related effects would be temporary (i.e., only during project construction). On completion of in-river dredging and revetment maintenance, no additional effects on hazards or hazardous materials would occur as part of the Proposed Action/Project. As described in Section 3.11 of this Draft EA/IS, a HMCSPRP will be prepared to identify the appropriate practices to reduce the likelihood of a spill of toxic chemicals and other hazardous materials during construction.

Although construction activities in general could result in similar hazards and hazardous materials concerns, no other projects have been identified that would contribute to potential hazards or hazardous materials impacts in the Action/Project Area. With implementation of the environmental commitments identified in Section 2.2.3, the incremental effect of the Proposed Action/Project related to hazardous materials is not cumulatively considerable and is therefore less than significant.

4.1.2.10 TRAFFIC AND CIRCULATION

The geographic scope for the cumulative traffic and circulation analysis includes the Action/Project Area and local roadways to the project site due to the largely rural nature of the area and the limited number of vehicles, equipment, and commuter trips necessary to implement the proposed project.

Combined with other projects in Butte and Glenn counties, there could be significant cumulative effects on transportation if the Proposed Action/Project and other projects are implemented at the same time. Potential transportation-related effects associated with the Proposed Action/Project, in combination with other past, present and reasonably foreseeable future projects in Butte and Glenn counties, have the potential to result in short-term disruptions to roadways, increases in emergency response time and road hazards, and decreases in LOS for roads accessed or used for detours during construction activities. However, no other reasonably foreseeable future projects are expected to occur in the immediate vicinity of the Action/Project Area at the same time as the Proposed Action/Project. Therefore, the Proposed Action/Project combined with other past, present, and reasonably foreseeable future actions could result in potentially significant cumulative effects to transportation and circulation.

As described in Section 3.12, temporary traffic-related effects associated with the Proposed Action/Project would not have a significant impact on traffic and circulation. However, to avoid potential delays or safety issues on the local roads that access the project site, a traffic control plan and other traffic-related impact minimization and avoidance measures (see Section 2.2.3) would be implemented, which would further insure that any potential impacts are reduced to a less-than-significant level. Given that potential impacts to traffic resulting from the Proposed Action/Project would be temporary (i.e., only during project construction), the incremental effect of the Proposed Action/Project on traffic and circulation is not cumulatively considerable and is therefore less than significant.

4.1.2.11 NOISE

The geographic scope for the cumulative noise analysis includes the immediate project vicinity where project-related noise effects (e.g., unwanted or excessive sound) are noticeable.

Noise is a localized issue that diminishes in intensity with distance from the source. If occurring concurrently, construction associated with the Proposed Action/Project in combination with construction activities of other projects in the area could potentially increase localized noise

impacts on lands directly adjacent to the Action/Project Area. Under these circumstances, potential cumulative noise impacts would be temporary and restricted to daytime hours. However, no other reasonably foreseeable future projects are expected to occur in the immediate vicinity of the Action/Project Area at the same time as the Proposed Action/Project.

Project-specific effects on noise are described in Section 3.13. Under both the No Action Alternative and the Proposed Action/Project, potential noise-related effects would be temporary (i.e., only during project construction) and would not be expected to adversely affect any sensitive receptors. Therefore, the incremental effect of the Proposed Action/Project on noise in the Action/Project Area is not cumulatively considerable and is therefore less than significant.

4.2 GROWTH INDUCING EFFECTS

CEQA requires a consideration of a project's capacity to induce growth. Growth inducement would occur if the amount of population or employment growth projected to occur as a result of the project would exceed planned levels. Increased development and growth in an area are dependent on a variety of factors, including employment and other opportunities, availability of developable land, and availability of infrastructure, water, and power resources.

The proposed project is located in a rural area and is intended to protect and maintain the viability of the M&T/Llano Seco Pumps Facility so that it will continue to provide a reliable water supply to M&T Chico Ranch, Llano Seco Rancho, USFWS refuge lands, and CDFW wildlife management areas, while meeting current fish screen criteria and obligations. None of the activities associated with the proposed project would directly or indirectly result in increased economic or population growth. Additionally, the proposed project would not change the use of the water supply or provide a new water supply for other uses such as development. Therefore, due to the nature of the proposed project, the limited time frame in which construction will occur, and the lack of land use change which would affect growth opportunities in the area, there will be a less than significant impact on growth inducement and no mitigation is required.

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5.0 ENDANGERED SPECIES ACT COMPLIANCE

5.1 INTRODUCTION

As discussed in Chapter 1 – Introduction, this joint document has multiple purposes. Within the context of complying with the Federal ESA, the Proposed Action has the potential to affect the obligations of both NMFS and USFWS under the Federal ESA of 1973, as amended (16 U.S.C. §§1531 *et seq*.). Additionally, the analysis of the Proposed Action described herein serves to address Essential Fish Habitat (EFH) considerations for species protected by the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

The Proposed Action consists of dredging the sediment deposit in the Sacramento River proximate to the M&T/Llano Seco Pumps Facility intake, and maintaining the 1,520-foot long rock-toe and tree revetment that was constructed on the west side of the Sacramento River during 2007. A detailed description of the Proposed Action under consideration is provided in Section 2.2 of this EA/IS.

5.1.1 REGULATORY CONTEXT

With respect to the obligations of NMFS and USFWS under the Federal ESA, this document is intended to serve as a joint BA pursuant to Section 7(c) of the Federal ESA (16 U.S.C. §1536(c)) and to 50 C.F.R. Part 402 concerning the potential effects of USFWS' action on Federally listed threatened and endangered species and on species proposed for listing.

The applicable Federal regulations state that the purpose of a BA is to:

> (a) …*evaluate the potential effects of the action on listed and proposed listed species and designated and proposed critical habitat and determine whether any such species or habitat are likely to be adversely affected by the action* (50 C.F.R. §402.12, 1995).

In turn, 50 C.F.R. § 402.02 (1995) defines "effect of the action" as follows:

> *Effect of the action refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action that will be added to the environmental baseline… Indirect effects are those that are caused by the proposed action and are later in time, but still reasonably certain to occur.*
>
> *Interrelated actions are those that are part of a larger action and depend on the larger actions for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration.*

Federally listed, State listed, proposed for listing, and EFH-managed species with the potential to occur within the Action Area, and those species having designated critical habitat within the action area, include Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, green sturgeon, fall-run/late fall-run Chinook salmon, VELB, and western yellow-billed cuckoo.

This BA considers the following major issues for aquatic, terrestrial, and riparian species within the action area:

- The presence of suitable habitat or potentially suitable habitat for each listed, proposed for listing, or EFH-managed species in the area potentially affected by the Proposed Action.
- The established level of use or potential for use of the suitable habitat for each species in the area potentially affected by the Proposed Action.
- The presence, and estimated magnitude, of potential disturbances to species or habitat due to the Proposed Action.
- The extent of direct habitat loss due to the Proposed Action.
- The overall level of direct and indirect effects of the Proposed Action.
- The past measures implemented to mitigate for indirect effects to sensitive species and their habitat.

The Lead Agencies (CDFW and USFWS) and the applicants, the M&T Chico Ranch and the Llano Seco Rancho, have prepared this BA chapter to address the potential effects of the Proposed Action on fish, wildlife and plant species that are either listed under the Federal ESA or proposed for such listing, and where applicable, their designated or proposed critical habitats. This BA chapter has been prepared in accordance with legal requirements in Section 7 of the Endangered Species Act (16 U.S.C. 1536; see also 50 CFR 402).

On behalf of themselves and the applicants, the Lead Agencies are submitting this BA chapter, in addition to the entire Draft EA/IS to NMFS and USFWS pursuant to Section 7(a)(2) of the ESA. The information contained within this BA chapter is provided to assist NMFS and USFWS determine whether the Proposed Action is likely to: (1) adversely affect listed species or designated critical habitat; (2) jeopardize the continued existence of species that are proposed for listing; or (3) adversely modify proposed critical habitat (USFWS and NMFS 1999). This BA chapter also addresses EFH for commercial fish species managed under the Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267; 50 CFR 600).

As part of the Federal ESA consultation process for the Proposed Action, it is anticipated that NMFS and USFWS will use the information presented in this BA chapter, supported by information presented in other chapters of the Draft EA/IS, to develop a BO addressing the Proposed Action's potential effects on listed species and critical habitat within each resource agency's respective jurisdictional authority. Each BO will document the opinion of the USFWS

and NMFS, respectively, as to whether or not the Proposed Action is likely to jeopardize the continued existence of listed species, or result in the destruction or adverse modification of designated critical habitat. The BOs also will include a summary of the information on which the opinion is based, as well as a discussion of the effects of the action on listed species or designated critical habitat (50 CFR §402.02, 50 CFR §402.14(h)).

It also is anticipated that CDFW will use this Draft EA/IS, including Chapter 5, to address compliance with CESA.

5.2 ACTION AREA

According to 50 CFR 402.14(g)(3), the Action Area is defined as the immediate area involved in the action and the entire area where effects to listed species extend as direct and indirect effects of the action. The Action Area is functionally defined as the area 100-feet from the construction footprint, including access roads, and a portion of the Sacramento River extending about 1,000 feet downstream from the construction site.

The Action Area is located in both Glenn and Butte counties, just west of the confluence of Big Chico Creek on the Sacramento River (see Figure 1-2). The Action Area includes areas upstream, adjacent to, and immediately downstream of the M&T/Llano Seco Pumps Facility. The M&T/Llano Seco Pumps Facility is located immediately downstream of the confluence of Big Chico Creek and the Sacramento River, on the east bank of the Sacramento River just south of the Bidwell-Sacramento River State Park at RM 193, approximately six miles southwest of the City of Chico.

The Action Area also is located within the SRCA, also called the SB1086 Program, which is currently administered by the SRCAF. The California Natural Resources Agency (2003) recognizes that a restriction of the Sacramento River's meander patterns may be necessary where studies indicate unobstructed meander could impair the operational viability of public and private facilities (e.g., buildings, bridges, pumping plants), which are considered to be protected "hard points". A structural "hard point" is defined as a structure within the area of recent river meander that because of various attributes including, but not limited to, historic location, public and private investment, and government commitment, is deemed necessary to be protected from river movement (Resources Agency 2003).

The Action Area is rural and surrounded by agricultural lands, a national wildlife refuge, a California State park and undeveloped land. A portion of the Action Area is on the Capay Unit of the SRNWR owned by USFWS and California State Parks, the proposed gravel bar removal site is within the banks of the Sacramento River, and the spoils deposit area is located just inside the east flood levee. The Action Area is located on the USGS Ord Ferry Quadrangle, Section 2 of T21N R1W.

5.3 CONSULTATION TO DATE

5.3.1 CONSULTATION HISTORY

Key meetings and consultations related to the evaluation of Proposed Action potential effects on covered species within the Action Area are described below.

- *October 4, 2011* – The Project Team, including representatives from CDFW, USFWS and NMFS, held an environmental review planning meeting to discuss the proposed project and related regulatory compliance processes, including potential options for complying with the Federal and State ESA.
- *October 20, 2011* – The Lead Agencies (CDFW and USFWS) and the Project Team reviewed and refined the summary of terrestrial resource field surveys that would be required for the Proposed Action.
- *January 10, 2012* – USFWS provided copies of the M&T/Llano Seco Pumping Plant Riparian Vegetation Mitigation Monitoring Reports, which describe December 2009, October 2010 and September 2011 observations regarding the status of riparian plantings completed as mitigation for the M&T Chico Ranch/Llano Seco Rancho Pumping Plant Maintenance of Channel Alignment Sacramento River Mile 192.5 Project.
- *June 21-28, 2012* – Coordinated with USFWS regarding terrestrial resource surveys and access to the USFWS Capay Unit during the June 25 through 28, 2012 survey period.
- *September 13, 2012* – The Project Team, including representatives from CDFW, USFWS and NMFS, held a project kick-off meeting to discuss the environmental review process to date, direction for the 2013 NEPA/CEQA document, as well as the concurrent process for ESA/CESA compliance.
- *September 14, 2012* – USFWS provided the annual mitigation report for the M&T/Llano Seco Pumping Plant Temporary Maintenance Project Grassland Restoration and Bank Swallow Conservation Easement Mitigation Monitoring at the Sacramento River National Wildlife Refuge, Rio Vista Unit and Capay Unit.
- *September 14, 2012* – USFWS provided the 2010 monitoring report titled "*Status of the Yellow-billed Cuckoo along the Sacramento River in 2010*" (Dettling and Howell 2011).
- *January 13, 2013* – USFWS provided the 2012 M&T/Llano Seco Pumping Plant Riparian Vegetation Mitigation Monitoring Report, which describes the September/October 2012 monitoring results regarding the status of riparian plantings completed as mitigation for the M&T Chico Ranch/Llano Seco Rancho Pumping Plant Maintenance of Channel Alignment Sacramento River Mile 192.5 Project.
- *January 24, 2013* – USFWS provided the 2012 monitoring report titled "*Yellow-billed Cuckoo Survey Effort Along the Sacramento and Feather Rivers*" (Dettling and Seavy 2012).

5.4 LEGAL AND STATUTORY AUTHORITIES

5.4.1 FEDERAL AND STATE ENDANGERED SPECIES ACTS

5.4.1.1 FEDERAL

The ESA establishes a Federal program to conserve, protect and restore threatened and endangered plants and animals, and their habitats. The USFWS and NMFS share responsibility for administration of the ESA. The Federal ESA (16 U.S.C. Section 1531 *et seq*.) requires projects that may affect a Federally listed threatened or endangered species to consult with the USFWS and/or NMFS. This consultation can be pursuant to either Section 7 or Section 10 of the ESA, depending on the involvement of the Federal government (e.g., Federal funding sources, permits, etc.).

Section 7 of the act mandates that all Federal agencies consult with USFWS and NMFS to ensure that the Federal agencies' actions do not jeopardize the continued existence of a listed species or destroy or adversely modify critical habitat for listed species. The USFWS (acting as NEPA lead agency) is required to consult with NMFS if it determines that the proposed action "may affect" a listed species under the jurisdiction of NMFS. Because the USFWS is the lead Federal agency, it will complete Intra-Service Section 7 consultation on those species under USFWS jurisdiction.

Under the Federal ESA, several possible determinations exist regarding a proposed action's effects on protected species (USFWS and NMFS 1998). These determinations[1] are as follows:

- No effect.
- May affect, but is not likely to adversely affect.
- May affect, is likely to adversely affect.
- Is likely to jeopardize the continued existence of a proposed species/result in the destruction or adverse modification of proposed critical habitat.

The Federal ESA prohibits the "taking" of any wildlife species listed as threatened or endangered, including the destruction of habitat that would prevent species recovery. "Taking" is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct. Under Federal regulations, "take" is defined further to include habitat modification or degradation where it actually results, or is reasonably expected to result, in death or injury to wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Wildlife Federally listed

[1] For additional detail regarding the application of the five possible Federal ESA determinations, please refer to Section 5.7 – Effects of the Proposed Action.

as threatened also are protected from take, but protection of these species may be modified at the time of their listing.

Under Section 9 of the Federal ESA, the take prohibition applies only to fish and wildlife species. However, Section 9 does prohibit the unlawful removal and reduction to possession, or malicious damage or destruction of, any endangered plant from Federal land. Section 9 prohibits acts to remove, cut, dig up, damage, or destroy an endangered plant in non-Federal areas in knowing violation of any State law or in the course of criminal trespass. Federal species of concern, and species that are proposed or under petition for listing receive no protection under Section 9 of the Federal ESA.

5.4.1.2 STATE

The California Endangered Species Act of 1984 (Fish and Game Code Section 2050 *et seq.*), is one of the laws CDFW administers to protect fish and wildlife resources by regulating the listing and "take" of endangered and threatened species. A "take" of such a species may be permitted by CDFW through issuance of permits for lawful activities pursuant to Fish and Game Code Section 2081. Under State laws, CDFW is empowered to review projects for their potential impacts to listed species and their habitats.

CESA is similar to the ESA but pertains only to State-listed endangered and threatened species. Under CESA, state agencies are subject to a general duty to "conserve" endangered and threatened species. Thus, "*all state agencies, boards, and commissions shall seek to conserve endangered species and threatened species and shall utilize their authority in furtherance of the purposes of this chapter* [1.5, regarding Endangered Species]." (Fish and Game Code Section 2055.) Consistent with this duty, state agencies "*should not approve projects as proposed which would jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat essential to the continued existence of those species, if there are reasonable and prudent alternatives available consistent with conserving the species or its habitat which would prevent jeopardy*." (Fish and Game Code Section 2053.) However, "*in the event specific economic, social, or other conditions make infeasible such alternatives, individual projects may be approved if appropriate mitigation and enhancement measures are provided*." (Fish and Game Code Section 2054.)

Pursuant to CEQA (Public Resources Code Section 21104.2) state agencies must consult with CDFW when preparing environmental impact reports to assess the effects of proposed projects on the continued existence of listed species. Agencies can approve a project that affects a listed species under CEQA, however, if the agency determines that there are "overriding considerations." (CEQA Guidelines section 15093.) This opportunity under CEQA, however, must be harmonized with the need under CESA, mentioned above, to provide "appropriate mitigation and enhancement measures" pursuant to Fish and Game Code Section 2054. CDFW may also authorize "incidental take statements" or "incidental take permits" pursuant to Fish and Game Code Section 2081 where CDFW determines that existing federal ESA incidental take

authorization meets the standards of CESA or where CDFW ensures that the "*impacts of the authorized take shall be minimized and fully mitigated*."

5.4.2 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267; 50 CFR 600), requires the identification of EFH for Federally managed fishery species and the implementation of measures to conserve and enhance this habitat. EFH includes specifically identified waters and substrate necessary for fish spawning, breeding, feeding, or growth to maturity and covers a species' full life cycle (16 U.S.C. Section 1802(10)). Federal action agencies are required to consult with NMFS on any action authorized, funded, or undertaken that may adversely impact EFH. This consultation process is usually integrated into existing environmental review procedures in accordance with the NEPA or ESA to provide the greatest level of efficiency.

The Magnuson-Stevens Act establishes jurisdiction over marine fisheries in the United States' exclusive economic zone (3 to 200 nautical miles offshore) through establishment of regional fisheries management councils that develop Fishery Management Plans (FMP). The FMPs address fishery management and conservation issues including establishing EFH to conserve and enhance species managed under FMPs. The Pacific Fisheries Management Council (PFMC) manages all species of Pacific Coast salmon pursuant to the Pacific Coast Salmon FMP, which includes the management of Chinook salmon in California. In the Mid-Pacific Region, the PFMC designates EFH and NMFS approves the designation. EFH only applies to commercial fisheries, including all runs (winter-run, spring-run and fall/late fall-run) of Chinook salmon in the Sacramento River.

The EFH provisions are intended to ensure a sustainable fishery. Originally enacted in 1976, the Magnuson-Stevens Act has been amended several times. In 1996, the Sustainable Fisheries Act amended the Magnuson-Stevens Act adding provisions intended to end overfishing and rebuild overfished fisheries, reduce bycatch, and assess and minimize the impacts of management measures on fishing communities (73 FR 60987). Congress articulated in its findings that one of the greatest long-term threats to the viability of commercial and recreational fisheries is the continuing loss of marine, estuarine, and other aquatic habitats (73 FR 60987). Habitat considerations should receive increased attention for the conservation and management of fishery resources of the United States (16 U.S.C. 1801(a)(9)). In making such findings, Congress declared one of the purposes of the MSA to be the promotion of ''*the protection of* [EFH] *in the review of projects conducted under Federal permits, licenses, or other authorities that affect or have the potential to affect such habitat*'' (16 U.S.C. 1801(b)(7)). To ensure habitat considerations receive increased attention for the conservation and management of fishery resources, the amended Magnuson-Stevens Act required each existing, and any new, FMP to: (1) describe and identify EFH; (2) minimize to the extent practicable adverse effects on such habitat caused by fishing; and (3) identify other actions to encourage the conservation and enhancement of such habitat (16 U.S.C. 1853(a)(7)).

5.4.2.1 ESSENTIAL FISH HABITAT

Federal agencies must consult with NMFS on all actions that may adversely affect EFH (Section 305(b)(2) of the Magnuson-Stevens Act). One species within the Action Area requires consultation under Section 305 of the Magnuson-Stevens Act. This species is Chinook salmon (*Oncorhynchus tshawytscha*). The following categories of Chinook salmon listed below would be subject to consultation.

- Sacramento River winter-run Chinook salmon ESU
- Central Valley spring-run Chinook salmon ESU
- Central Valley fall/late fall-run Chinook salmon ESU

The Magnuson-Stevens Act defines EFH as *"those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity,"* (16 U.S.C. § 1801 *et seq.*). For purpose of interpreting the definition of EFH, NMFS further clarified several EFH terms as follows (67 FR 2343):

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

As required by the Magnuson-Stevens Act, PFMC (1999) identified and described EFH, and identified adverse impacts and recommended conservation measures for salmon in Amendment 14 to the Pacific Coast Salmon FMP. The EFH for the Pacific Coast salmon fishery is defined as those waters and substrate necessary for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to a healthy ecosystem (PFMC 1999). The Action Area associated with the Proposed Action is within designated EFH, used by Chinook salmon.

IDENTIFICATION OF ESSENTIAL FISH HABITAT

Pacific Coast Chinook salmon stocks are managed by the Pacific Fishery Management Council (PFMC) under the Pacific Salmon Fisheries Management Plan (FMP), and these stocks primarily include fall- and late fall-run Chinook salmon from the Central Valley system (NMFS 2009a). As required by the Magnuson-Stevens Act, PFMC (1999) identified and described EFH, and identified adverse impacts and recommended conservation measures for salmon in Amendment 14 to the Pacific Coast Salmon FMP. The EFH for the Pacific Coast salmon fishery is defined as

those waters and substrate necessary for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to a healthy ecosystem (PFMC 1999). The Action Area for the Proposed Action is within the area identified as EFH for Pacific Coast salmon species identified in Amendment 14 of the Pacific Coast Salmon FMP (PFMC 1999).

According to NMFS and PFMC (2011), EFH, as currently designated, includes all streams, estuaries, marine waters, and other waterbodies occupied or historically accessible to Chinook salmon in Washington, Oregon, Idaho, and California. Historically, fall-run Chinook salmon used rivers and their tributaries in the Central Valley from the Kings River in the south to the Pit and McCloud rivers in the north (Schick et al. 2005). Late fall-run Chinook salmon probably used the Sacramento River and tributaries above Shasta Dam (Moyle et al. 1995). Exceptions include cases in which long-standing naturally occurring barriers (e.g., natural waterfalls in existence for several hundred years) or specifically identified man-made barriers (e.g., dams) represent the current upstream extent of Pacific salmon access (PFMC 1999).

Central Valley Pacific salmon freshwater EFH includes not only the watersheds of the Sacramento and San Joaquin River basins but also the San Joaquin Delta (Delta) hydrologic unit (i.e., HUC No. 18040003), Suisun Bay hydrologic unit (HUC No. 18050001) and the lower Sacramento hydrologic unit (HUC No. 18020109). Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley fall- and late fall-run Chinook salmon are species managed under the Pacific Coast Salmon FMP that occur in the Central Valley, as well as the Delta, Suisun Bay, and lower Sacramento hydrologic units.

In 1999, the PFMC identified EFH for Central Valley Chinook salmon stocks to include the Sacramento and San Joaquin rivers and their tributaries. Freshwater EFH for Chinook salmon consists of four major habitat functions: (1) adult migration corridors and adult holding habitat; (2) spawning and incubation; (3) juvenile rearing; and (4) juvenile migration corridors (PFMC 1999).

In October 2008, NMFS promulgated additional regulations specifically related to the identification of EFH for Pacific salmon (73 FR 60987). Chinook salmon EFH was defined to include "*all streams, estuaries, marine waters, and other water bodies occupied or historically accessible to Chinook salmon*…" within specified U.S. Geological Survey (USGS) hydrologic units, which include the Sacramento River.

The Magnuson-Stevens Act requires regional fishery management councils and NMFS to periodically review the EFH provisions of FMPs, and to revise or amend EFH provisions as warranted, based on available information (50 CFR 600.815(a)(10)). Reviews should be conducted periodically, and complete reviews should be conducted at least once every five years. Pacific Coast salmon EFH was first designated in 1999 as part of Amendment 14 to the Pacific Coast Salmon FMP, and was codified in 2008 as a result of the Idaho County versus Commerce court case (Idaho County et al. v. Donald Evans et al., United States District Court for the

District of Idaho, Case No. CV02-80-CEJL). Although the 2008 codification process addressed some issues (78 FR 60987), it did not constitute a full review (NMFS 2010).

In March 2011, NMFS and PFMC (2011) released a report titled, *Pacific Coast Salmon 5-Year Review of Essential Fish Habitat Final Report to the Pacific Fishery Management Council*, which described the findings from the latest five-year review, as summarized below.

- A summary of existing designations of EFH for Pacific Coast salmon.
- Currently available information on the distribution of Pacific Coast salmon in both fresh and marine waters.
- Potential changes to the existing EFH designations.
- Potential changes to the list of impassible dams that currently form the upstream extent of EFH.
- A discussion regarding whether appropriate models exist to predict salmon distribution where data on distribution are lacking.
- A discussion of potential Habitat Areas of Particular Concern.
- A summary of new information on the life history and habitat requirements of salmon.
- Updated information on threats to EFH both from fishing and non-fishing activities.
- Identification of research needs to further refine EFH.

The Magnuson-Stevens Act (50 CFR Part 600) recommends that the FMPs include specific types or areas of habitat within EFH as "habitat areas of particular concern" (HAPC) based on one or more of the following considerations: (1) the importance of the ecological function provided by the habitat; (2) the extent to which the habitat is sensitive to human-induced environmental degradation; (3) whether, and to what extent, development activities are, or will be, stressing the habitat type; and (4) the rarity of the habitat type (NMFS and PFMC 2011). The intended goal of identifying such habitats as HAPCs is to provide additional focus for conservation efforts. While the HAPC designation does not add any specific regulatory process, it highlights certain habitat types that are of high ecological importance. This designation is manifested in EFH consultations, in which NMFS can call attention to a HAPC and recommend that the Federal action agency make an extra effort to protect these important habitats (NMFS and PFMC 2011). As part of the 5-year review, NMFS and PFMC (2011) developed five potential HAPCs for Pacific Coast salmon, which include: (1) complex channels and floodplain habitats; (2) thermal refugia; (3) spawning habitat; (4) estuaries; and (5) marine and estuarine submerged aquatic vegetation.

5.5 SPECIES STATUS, CRITICAL HABITAT AND EFH

5.5.1 AQUATIC SPECIES

5.5.1.1 SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON ESU

ESA LISTING STATUS

Based on low annual run size during 1989, NMFS published an emergency rule on August 4, 1989 to list winter-run Chinook salmon as a threatened species (54 FR 32085). A proposed rule to list the species as threatened was published on March 20, 1990 (55 FR 10260). On April 2, 1990, the emergency rule of August 4 was extended to ensure continued protection of the run under the ESA while the final rule was developed (55 FR 12191). A final rule listing the run as a threatened species under the ESA was published on November 5, 1990 (55 FR 46515).

On January 4, 1994, NMFS listed the Sacramento River ESU of winter-run Chinook salmon (*Oncorhynchus tshawytscha)* as "endangered" (59 FR 440). On June 28, 2005, NMFS reaffirmed the endangered status of this ESU. Following a five-year status review, NMFS concluded that the Sacramento River winter-run Chinook salmon ESU remain listed as endangered. The ESU includes all naturally spawned populations of winter-run Chinook salmon in the Sacramento River and its tributaries in California, as well as two artificial propagation programs, including winter-run Chinook salmon from the Livingston Stone National Fish Hatchery (NFH) and winter-run Chinook salmon in a captive broodstock program maintained at Livingston Stone NFH and the University of California Bodega Marine Laboratory (NMFS 2012).

According to NMFS (1997), between 1982 and 1988, the estimated annual run-size of winter-run Chinook salmon had varied around a mean of 2,382 fish. However, the 1989 run-size was estimated at about 533 fish, roughly 75% less than average run-sizes during the past several preceding years. Based on the low return of fish in 1989, and because the USFWS hatchery program for augmenting natural production was still developmental and not likely to produce substantial numbers of juvenile winter-run Chinook for several years, CDFW recommended that the Fish and Game Commission list the winter-run as a threatened species under CESA. The commission voted not only to list the run but to list it as endangered rather than threatened. The Sacramento River winter-run Chinook salmon ESU was formally listed as endangered under CESA in August 1989 (NMFS 1997).

CRITICAL HABITAT DESIGNATION

On August 4, 1989, concurrent to the emergency listing of winter-run Chinook salmon, NMFS designated critical habitat for the population (54 FR 32085). A second emergency ruling was published on April 2, 1990, to provide for continued protection of critical habitat for winter-run Chinook salmon as the formal listing process was not yet complete (55 FR 12191).

On August 14, 1992, NMFS published a proposed critical habitat designation for the Sacramento River winter-run Chinook salmon (57 FR 35526). On June 16, 1993, the final rule designating critical habitat was published (58 FR 33212).

Designated critical habitat for the Sacramento River winter-run Chinook salmon ESU includes: the Sacramento River from Keswick Dam, Shasta County (RM 302) to Chipps Island (RM 0) at the westward margin of the Sacramento-San Joaquin Delta; all waters from Chipps Island westward to Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and Carquinez Strait; all waters of San Pablo Bay westward of the Carquinez Bridge; and those waters north of the San Francisco/Oakland Bay Bridge. Within the Sacramento River, this designation included the river water column, the river bottom (including those areas and the associated gravel used by winter-run Chinook salmon as spawning substrate), and the adjacent riparian zone (limited to those areas above a streambank that provide shade and cover to the nearshore aquatic areas) used by fry and juveniles for rearing (NMFS 2009a). Designated critical habitat encompasses the Action Area in the Sacramento River.

Primary Constituent Elements

Primary constituent elements (PCEs) are those physical and biological features essential to the conservation of a species, upon which its designated or proposed critical habitat is based. Features include space for individual and population growth, and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and habitats that are protected from disturbance or are representative of the species historic geographic and ecological distribution (USFWS 2004).

In designating critical habitat, NMFS (2009a) considers the following requirements of the species: (1) space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, or rearing offspring; and, generally, (5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species [see 50 CFR 424.12(b)]. In addition to these factors, NMFS also focuses on the known physical and biological features (essential features) within the designated area that are essential to the conservation of the species and that may require special management considerations or protection. These essential features may include, but are not limited to, spawning sites, food resources, water quality and quantity, and riparian vegetation (NMFS 2009a).

The final rule designating critical habitat for winter-run (June 16, 1993, 58 FR 33212) identifies the following physical and biological features that are essential for the conservation of winter-run: (1) access from the Pacific Ocean to appropriate spawning areas in the upper Sacramento River, (2) the availability of clean gravel for spawning substrate, (3) adequate river flows for successful spawning, incubation of eggs, fry development and emergence, and downstream

transport of juveniles, (4) water temperatures between 42.5 and 57.5°F for successful spawning, egg incubation, and fry development, (5) habitat areas and adequate prey that are not contaminated, (6) riparian habitat that provides for successful juvenile development and survival, and (7) access downstream so that juveniles can migrate from spawning grounds to San Francisco Bay and the Pacific Ocean (NMFS 2009a).

Within the range of winter-run, biological features of the designated critical habitat that are considered vital for winter-run include unimpeded adult upstream migration routes, spawning habitat, egg incubation and fry emergence areas, rearing areas for juveniles, and unimpeded downstream migration routes for juveniles (NMFS 2009a).

ABUNDANCE

According to NMFS (2009a), the abundance of winter-run Chinook salmon rapidly declined from 1969 to 1979 after completion of the RBDD and, over the next 20 years, the population eventually reached a low point of only an estimated 144 in-river spawning adults in 1994. If not for a very successful captive broodstock program, construction of a temperature control device (TCD) on Shasta Dam, having the RBDD gates up for much of the year, and restrictions in the ocean harvest, the population would have likely failed to exist in the wild (NMFS 2009a).

Annual run sizes of winter-run Chinook salmon are reported in "GrandTab," a database administered by CDFG for the Central Valley that includes reported run size estimates from 1960 through 2011, although mainstem Sacramento River estimates are not available for years before 1969. In recent years, the carcass survey population estimates of in-river spawning winter-run Chinook salmon in the mainstem Sacramento River included a high of 17,197 in 2006, followed by a precipitous decline in 2007 (2,487 fish) that continued in 2008 (2,725 fish). The most recent estimates of in-river spawning winter-run Chinook salmon in the mainstem Sacramento River are 4,416 in 2009, 1,533 in 2010 and 738 in 2011.

GENERAL LIFE HISTORY AND HABITAT REQUIREMENTS

The life history and habitat requirements of the Central Valley winter-run Chinook salmon ESU, particularly as they pertain to the Action Area, were described in Section 3.3.1.4 of this EA/IS, and are not repeated in detail here. In summary, adult and juvenile winter-run Chinook salmon utilize the Sacramento River in the Action Area as a migration corridor. Based on available information, adult winter-run Chinook salmon generally migrate upstream through the Action Area from November through June.

During the in-river work period (July 1 through October 15) for the Proposed Action, the only lifestage of winter-run Chinook salmon in the Action Area is juvenile emigration (and transient rearing). Although juvenile winter-run Chinook salmon downstream migration in the Upper Sacramento River reportedly can extend from mid-July through March, it is likely that most juvenile emigration occurs through the Action Area after October.

Additional information on winter-run Chinook salmon life history, species status and population trends can be found in the 2009 NMFS Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project (NMFS 2009a), and is incorporated herein by reference.

LIMITING FACTORS, THREATS, AND STRESSORS

Limiting factors and threats supporting the listing of the Sacramento River winter-run Chinook salmon ESU are presented in two documents. The first is titled *''Factors for Decline: A Supplement to the Notice of Determination for West Coast Steelhead''* (NMFS 1996). That report concluded that all of the factors identified in Section 4(a)(1) of the ESA have played roles in the decline of steelhead and other salmonids, including Chinook salmon. The report identifies destruction and modification of habitat, overutilization of fish for commercial and recreational purposes, and natural and human-made factors as being the primary reasons for the declines of west coast steelhead and other salmonids including Chinook salmon. The second document is a supplement to the document referred to above. This document is titled *''Factors Contributing to the Decline of West Coast Chinook Salmon: An Addendum to the 1996 West Coast Steelhead Factors for Decline Report''* (NMFS 1998).

At the ESU level, more recent descriptions of limiting factors, threats and stressors are provided in the CVP/SWP OCAP BA (Reclamation 2008), the CVP/SWP OCAP BO (NMFS 2009a), and the *"Public Draft Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of Central Valley Steelhead"* (NMFS Draft Recovery Plan) (NMFS 2009b).

Regarding limiting factors, threats and stressors associated with the Sacramento River winter-run Chinook salmon ESU, these five documents are incorporated herein, and should be referred to for additional descriptions, in addition to the brief summary provided below.

NMFS (2009b) states that several factors have contributed to the decline of winter-run Chinook salmon through degradation of spawning, rearing, and migration habitats. The primary factors include blockage of historical habitat by Shasta and Keswick dams, warm water releases from Shasta Dam, juvenile and adult passage constraints at RBDD, water exports in the southern Delta, heavy metal contamination from Iron Mountain Mine, high ocean harvest rates and entrainment in a large number of unscreened or poorly screened water diversions (NMFS 1997). Other factors include smaller water manipulation facilities and dams, loss of rearing habitat in the lower Sacramento River and Delta from levee construction, marshland reclamation, interaction with and predation by introduced species, adverse flow conditions, high summer water temperatures and vulnerability to drought (NMFS 1997).

Stressors of "Very High" importance to the Sacramento River winter-run Chinook salmon ESU identified in the Draft Recovery Plan (NMFS 2009b) include: (1) the barriers of Keswick and Shasta dams, which block access to historic staging and spawning habitat; (2) flow fluctuations, water pollution, water temperature impacts in the upper Sacramento River during embryo

incubation; (3) loss of juvenile rearing habitat in the form of lost natural river morphology and function, and lost riparian habitat and instream cover; (4) predation during juvenile rearing and outmigration; (5) ocean harvest; and (6) entrainment of juveniles at the C.W. Jones and Harvey O. Banks pumping plants. The potential effects of long-term climate change also may adversely affect winter-run Chinook salmon and their recovery.

VIABILITY

Because the Sacramento River winter-run Chinook salmon ESU is represented by a single naturally spawning population that has been completely displaced from its historical spawning habitat by the construction of Shasta and Keswick Dams, and the spawning population is confined to spawning habitat on the Sacramento River between Keswick Dam and RBDD which is artificially maintained by cold-water releases from Shasta Dam, NMFS (70 FR 37160; Good et al. 2005) considered the ESU to be "in danger of extinction" due to risks associated with its reduced diversity and spatial structure.

According to NMFS (2009a), winter-run Chinook salmon fail the representation and redundancy rule for ESU viability, because the ESU is restricted to one current population outside of its historic distribution. Due to population size, population growth rate, diversity and spatial structure considerations, NMFS (2009a) concluded that the Sacramento River winter-run Chinook salmon ESU is at a "high risk of extinction."

In 2011, NMFS completed a 5-year status review of the Sacramento River winter-run Chinook salmon ESU. According to NMFS (2011a), Sacramento River winter-run Chinook salmon have declined in abundance since 2005, and the 10-year trend in abundance is negative, the natural population size peaked in 2006 (17,205), and has since experienced a sharp decline in the past four years. In evaluating escapement estimate data through 2010, NMFS (2011a) stated that the population growth rate or cohort replacement rate (CRR) for the ESU has been negative for the past 4 years indicating it has been declining and is not self-sustaining. Review of GrandTab estimates for escapement of winter-run Chinook salmon supports that conclusion, with an estimate of only 738 winter-run Chinook salmon in 2011.

Citing Williams et al. (2011), NMFS (2011a) concludes that the Sacramento River winter-run Chinook salmon ESU continues to be at a high risk of extinction, and the ESU remains in danger of extinction and will so until additional low-risk populations are re-established within its historical spawning range.

RECOVERY PLAN AND RECOVERY GUIDANCE

The ESA requires recovery plans to incorporate (to the maximum extent practicable) objective, measurable criteria which, when met, would result in a determination in accordance with the provisions of the ESA that the species can be removed from the Federal List of Endangered and Threatened Wildlife and Plants (50 CFR 17.11 and 17.12). NMFS has not yet issued a final

approved recovery plan for this ESU. A draft proposed plan was released in 1997 that did have objective, measureable criteria, but that plan was never finalized (NMFS 2011a).

In 2009, NMFS released a draft proposed multi-species recovery plan for Central Valley salmon and steelhead. The Draft Recovery Plan (NMFS 2009b) contains proposed recovery criteria that reflect the best available and most-up-to-date information on the biology of the species and its habitat and address both biological parameters as well as the listing factors (NMFS 2011a). The proposed biological recovery criteria in the 2009 Draft Recovery Plan are based on the Viable Salmon Population (VSP) criteria developed by McElhany et al. (2000).

Establishment of a second naturally-spawning population is considered critical to the long-term viability of the Sacramento River winter-run Chinook salmon ESU, and plans are under way to attempt establishment of a second population in the upper Battle Creek watershed (NMFS Website 2013).

According to NMFS (Website 2013), the primary priority remaining for the Sacramento River winter-run Chinook salmon ESU is the establishment of an additional population or populations within the ESU. With only one population, the effects of other remaining threats are exacerbated. CALFED's Battle Creek Restoration Project is another priority action to address limiting factors. This project has already restored stream reaches in the 42 miles of Upper Battle Creek suitable for winter-run Chinook salmon. The upper reach is to be fully restored under an agreement between Pacific Gas and Electric and the resource agencies (NMFS Website 2013). Continued funding and implementation of CALFED's Ecosystem Restoration Program and the CVPIA remain a priority overall to continue habitat restoration efforts, screening of diversions, flow and temperature monitoring, status and trends research monitoring, modification of structures to improve fish passage, and overall water quality improvements (NMFS Website 2013).

5.5.1.2 CENTRAL VALLEY SPRING-RUN CHINOOK SALMON ESU

ESA LISTING STATUS

On September 16, 1999, NMFS listed the Central Valley ESU of spring-run Chinook salmon (*Oncorhynchus tshawytscha)* as a "threatened" species (64 FR 50394). On June 14, 2004, following a five-year species status review, NMFS proposed that the Central Valley spring-run Chinook salmon remain listed as a threatened species based on the Biological Review Team strong majority opinion that the Central Valley spring-run Chinook ESU is ''likely to become endangered within the foreseeable future'' due to the greatly reduced distribution of Central Valley spring-run Chinook salmon and hatchery influences on the natural population. On June 28, 2005, NMFS reaffirmed the threatened status of the Central Valley spring-run Chinook salmon ESU, and included the FRFH spring-run Chinook salmon population as part of the Central Valley spring-run Chinook salmon ESU (70 FR 37160).

Section 4(c)(2) of the ESA requires that NMFS review the status of listed species under its authority at least every five years and determine whether any species should be removed from the list or have its listing status changed. In August 2011, NMFS completed a 5-year status review of the Central Valley spring-run Chinook salmon ESU. Prior to making a determination whether the listing status of a species should be uplisted (i.e., threatened to endangered), downlisted (i.e., endangered to threatened), or remain unchanged, NMFS considered: (1) new scientific information that has become available since the 2005 status review (Good et al. 2005); (2) an updated biological status summary report (Williams et al. 2011) intended to determine whether or not the biological status of spring-run Chinook salmon has changed since the 2005 status review was conducted (referred to as the "viability report"); (3) the current threats to the species; and (4) relevant conservation measures.

Based on a review of available information, NMFS recommended that the Central Valley spring-run Chinook salmon ESU remain classified as a threatened species. NMFS' review also indicates that the biological status of the ESU has declined since the previous status review in 2005, and therefore, NMFS recommended that the ESU's status be reassessed in 2 to 3 years if it does not respond positively to improvements in environmental conditions and management actions. As part of the 5-year review, NMFS also re-evaluated the status of the FRFH stock and concluded that it still should be considered part of the Central Valley spring-run Chinook salmon ESU.

In addition to Federal regulations, the California Endangered Species Act (CESA, Fish and Game Code Sections 2050 to 2089) establishes various requirements and protections regarding species listed as threatened or endangered under State law. California's Fish and Game Commission is responsible for maintaining lists of threatened and endangered species under CESA. Spring-run Chinook salmon in the Sacramento River Basin was listed as a threatened species under CESA on February 2, 1999.

CRITICAL HABITAT DESIGNATION

According to NMFS (2009a), critical habitat was designated for spring-run Chinook salmon on September 2, 2005 (70 FR 52488), and includes stream reaches of the Feather and Yuba Rivers, Big Chico, Butte, Deer, Mill, Battle, Antelope, and Clear creeks, the Sacramento River, as well as portions of the northern Delta. Critical habitat includes the stream channels in the designated stream reaches and the lateral extent as defined by the ordinary high-water line. In areas where the ordinary high-water line has not been defined, the lateral extent will be defined by the bankfull elevation (defined as the level at which water begins to leave the channel and move into the floodplain; it is reached at a discharge that generally has a recurrence interval of 1 to 2 years on the annual flood series; Bain and Stevenson 1999; 70 FR 52488, September 2, 2005). Critical habitat was designated for the Central Valley spring-run Chinook salmon ESU on September 2, 2005 (70 FR 52488). It encompasses the Action Area in the Sacramento River.

Primary Constituent Elements

As described above for winter-run Chinook salmon, PCEs are those physical and biological features essential to the conservation of a species for which its designated or proposed critical habitat is based on. NMFS focuses on the known physical and biological features (essential features) within the designated area that are essential to the conservation of the species and that may require special management considerations or protection.

Critical habitat for spring-run Chinook salmon is defined as specific areas that contain the PCEs and physical habitat elements essential to the conservation of the species (NMFS 2009a). Within the range of the spring-run Chinook salmon ESU, biological features of the designated critical habitat that are considered vital for spring-run Chinook salmon include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, estuarine areas, and nearshore and offshore marine areas. Detailed descriptions of the freshwater PCEs for the Central Valley spring-run Chinook salmon ESU can be found in NMFS (2009a).

ABUNDANCE

Spring-run Chinook salmon were once the most abundant run of salmon in the Central Valley (Campbell and Moyle 1990) and were found in both the Sacramento and San Joaquin drainages. The Central Valley drainage as a whole is estimated to have supported annual runs of spring-run Chinook salmon as large as 600,000 fish between the late 1880s and 1940s (CDFG 1998). More than 500,000 spring-run Chinook salmon were caught in the Sacramento-San Joaquin commercial fishery in 1883 alone (Yoshiyama et al. 1998). Before the construction of Friant Dam, nearly 50,000 adults were counted in the San Joaquin River (Fry 1961). The San Joaquin populations were essentially extirpated by the 1940s, with only small remnants of the run that persisted through the 1950s in the Merced River (Hallock and Van Woert 1959; Yoshiyama et al. 1998).

The Central Valley spring-run Chinook salmon ESU has displayed broad fluctuations in adult abundance. GrandTab estimates of in-river spawning spring-run Chinook salmon in the Sacramento River and its tributaries (not including the lower Yuba and Feather rivers because GrandTab does not distinguish between fall-run and spring-run Chinook salmon in-river spawners) have ranged from 1,404 in 1993 to 25,890 in 1982.

The average abundance for in-river spawning spring-run Chinook salmon for the Sacramento River and its tributaries (excluding the lower Yuba and Feather rivers – see above) was 11,596 for the period extending from 1970 through 1979, 14,240 for the period 1980 through 1989, 5,825 for the period 1990 through 1999, and 8,900 for the period 2000 through 2009. The estimated spring-run Chinook salmon run size was 2,131 for 2010 and 3,064 for 2011. Since 1995, spring-run Chinook salmon annual run size estimates have generally been dominated by Butte Creek returns, which have averaged 5,718 fish from 1995 through 2011, representing 66% of the entire run over this period.

GENERAL LIFE HISTORY AND HABITAT REQUIREMENTS

The life history and habitat requirements the Central Valley spring-run Chinook salmon ESU, particularly as they pertain to the Action Area, were described in Section 3.3.1.4 of this EA/IS, and are not repeated in detail here. In summary, adult and juvenile spring-run Chinook salmon utilize the Sacramento River in the Action Area as a migration corridor. Adult spring-run Chinook salmon potentially could be migrating upstream through the Action Area between March and September, although peak spawning migration through this area of the Sacramento River reportedly occurs during May and June. Additionally, studies have shown that spring-run Chinook salmon in Butte Creek may arrive as early as mid-February (T. McReynolds CDFW, 2013, pers. comm.). Based on available information, most juvenile emigration occurs through the Action Area from November to May, although there is a very limited potential for juvenile spring-run Chinook salmon to occur in the Action Area during the in-river work period.

Additional information on spring-run Chinook salmon life history, species status and population trends can be found in the 2009 NMFS Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project (NMFS 2009a), and is incorporated herein by reference.

LIMITING FACTORS, THREATS, AND STRESSORS

As previously described for Sacramento River winter-run Chinook salmon, limiting factors and threats supporting the listing of the Central Valley spring-run Chinook salmon ESU are presented in two documents: (1) *''Factors for Decline: A Supplement to the Notice of Determination for West Coast Steelhead''* (NMFS 1996); and (2). *''Factors Contributing to the Decline of West Coast Chinook Salmon: An Addendum to the 1996 West Coast Steelhead Factors for Decline Report''* (NMFS 1998). More recent descriptions of limiting factors, threats and stressors for spring-run Chinook salmon are provided in the CVP/SWP OCAP BA (Reclamation 2008), the CVP/SWP OCAP BO (NMFS 2009a), and the *"Public Draft Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of Central Valley Steelhead"* (NMFS Draft Recovery Plan) (NMFS 2009b).

These five documents are incorporated herein, and should be referred to for additional descriptions of limiting factors, threats and stressors associated with the Central Valley spring-run Chinook salmon ESU, in addition to the brief summary provided below.

According to the NMFS Draft Recovery Plan (NMFS 2009b), threats to Central Valley spring-run Chinook salmon are in three broad categories: (1) loss of historical spawning habitat; (2) degradation of remaining habitat; and (3) threats to the genetic integrity of the wild spawning populations from the Feather River Fish Hatchery spring-run Chinook salmon production program. As stated in NMFS (2009b), the Central Valley spring-run Chinook salmon ESU continues to be threatened by habitat loss, degradation and modification, small hydropower dams and water diversions that reduce or eliminate instream flows during migration, unscreened or

inadequately screened water diversions, excessively high water temperatures, and predation by non-native species. The potential effects of long-term climate change also may adversely affect spring-run Chinook salmon and their recovery. The 2009 NMFS OCAP BO (2009a) identified the factors that have led to the current status of the species to be habitat blockage, water development and diversion dams, water conveyance and flood control, land use activities, water quality, hatchery operations and practices, over-utilization (e.g., ocean commercial and sport harvest, inland sport harvest), disease and predation, environmental variation (e.g., natural environmental cycles, ocean productivity, global climate change), and non-native invasive species.

VIABILITY

Because the Central Valley spring-run Chinook salmon ESU continues to display broad fluctuations in abundance, is confined to relatively few remaining streams containing high quality spawning sites with adequate water and substrate conditions, or rearing sites with adequate floodplain connectivity, cover, and water conditions (i.e., key primary constituent elements of critical habitat that contribute to its conservation value), NMFS (2005a) considered the ESU to be at a moderate risk of extinction.

According to NMFS (2009a), spring-run Chinook salmon fail the representation and redundancy rule for ESU viability, because the current distribution of independent populations has been severely constricted to only one of their former geographic diversity groups. NMFS (2009a) concluded that the Central Valley spring-run Chinook salmon ESU is at moderate risk of extinction.

In 2011, NMFS completed a 5-year status review of the Central Valley spring-run Chinook salmon ESU. According to NMFS (2011), new information for the Central Valley spring-run Chinook salmon ESU suggests an increase in extinction risk. With a few exceptions, Central Valley spring-run Chinook salmon escapements has declined over the past 10 years, in particular since 2006 (NMFS 2011). Overall, the recent declines have been significant but not severe enough to qualify as a catastrophe under the criteria of Lindley et al. (2007). On the positive side, spring-run Chinook salmon appear to have been re-populating Battle Creek and increasing in abundance in Clear Creek in recent years.

The status of the Central Valley spring-run Chinook salmon ESU has probably deteriorated on balance since the 2005 status review and Lindley et al.'s (2007) assessment, with two of the three extant independent populations of spring-run Chinook salmon slipping from low or moderate extinction risk to high extinction risk (NMFS 2011). Butte Creek remains at low risk. By contrast, spring-run Chinook salmon in Battle and Clear creeks have increased in abundance over the last decade, reaching levels of abundance that place these populations at moderate extinction risk (NMFS 2011).

In summary, NMFS (2011) states that the status of the Central Valley spring-run Chinook salmon ESU has probably deteriorated since the 2005 status review. According to NMFS (2011),

improvements in the status of two spring-run Chinook salmon populations in the Central Valley are not sufficient to warrant a downgrading of the ESU extinction risk, and the degradation in status of three formerly low- or moderate-risk independent populations is cause for concern. New information available since Good et al. (2005) indicates an increased extinction risk (NMFS 2011).

RECOVERY PLAN IMPLEMENTATION

NMFS has not yet issued a final approved recovery plan for the Central Valley spring-run Chinook salmon ESU. In 2009, NMFS released a draft proposed multi-species recovery plan for Central Valley salmon and steelhead. The Draft Recovery Plan (NMFS 2009b) contains proposed recovery criteria that reflect the best available information on the biology of the species and its habitat, and address both biological parameters as well as the listing factors (NMFS 2011a). The proposed biological recovery criteria in the draft 2009 recovery plan are based on the Viable Salmon Population (VSP) criteria developed by McElhany et al. (2000).

Recovery of the Central Valley spring-run Chinook salmon ESU continues to be limited by geographic proximity of the only three remaining wild spring-run Chinook salmon populations with consistent spawning runs. Thus, the ESU is vulnerable to disease and catastrophic events, loss of spawning habitat, widespread degradation and modification of remaining habitat (especially spawning and rearing habitat), and genetic threats from the Feather River Fish Hatchery (NMFS Website 2013). The conceptual recovery scenario for the Central Valley spring-run Chinook Salmon ESU includes: (1) securing extant populations by implementing key habitat restoration actions, particularly in the near term; and (2) establishment of additional viable independent populations in the ESU (NMFS 2009b).

As with Sacramento River winter-run Chinook salmon, CALFED's Battle Creek Restoration Project is a priority action for the recovery of the Central Valley spring-run Chinook salmon. According to NMFS (Website 2013), continued funding and implementation of CALFED's Ecosystem Restoration Program and the CVPIA remain a priority overall to continue habitat restoration efforts, screening of diversions, flow and temperature monitoring, status and trends research monitoring, modification of structures to improve fish passage, and overall water quality improvements.

5.5.1.3 CENTRAL VALLEY STEELHEAD DPS

ESA LISTING STATUS

On March 19, 1998 (63 FR 13347) NMFS listed the California Central Valley steelhead ESU as "threatened", concluding that the risks to Central Valley steelhead had diminished since the completion of the 1996 status review based on a review of existing and recently implemented State conservation efforts and Federal management programs (e.g., CVPIA, AFRP, CALFED) that address key factors for the decline of this species. The California Central Valley steelhead

ESU included all naturally spawned populations of steelhead in the Sacramento and San Joaquin rivers and their tributaries, but excluded steelhead from the tributaries of San Francisco and San Pablo bays (NMFS 2004a).

On June 14, 2004, NMFS proposed listing determinations for 27 ESUs of West Coast salmon and *O. mykiss*, including the California Central Valley steelhead ESU. In the proposed rule, NMFS concluded that steelhead were not in danger of extinction, but were likely to become endangered within the foreseeable future throughout all or a significant portion of their range and, thus, proposed that steelhead remain listed as threatened under the ESA. Steelhead from the Coleman National Fish Hatchery and the Feather River Fish Hatchery, as well as resident populations of *O. mykiss* (rainbow trout) below impassible barriers that co-occur with anadromous populations, were included in the California Central Valley steelhead ESU and, therefore, also were included in the proposed listing.

During the 2004 comment period on the proposed listings, the USFWS provided comments that the USFWS does not use NMFS' ESU policy in any USFWS ESA listing decisions. As a result of the comments received, NMFS re-opened the comment period to receive comments on a proposed alternative approach to delineating ''species'' of West Coast *O. mykiss* (70 FR 67130). NMFS proposed to depart from past practice of applying the ESU Policy to *O. mykiss* stocks, and instead proposed to apply the DPS Policy in determining ''species'' of *O. mykiss* for listing consideration. NMFS noted that within a discrete group of *O. mykiss* populations, the resident and anadromous life forms of *O. mykiss* remain ''markedly separated'' as a consequence of physical, physiological, ecological, and behavioral factors, and may therefore warrant delineation as separate DPSs (71 FR 834).

NMFS issued a policy for delineating distinct population segments of Pacific salmon in 1991 (56 FR 58612; November 20, 1991). Under this policy, a group of Pacific salmon populations is considered an ''Evolutionarily Significant Unit'' if it is substantially reproductively isolated from other conspecific populations, and it represents an important component in the evolutionary legacy of the biological species. In 1996, NMFS and USFWS adopted a joint policy for recognizing DPSs under the ESA (DPS Policy; 61 FR 4722; February 7, 1996). The DPS Policy adopted criteria similar to, but somewhat different from, those in the ESU Policy for determining when a group of vertebrates constitutes a DPS – the group must be discrete from other populations, and it must be significant to its taxon. A group of organisms is discrete if it is ''*markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, and behavioral factors*.'' Significance is measured with respect to the taxon (species or subspecies) as opposed to the full species (71 FR 834). Although the ESU Policy did not by its terms apply to steelhead, the DPS Policy stated that NMFS will continue to implement the ESU Policy with respect to ''Pacific salmonids'' (which included *O. mykiss*). In a previous instance of shared jurisdiction over a species (Atlantic salmon), NMFS and USFWS used the DPS Policy in their determination to list the Gulf of Maine DPS of Atlantic salmon as endangered (65 FR 69459; November 17, 2000).

Given NMFS and USFWS shared jurisdiction over *O. mykiss*, and consistent with joint NMFS and USFWS approaches for Atlantic salmon, it was concluded that application of the joint DPS policy was logical, reasonable, and appropriate for identifying DPSs of *O. mykiss (*71 FR 834). Moreover, NMFS determined that use of the ESU policy — originally intended for Pacific salmon — should not continue to be extended to *O. mykiss*, a type of salmonid with characteristics not typically exhibited by Pacific salmon (71 FR 834).

On January 5, 2006 NMFS issued a final decision that defined Central Valley steelhead as a DPS rather than an ESU, and retained the status of Central Valley steelhead as threatened (71 FR 834). The DPS includes all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in the Sacramento and San Joaquin Rivers and their tributaries, excluding steelhead from San Francisco and San Pablo Bays and their tributaries (63 FR 13347). Steelhead in two artificial propagation programs — the Coleman National Fish Hatchery, and Feather River Fish Hatchery steelhead hatchery programs are considered to be part of the DPS. NMFS determined that these artificially propagated stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the DPS (71 FR 834).

In August 2011, NMFS completed a 5-year status review of the Central Valley steelhead DPS. Based upon a review of available information, NMFS (2011b) recommended that the Central Valley steelhead DPS remain classified as a threatened species. However, NMFS (2011b) also indicated that the biological status of the DPS has declined since the previous status review in 2005 and, therefore, NMFS recommend that the DPS's status is reassessed in 2 to 3 years if it does not respond positively to improvements in environmental conditions and management actions. In the interim period, NMFS also recommended that the status of the DPS should be monitored and the most recent genetic information for the DPS, including information for the four steelhead hatchery stocks, should be reviewed to re-assess the DPS membership status of the Nimbus and Mokelumne River hatcheries. New information resulting from the genetics review should be incorporated into any updated status review for the DPS (NMFS 2011b).

Central Valley steelhead has no State listing status.

CRITICAL HABITAT DESIGNATION

On February 16, 2000 (65 FR 7764), NMFS published a final rule designating critical habitat for Central Valley steelhead. Critical habitat was designated to include all river reaches accessible to listed steelhead in the Sacramento and San Joaquin rivers and their tributaries in California, including the lower Yuba River upstream to Englebright Dam. NMFS proposed new critical habitat for spring-run Chinook salmon and Central Valley steelhead on December 10, 2004 (69 FR 71880) and published a final rule designating critical habitat for these species on September 2, 2005. The critical habitat designation includes the Action Area, which is part of the Tehama Hydrologic Unit (HU) 5504. The Tehama Hydrologic Unit includes the upstream reach of the Sacramento River to Antelope Creek (70 FR 52488 (September 2, 2005)).

Primary Constituent Elements

As previously described for Chinook salmon, PCEs for steelhead are those physical and biological features essential to the conservation of a species, and which serve as the basis for designation of critical habitat.

Critical habitat for spring-run is defined as specific areas that contain the PCEs and physical habitat elements essential to the conservation of the species (NMFS 2009a). The critical habitat designation (70 FR 52488, September 2, 2005) lists PCEs for steelhead. The PCEs include sites essential to support one or more lifestages of the DPS including freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, estuarine areas, and nearshore and offshore marine areas. Detailed descriptions of the freshwater PCEs for the Central Valley steelhead DPS can be found in NMFS (2009a).

ABUNDANCE

According to NMFS (2009b), steelhead historically occurred naturally throughout the Sacramento and San Joaquin River basins, although stocks have been extirpated from large areas in both basins. The California Advisory Committee on Salmon and Steelhead (CDFG 1988) reported a reduction in Central Valley steelhead habitat from 6,000 miles historically to 300 miles.

NMFS (2009b) reported that prior to dam construction, water development and watershed perturbations, Central Valley steelhead were distributed throughout the Sacramento and San Joaquin rivers (Busby et al. 1996; McEwan 2001). Existing wild steelhead stocks in the Central Valley are mostly confined to the upper Sacramento River and its tributaries, including Antelope, Deer, and Mill creeks, and the Yuba River. Populations may exist in Big Chico and Butte creeks, and a few wild steelhead are produced in the American and Feather rivers (McEwan 2001).

It is possible that naturally spawning populations exist in many other streams but are undetected due to lack of monitoring programs (IEP Steelhead Project Work Team 1999 in NMFS 2009b). Naturally spawning populations of steelhead also occur in the Feather, Yuba, American, and Mokelumne rivers, but these populations have had substantial hatchery influence and their ancestries are not clear (Busby et al. 1996). Steelhead runs in the Feather and American rivers are sustained largely by the FRFH and Nimbus Hatchery (McEwan and Jackson 1996). Steelhead also currently occur in the Stanislaus, Calaveras, Merced, and Tuolumne rivers (NMFS 2009b).

Historic Central Valley steelhead run sizes are difficult to estimate because of the lack of data, but McEwan (2001) suggested that steelhead run sizes may have approached one to two million adults annually. McEwan and Jackson (1996) suggested that by the early 1960s, the steelhead run size had declined to about 40,000. Over the last 30 years the steelhead populations in the upper Sacramento River have declined substantially (NMFS 2009b). In 1996, NMFS estimated the Central Valley total run size based on dam counts, hatchery returns, and past spawning surveys was probably fewer than 10,000 fish. Both natural and hatchery runs have declined since

the 1960s. Counts at RBDD averaged 1,400 fish from 1991 to 1996, compared to counts in excess of 10,000 fish in the late 1960s (McEwan and Jackson 1996).

Specific information regarding steelhead spawning within the mainstem Sacramento River is limited due to lack of monitoring (NMFS 2004). Currently, the number of steelhead spawning in the Sacramento River is unknown because redds cannot be distinguished from a large resident rainbow trout population that has developed as a result of managing the upper Sacramento River for coldwater species.

The lack of sustained monitoring programs for steelhead throughout most of the Central Valley persists to the present time. There is a paucity of reliable data to estimate run sizes of steelhead in the Central Valley, particularly wild stocks. However, some steelhead escapement monitoring surveys have been initiated in upper Sacramento River tributaries (e.g., Beegum, Deer, and Antelope Creeks) using snorkel methods similar to spring-run Chinook escapement surveys (NMFS 2009a).

There is a general lack of steelhead population monitoring in most of the Central Valley (NMFS 2009a). Lindley et al. (2007) stated that there are almost no data with which to assess the status of any of the Central Valley steelhead populations. They further stated that Central Valley steelhead populations are classified as data deficient, with the exceptions restricted to streams with long-running hatchery programs including Battle Creek and the Feather, American and Mokelumne rivers. These statements remain germane today.

GENERAL LIFE HISTORY AND HABITAT REQUIREMENTS

The life history and habitat requirements of the Central Valley steelhead ESU, particularly as they pertain to the Action Area, were described in Section 3.3.1.4 of this Draft EA/IS, and are not repeated in detail here. Adult and juvenile steelhead primarily utilize the Sacramento River in the Action Area as a migration corridor. Adult steelhead are not known to spawn within the Sacramento River in the vicinity of the Action Area. Adult steelhead are generally believed to migrate upstream through the Action Area from August through March, with peak immigration occurring during January and February. Juveniles may be present during their downstream migration primarily from January through May.

Additional information on steelhead life history, species status and population trends can be found in the 2009 NMFS Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project (NMFS 2009a), and is incorporated herein by reference.

LIMITING FACTORS, THREATS, AND STRESSORS

As stated by NMFS (2005b), the factors affecting the survival and recovery of Central Valley steelhead and their habitat are similar to those affecting spring-run Chinook salmon and are primarily associated with habitat loss (McEwan 2001). McEwan and Jackson (1996) attribute

this habitat loss and other impacts to steelhead habitat primarily to water development resulting in inadequate flows, flow fluctuations, blockages, and entrainment into diversions. Because most suitable habitat has been lost to dam construction, juvenile steelhead rearing is generally confined to lower elevation stream reaches, where water temperatures during late summer and early fall can be sub-optimal (NMFS 2005b).

The five documents providing descriptions of limiting factors, threats and stressors for winter-run and spring-run Chinook salmon also pertain to Central Valley steelhead, and should be referred to for additional discussion regarding the Central Valley steelhead DPS, in addition to the brief summary provided below.

According to the NMFS Draft Recovery Plan (NMFS 2009b), threats to Central Valley steelhead are similar to those for spring-run Chinook salmon and fall into three broad categories: (1) loss of historical spawning habitat; (2) degradation of remaining habitat; and (3) threats to the genetic integrity of the wild spawning populations from hatchery steelhead production programs in the Central Valley. Also, as for spring-run Chinook salmon, the potential effects of long-term climate change also may adversely affect steelhead and their recovery.

NMFS (2009b) identified several major stressors presently applicable to the entire Central Valley steelhead DPS. Many of the most important stressors specific to the steelhead DPS correspond to the stressors described for the spring-run Chinook salmon ESU. The 2009 NMFS OCAP BO (2009a) identified factors leading to the current status of the spring-run Chinook salmon ESU, which also are applicable to the steelhead DPS, including habitat blockage, water development and diversion dams, water conveyance and flood control, land use activities, water quality, hatchery operations and practices, over-utilization (e.g., ocean commercial and sport harvest, inland sport harvest), disease and predation, environmental variation (e.g., natural environmental cycles, ocean productivity, climate change), and non-native invasive species.

Threats and stressors for the Central Valley steelhead DPS identified in Appendix B (Threats Assessment) of the NMFS Draft Recovery Plan (NMFS 2009b) include: (1) destruction, modification, or curtailment of habitat or range; (2) overutilization for commercial, recreational, scientific or education purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms, including Federal and non-Federal efforts; (5) other natural and man-made factors affecting its continued existence; and (6) non-lifestage specific threats and stressors including artificial propagation programs, small population size, genetic integrity and long-term climate change.

VIABILITY

According to NMFS (2005a), both the Biological Review Team (Good et al. 2005) and the Artificial Propagation Evaluation Workshop (69 FR 33102) concluded that the Central Valley steelhead ESU was “in danger of extinction.” However, in the proposed status review NMFS concluded that the ESU in-total is “not in danger of extinction, but is likely to become endangered within the foreseeable future” citing unknown benefits of restoration efforts and a

yet to be funded monitoring program (69 FR 33102). Because the Central Valley steelhead population has been fragmented into smaller isolated tributaries without any large source population and the remaining habitat continues to be degraded by water diversions, NMFS (2005a) considered the [at that time] ESU to be at "high risk of extinction."

As described by NMFS (2009b), there are few data with which to assess the status of Central Valley steelhead populations. Lindley et al. (2007) stated that, with the few exceptions of streams with long-running hatchery programs such as Battle Creek and the Feather, American and Mokelumne rivers, Central Valley steelhead populations are classified as data deficient. In all cases, hatchery-origin fish likely comprise the majority of the natural spawning run, placing the natural populations at high risk of extinction (Lindley et al. 2007). As of 2009, NMFS (2009b) reinforced the conclusion that the Central Valley steelhead DPS is data deficient, with the exception of these hatchery programs.

Presently, little information is available regarding the abundance of steelhead in the Central Valley (CDFG 2010a). Currently there is virtually no coordinated, comprehensive, or consistent monitoring of steelhead in the Central Valley.

According to NMFS (2009b), data are lacking to suggest that the Central Valley steelhead DPS is at low risk of extinction, or that there are viable populations of steelhead anywhere in the DPS. Conversely, there is evidence to suggest that the Central Valley steelhead DPS is at moderate or high risk of extinction (NMFS 2009b). Without demonstrably viable populations in any of the diversity groups that historically contained them, Central Valley steelhead fail the representation and redundancy rule for DPS viability (NMFS 2009b).

In 2011, NMFS completed a 5-year status review of the Central Valley steelhead DPS. According to NMFS (2011b), the most recent biological information suggests that the extinction risk of the Central Valley steelhead DPS has increased since the last status review and that several of the listing factors have contributed to the decline, including recent years of drought and poor ocean conditions. There continue to be ongoing threats to the genetic integrity of natural or wild steelhead from hatchery steelhead programs in the Central Valley, but it is unclear if or how this factor has influenced the overall viability of the DPS (NMFS 2011b).

RECOVERY PLAN IMPLEMENTATION

In 2009, NMFS released a draft proposed multi-species recovery plan for Central Valley salmon and steelhead. The Draft Recovery Plan (NMFS 2009b) contains proposed recovery criteria, based on VSP, that address both biological parameters as well as the listing factors. NMFS has not yet issued a final approved recovery plan for the Central Valley steelhead DPS.

The recovery potential for the Central Valley steelhead DPS was determined to be low to moderate due to a lack of suitable habitat (requiring cold water and high elevation) below impassable barriers, inadequate status and trends data to assess DPS viability, and the widespread stocking of hatchery fish (which could negatively impact wild steelhead populations)

(NMFS Website 2013). As stated for Central Valley spring-run Chinook salmon, the conceptual recovery scenario for the Central Valley steelhead DPS includes: (1) securing extant populations by implementing key habitat restoration actions, particularly in the near term; and (2) establishment of additional viable independent populations in the DPS (NMFS 2009b).

As with Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon, CALFED's Battle Creek Restoration Project is a priority action for the recovery of the Central Valley steelhead. According to NMFS (Website 2013), continued funding and implementation of CALFED's Ecosystem Restoration Program and the CVPIA remain a priority overall to continue habitat restoration efforts, screening of diversions, flow and temperature monitoring, status and trends research monitoring, modification of structures to improve fish passage, and overall water quality improvements.

5.5.1.4 SOUTHERN DPS OF NORTH AMERICAN GREEN STURGEON

ESA LISTING STATUS

The green sturgeon is the most widely distributed member of the sturgeon family Acipenseridae (70 FR 17386). North American green sturgeon are found in rivers from British Columbia south to the Sacramento River, California, and their ocean range is from the Bering Sea to Ensenada, Mexico. In assessing North American green sturgeon status, NMFS determined that two DPSs exist. The northern DPS is made up of known North American green sturgeon spawning (or single stock populations) in the Rogue, Klamath and Eel rivers. The southern DPS presently contains only a single spawning population in the Sacramento River (70 FR 17386).

The Southern DPS of North American green sturgeon (*Acipenser medirostrus*) was listed as a Federally threatened species on April 7, 2006 (71 FR 17757) and includes the green sturgeon population spawning in the Sacramento River and utilizing the Sacramento-San Joaquin River Delta, and San Francisco Estuary. NMFS (2009c) *"Draft Environmental Assessment for the Proposed Application of Protective Regulations Under Section 4(D) of the Endangered Species Act for the Threatened Southern Distinct Population Segment of North American Green Sturgeon"* indicated that the Southern DPS of North American green sturgeon faces several threats to its survival, including the loss of spawning habitat in the upper Sacramento River, and potentially in the Feather and Yuba rivers, due to migration barriers and instream alterations.

CRITICAL HABITAT DESIGNATION

On October 9, 2009, NMFS (74 FR 52300) designated critical habitat for the Southern DPS of North American green sturgeon. This designated critical habitat includes most of the DPS's occupied range, including: (1) coastal marine waters from Monterey Bay to the Washington/Canada border; (2) coastal bays and estuaries in California, Oregon, and Washington; and (3) fresh water rivers in the Central Valley, California. In the Central Valley, critical habitat for green sturgeon includes the Sacramento River, lower Feather River, lower

Yuba River, the Sacramento-San Joaquin River Delta, and San Francisco Estuary. NMFS (74 FR 52300) defined specific habitat areas in the Sacramento, Feather, and Yuba rivers in California to include riverine habitat from each river mouth upstream to and including the furthest known site of historic and/or current sighting or capture of North American green sturgeon, as long as the site is still accessible. The Action Area is located within designated critical habitat of the Southern DPS of North American green sturgeon.

Primary Constituent Elements

The essential physical and biological habitat features identified for the Southern DPS of North American green sturgeon include food resources (e.g., benthic invertebrates and small fish), substrate types (i.e., appropriate spawning substrates within freshwater rivers), water flow (particularly in freshwater rivers), water quality, water depth, migratory corridors, and sediment quality. Descriptions of the current conditions of the freshwater PCEs for the southern DPS of North American Green Sturgeon are available in the 2009 NMFS OCAP BO (NMFS 2009a) and the 2009 NMFS Draft Biological and Conference Opinion for the Federal Energy Regulatory Commission's (FERC) Relicensing of the California Department of Water Resources Oroville Facilities (FERC Project No. 2100-134) (NMFS 2009d).

ABUNDANCE

Green sturgeon are widely distributed along the Pacific Coast, have been documented offshore from Ensenada, Mexico, to the Bering Sea, and are found in rivers from British Columbia to the Sacramento River (Moyle 2002). In assessing North American green sturgeon status, NMFS determined that two DPSs exist. The northern DPS contains a single stock green sturgeon spawning population in the Rogue, Klamath, and Eel rivers (NMFS 2005); the southern DPS contains only a single spawning population in the Sacramento River (NMFS 2005).

According to NMFS (2009a), spawning populations of green sturgeon in North America are currently found in only three river systems – the Sacramento and Klamath rivers in California, and the Rogue River in southern Oregon. Particularly large concentrations of green sturgeon from both the northern and southern populations occur in the Columbia River estuary, Willapa Bay, Grays Harbor and Winchester Bay, with smaller aggregations in Humboldt Bay, Tillamook Bay, Nehalem Bay, and San Francisco and San Pablo bays (Emmett et al 1991; Moyle et al. 1992; Beamesderfer et al. 2007).

Data indicate that green sturgeon are migrating considerable distances up the Pacific Coast into other estuaries, particularly the Columbia River estuary. This information also agrees with the results of previous green sturgeon tagging studies (CDFG 2002), where CDFG tagged a total of 233 green sturgeon in the San Pablo Bay estuary between 1954 and 2001 (NMFS 2009a). A total of 17 tagged fish were recovered: 3 in the Sacramento-San Joaquin Estuary, 2 in the Pacific Ocean off of California, and 12 from commercial fisheries off of the Oregon and Washington

coasts. Eight of the 12 commercial fisheries recoveries were in the Columbia River estuary (CDFG 2002).

In 2006, NMFS concluded that an effective population of spawning green sturgeon did not exist in the lower Feather River (71 FR 17757). However, four fertilized green sturgeon eggs were collected near the Thermalito Afterbay Outlet on June 14, 2011, thus providing the first documentation of at least some successful spawning in the Feather River (A. Seesholtz, CDWR, pers. comm., June 16, 2011).

With the exception of acoustic tagging conducted by the CFTC, there is a general lack of green sturgeon population monitoring in most of the Central Valley. Consequently, there is a general paucity of data with which to assess the abundance of green sturgeon.

According to NMFS (2009a), limited population abundance information regarding the Southern DPS of North American green sturgeon comes from incidental captures of from the white sturgeon monitoring program by the CDFG sturgeon tagging program (CDFG 2002). By comparing ratios of white sturgeon to green sturgeon captures, CDFG provides estimates of adult and sub-adult North American green sturgeon abundance. Estimated abundance between 1954 and 2001 ranged from 175 fish in 1993 to more than 8,421 in 2001, and averaged 1,509 fish per year. NMFS (2009a) reported that there are many biases and errors associated with these data, and CDFG does not consider these estimates reliable, since the population estimates are based on small sample sizes, intermittent reporting, and inferences made from white sturgeon catches.

GENERAL LIFE HISTORY AND HABITAT REQUIREMENTS

The life history and habitat requirements of the Southern DPS of North American green sturgeon, particularly as they pertain to the Action Area, were described in Section 3.3.1.4 of this EA/IS, and are not repeated in detail here.

Green sturgeon primarily utilize the Sacramento River in the Action Area as a migration corridor. Adult green sturgeon spawning occurs in the Sacramento River upstream of the Action Area. Based upon available information, adult green sturgeon most likely migrate upstream through the Action Area during spring, from February perhaps into June. After spawning, the adults hold over in the upper Sacramento River between RBDD and GCID until November, after which time they would be expected to pass through the Action Area, although some adults may rapidly leave the system following spawning and re-enter the ocean in early summer. Juveniles may be present in the Action Area during their downstream migration primarily from May through August, and most abundant during June and July.

Additional information on green sturgeon life history, species status and population trends can be found in the 2009 NMFS Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project (NMFS 2009a) and in the 2009 NMFS Designation of Critical Habitat for the Threatened Southern Distinct Population Segment

of North American Green Sturgeon Final Biological Report (NMFS 2009e), which are incorporated herein by reference.

LIMITING FACTORS, THREATS, AND STRESSORS

The principal factor for decline for the southern DPS of green sturgeon reportedly comes from the reduction of green sturgeon spawning area to a limited area of the Sacramento River (NMFS 2005). Keswick Dam provides an impassible barrier blocking green sturgeon access to what were likely historic spawning grounds upstream (NMFS 2005). In addition, a substantial amount of potential habitat in the Feather River above Oroville Dam may have been lost (NMFS 2005).

Potential adult migration barriers to green sturgeon include RBDD, Sacramento Deep Water Ship Channel locks, Fremont Weir, Sutter Bypass, and the Delta Cross Channel Gates on the Sacramento River, and Shanghai Bench and Sunset Pumps on the Feather River (NMFS 2005). The threat of screened and unscreened agricultural, municipal, and industrial water diversions in the Sacramento River and Delta to green sturgeon are largely unknown as juvenile sturgeon are often not identified, and the current CDFG and NMFS' screen criteria do not address sturgeon. Based on the temporal occurrence of juvenile green sturgeon and the high density of water diversion structures along rearing and migration routes, the potential threat of these diversions are found to be serious and in need of study (NMFS 2005). Additional threats and stressors include habitat alteration, stranding, and impaired water quality. Green sturgeon also may experience predation by introduced species including striped bass, but predation has yet to be estimated (NMFS 2005).

VIABILITY

In their status review, NMFS (2005) concluded that green sturgeon in the southern DPS were likely to become endangered in the foreseeable future throughout all of its range. Lindley et al. (2007) suggested that an ESU represented by a single population at moderate risk is at a high risk of extinction over the long term. Although the extinction risk of the Southern DPS of green sturgeon has not been assessed, NMFS believes that the extinction risk has increased because there is only one known population, within the mainstem Sacramento River (NMFS 2009a).

RECOVERY PLAN IMPLEMENTATION

The AFRP under authority of the CVPIA states that the target production level for green sturgeon in Central Valley rivers is 2,000 fish. CALFED's (2000) goal is to achieve recovery objectives identified for green sturgeon in the *Recovery Plan for the Sacramento/San Joaquin Delta Native Fishes* (USFWS 1996). In that document, green sturgeon would be considered restored when the median population of mature sturgeon (>1.0 meter in length) has reached 1,000 individuals in the Sacramento-San Joaquin Delta (USFWS 1996). Unlike winter-run and spring-run Chinook salmon, and steelhead in the Central Valley, a specific recovery plan for the Southern DPS of North American green sturgeon has not been developed.

5.5.2 ESSENTIAL FISH HABITAT-MANAGED SPECIES

As previously discussed, Federal agencies must consult with NMFS on all actions that may adversely affect EFH (Section 305(b)(2) of the MSA). Chinook salmon occur within the Action Area and require consultation under Section 305 of the Magnuson-Stevens Act. Although EFH pertains to all Pacific salmon, fall-/late fall-run Chinook salmon and their associated habitat requirements are discussed in this section because winter- and spring-run Chinook salmon and their habitat were discussed in Sections 5.5.1 and 5.5.2, above.

5.5.2.1 CENTRAL VALLEY FALL/LATE FALL-RUN CHINOOK SALMON ESU

LISTING STATUS

Central Valley fall- and late fall-run Chinook salmon are considered by NMFS to be the same ESU (64 FR 50394). NMFS removed the Central Valley fall-run/late fall-run Chinook salmon from the Federal list of candidate species in 2004, but this ESU remains a Species of Concern under the Federal ESA because of specific risk factors, including population size and hatchery influence (69 FR 19975). The Central Valley fall-run/late fall-run Chinook salmon ESU includes all naturally spawned fall and late fall-run populations of Chinook salmon in the Sacramento and San Joaquin basins and their tributaries, east of Carquinez Strait, California (64 FR 50394). The Central Valley fall-run/late fall-run Chinook salmon ESU is designated as a California Species of Special Concern (CDFG Website 2005). In California, Species of Special Concern is an informal designation used by CDFW to identify declining and vulnerable species in the State.

Because the Central Valley fall-run/late fall-run Chinook salmon ESU has not been listed as threatened or endangered under the ESA, critical habitat has not been designated. However, the Central Valley fall-run/late fall-run Chinook salmon ESU is a managed species under the MSA, and the identification of EFH in Section 5.4.2.1 pertains to this ESU, as well as to the Sacramento River winter-run Chinook salmon ESU and the Central Valley spring-run Chinook salmon ESU.

ABUNDANCE

In the Central Valley, fall-run Chinook salmon are the most numerous of the four salmon runs, and is currently the largest run of Chinook salmon utilizing the Sacramento River system. Fall-run Chinook salmon have displayed broad fluctuations in adult abundance over the years. GrandTab estimates of fall-run Chinook salmon in-river (non-hatchery) adult spawning escapement in the Sacramento River and its tributaries (not including the lower Yuba and Feather rivers because GrandTab does not distinguish between fall-run and spring-run Chinook salmon in-river spawners) have averaged 120,458 for the period extending from 1970 through 1979, 127,953 for the period 1980 through 1989, 145,293 for the period 1990 through 1999, and 209,103 for the period 2000 through 2009. From 1970 to 2011, in-river (non-hatchery) adult escapement in the Sacramento River and its tributaries (not including the lower Yuba and

Feather rivers) averaged 146,107 per year. Escapement peaked in 2002 (609,438 individuals) and declined to historical lows in 2009 (19,187 individuals). However, the run has increased in the most recent years in-river adult escapement estimated at 47,237 fish during 2010, and 61,200 fish during 2011.

Late fall-run Chinook salmon in-river adult spawning escapement in the Sacramento River and its tributaries (including Battle, Clear, Cottonwood, Salt, and Craig creeks) averaged 10,872 individuals between the 1970/71 and 2010/11 spawning seasons. Late fall-run Chinook salmon in-river spawners in the Sacramento River and its tributaries (as described above) have averaged 15,547 for the period extending from 1971 through 1979, 10,169 for the period 1980 through 1989, 7,376 for the period 1990 through 1999, and 12,232 for the period 2000 through 2009. Escapement of in-river spawning adults was reported as 0 in the 1994/95, 1995/96 and 1996/97 spawning seasons, but a peak escapement of 39,340 in-river spawners was reported for the 1997/98 spawning season. In recent years, late fall-run Chinook salmon in-river adult spawning escapement in the Sacramento River and its tributaries (as described above) was estimated at 4,309 fish in the 2009/10 spawning season, and 3,728 fish in the 2010/11 spawning season.

GENERAL LIFE HISTORY AND HABITAT REQUIREMENTS

Central Valley fall-run and late fall-run Chinook salmon life histories and habitat requirements, particularly as they pertain to the Action Area, were described in Section 3.3.1.4 of this EA/IS, and are not repeated in detail here.

Adult and juvenile fall-run and late fall-run Chinook salmon primarily utilize the Sacramento River in the Action Area as a migration corridor. Relatively infrequent and small amounts of fall-run and late fall-run Chinook salmon spawning may occur within the vicinity of the Action Area. Adult fall-run Chinook salmon generally migrate upstream through the Action Area from July through December, while adult late fall-run Chinook salmon upstream migration through the Action Area can begin during late October and extend through April. Available information indicates that most juvenile fall-run Chinook salmon emigration occurs through the Action Area from January through June. Although downstream migration or dispersal of late fall-run Chinook salmon juveniles can occur from April through December, the primary movement of yearlings is believed to occur during late fall and winter months.

LIMITING FACTORS, THREATS AND STRESSORS

A variety of environmental and biological factors were identified in USFWS (2007) that affect reproductive success, mortality, and population dynamics of fall-run/late fall-run Chinook salmon. These factors include the loss of access to historic spawning and juvenile rearing areas as a result of the construction of dams and reservoirs on many of the Central Valley river systems is a factor affecting population abundance. In addition, exposure to seasonal water temperatures during both the upstream migration of adults and downstream migration of juveniles, changes in instream flows resulting from reservoir operations, degradation of the

quality and availability of suitable spawning habitat and juvenile rearing areas, and the effects of hatchery operations on Chinook salmon have been identified as important factors affecting abundance (USFWS 2007). Juvenile Chinook salmon also are susceptible to entrainment at unscreened water diversions, losses resulting from salvage and handling at the SWP and CVP export facilities, predation mortality by non-native fish species, interannual variability in hydrologic conditions within the streams and river systems, and variability in ocean rearing conditions also have been identified. Contaminant exposure, impediments and barriers to upstream and downstream migration, ocean commercial and recreational angler harvest, and inland recreational harvest have also been identified as factors affecting population abundance (USFWS 2007).

Fall-run and late fall-run Chinook salmon habitat quality and availability within the upper Sacramento River and tributaries has been affected by a variety of factors including construction and operation of water storage impoundments and water diversions, changes in the magnitude and seasonal timing of instream flows, hatchery operations, and barriers and impediments to adult and juvenile migration (USFWS 2007). Predation by pikeminnow and striped bass and other species, commercial and recreational angler harvest, changes in land use, channelization and stabilization using riprap of the mainstem river and tributaries, reductions in floodplain habitat and instream cover, and a variety of other factors have affected the species. Chinook salmon also are vulnerable to mortality as a direct and indirect result of SWP and CVP water diversion operations, operation of the Red Bluff Diversion Dam, operation of the Delta cross-channel, and entrainment into unscreened diversions. Reduction in the availability and quality of spawning gravel downstream of dams has also been identified as a factor affecting the species (USFWS 2007).

In a comprehensive review, Lindley et al. (2009) identified specific factors that were probably responsible for the large decline in the number of adult fall-run Chinook salmon that returned to the Central Valley in 2007 and 2008. The proximate cause for the decline probably consisted of anomalous conditions in the coastal portion of the Pacific Ocean in 2005 and 2006 which then resulted in unusually poor survival of the 2004 and 2005 broods of juvenile fall-run Chinook salmon that had migrated to the ocean (USDOI 2010). Some of the anomalous conditions in the ocean that may have caused the poor survival of juvenile Chinook salmon entering the Pacific Ocean include weak upwelling of ocean water which resulted in low primary productivity, warm sea surface temperatures that may have led to a general reduction in fish health, and low densities of the prey items that juvenile salmon consume (USDOI 2010). Lindley et al. (2009) also suggest other factors likely compounded the problems created by unusual ocean conditions including: (1) the ongoing degradation of freshwater and estuarine habitats that juvenile salmon depend upon for rearing and growth; (2) the production of juvenile fall-run Chinook salmon at five fish hatcheries in the Central Valley that have contributed to the loss of genetic diversity in, and therefore the fitness of, native salmon populations; and (3) inaccurate forecasts of the number of adult salmon that were projected to return to the Central Valley to spawn, and the

subsequent establishment of harvest levels that overestimated the number of adult salmon that could be harvested on a sustainable basis.

MANAGEMENT PLANS

Measures for recovery of the fall-run and late fall-run Chinook salmon populations are presented in the AFRP (2001), and in the *"Recovery Plan for Sacramento-San Joaquin Delta Native Fishes"* (USFWS 1996). As previously discussed, the fall-run/late fall-run ESU is managed under the MSA, and the PMFC develops FMPs that address this ESU. In 1999, Amendment 14 to the Pacific Coast Salmon FMP identified 21 activities that may adversely affect EFH, and actions to encourage the conservation and enhancement of EFH including recommended options to avoid, minimize, or mitigate for the adverse effects identified in the FMP.

Under the MSA, during the 5-Year EFH review NMFS and PFMC (2011) have more recently identified 10 additional non-fishing threats that may adversely affect EFH. Each of the identified non-fishing-related activities may directly, indirectly, or cumulatively, temporarily or permanently, threaten the physical, chemical, and biological properties of the habitat utilized by salmonid species and/or their prey. As of 2011, conservation measures to address the 10 recently identified threats have not been developed by PFMC or NMFS. If the PFMC decides to amend the Pacific Coast Salmon FMP in the future, then the descriptions of all 31 threats will be expanded upon and refined, and conservation measures developed for each threat (NMFS and PFMC 2011).

5.5.3 TERRESTRIAL SPECIES

5.5.3.1 VALLEY ELDERBERRY LONGHORN BEETLE

ESA LISTING STATUS

The valley elderberry longhorn beetle (VELB) (*Desmocerus californicus dimorphus*) was Federally listed as a threatened species in 1980 (45 FR 52803). The California Endangered Species Act does not provide protection to insects (California Fish and Game Code Sections 2062, 2067 and 2068). VELB has no State-listed status.

In July 2005, USFWS initiated a five-year review for VELB (70 FR 39327). The review found that VELB-specific conservation actions resulted in the protection of 50,000 acres of riparian habitat and the restoration of 1,500 acres of beetle habitat (USFWS 2006; USFWS 2009). Additionally, the number of occurrences increased from 10 locations known in 1980 to 190 known in 2006 (USFWS 2009). Upon completion of the five-year review in 2006, USFWS recommended that VELB be delisted.

In 2010, USFWS received a petition from the Pacific Legal Foundation requesting that VELB be removed from the Federal list of threatened species. In 2011, USFWS published a 90-day finding on the petition, which concluded that the petition contained substantial information that delisting

the beetle may be warranted (76 FR 51929). As required under the ESA, the USFWS initiated a status review. As the result of that status review, USFWS determined that delisting VELB is warranted, and proposed to remove the beetle from the list of endangered and threatened species, and remove designated critical habitat (77 FR 60238).

On October 2, 2012, USFWS issued a proposed rule to remove VELB from the Federal list of endangered and threatened wildlife and to remove the designation of critical habitat (77 FR 60237). The 60-day comment period for the proposed rule ended on December 3, 2012.

On January 23, 2013, the public comment period on the October 2, 2012, 12-month petition finding and proposed rule was reopened. The USFWS announced a 30-day reopening of the comment period to allow all interested parties an additional opportunity to comment on the proposed rule and to submit information on the status of the species. The public comment closed on February 22, 2013 (78 FR 4812).

Typically, if the USFWS decides to delist VELB in the Final Rule, then the prohibitions and conservation measures provided by the ESA would no longer apply to VELB. However, because the Capay Unit of the SRNWR was established, in part, for VELB habitat restoration purposes, the protective measures identified for VELB in Chapter 2 (see Section 2.2.3) would likely remain in place on the Capay Unit. Section 4(g)(1) of the ESA requires the Secretary of the Interior, in cooperation with the States, to implement a system to monitor for not less than 5 years the status of all species that have recovered and been delisted. The purpose of the post-delisting monitoring is to verify that a species delisted due to recovery remains secure from risk of extinction after it no longer has the protections of the ESA. Section 4(g) of the ESA requires USFWS to develop and implement a post-delisting monitoring program. The primary goal of the final post-delisting monitoring plan is to monitor the species to ensure that any substantial decline in the species occurrences or any increases in threats are detected, and to take measures to halt either so that re-proposing VELB as a threatened or endangered species is not needed. A draft VELB post-delisting monitoring plan was released on October 2, 2012, and is designed to monitor threats to VELB by detecting changes in its status and habitat throughout its known range for the five year period following delisting.

CRITICAL HABITAT DESIGNATION

Two critical habitat zones have been established for this species (USFWS 1984):

- **Sacramento Zone –** An area in the City of Sacramento enclosed on the north by the Route 160 freeway, on the west and southwest by the Western Pacific railroad tracks, and on the east by Commerce Circle, and its extension southward to the railroad tracks.
- **American River Parkway Zone –** An area of the American River Parkway on the south bank of the American River, bounded on the north by latitude 38 37’30”N, on the west and southwest by Elmanto Drive from its junction with Ambassador Drive to its extension to latitude 38 37’30”N, and on the south and east by Ambassador Drive and its

extension north to latitude 38 37'30"N, Goethe Park, and that portion of the American River Parkway northeast of Goethe Park, west of the Jedediah Smith Memorial Bicycle Trail, and north to a line extended eastward from Palm Drive.

In addition, two "essential habitat" zones have been established:

- **American River Parkway Zone –** An area within the American River Parkway, consisting of both left and right banks, extending from Nimbus Dam downstream to Arden Bar, adjacent to and encompassing previously-designated "*Critical Habitat, American River Parkway Zone*" (USFWS 1984).
- **Putah Creek Zone –** Solano County. Township 8 North, Range 2 West, Sections 25, 26, 35, and 36 (USFWS 1984).

The Action Area is not located within any of the areas presently designated as critical habitat zones for VELB.

Regardless of the critical habitat designation, elderberries with stems over 1 inch in diameter at ground level in the VELB's species range are protected under the ESA.

GENERAL LIFE HISTORY AND HABITAT REQUIREMENTS

VELB is a wood borer dependent on (and found only in association with) its host plant, the elderberry (*Sambucus spp*.), which is a common shrub component of riparian forests and adjacent upland vegetation along river corridors of the Central Valley (77 FR 60238). In order to serve as habitat, elderberry stems must be greater than 1.0 inches in diameter at ground level. VELB exhibit four lifestages, including egg, larva, pupa and adult.

Adult beetles feed on elderberry nectar, flowers and foliage, and are generally active from March through June (77 FR 60238; USFWS 2006). Despite their relatively large size and conspicuous coloration, they are rarely observed. VELB mate during May, and females lay eggs on the leaves or stems of living elderberry shrubs (Barr 1991). Larvae hatch within a few days and bore into living stems that are at least 1.0 inch in diameter. The larvae remain within the elderberry stem, feeding on the pith (dead woody material) until they complete their development. Each larva creates its own gallery (set of tunnels) within the stem by feeding (Talley et al. 2006a). The larvae feed on the pith of the plant for one to two years (USFWS 2006). When a larva is ready to pupate, it chews an exit hole to the outside of the stem and then plugs it with wood shavings. The larva then retreats into the feeding gallery and constructs a pupal chamber. The pupal stage lasts about a month, and the larvae generally metamorphose between December and April. After metamorphosing into an adult, the adults remain in the chamber for several weeks and then emerge from the chamber through the exit hole. Most records for adults occur from late-April to mid-May (USFWS 1984; USFWS 2007a). Adults live from a few days to a few weeks after emerging, during which time they mate and lay their eggs (77 FR 60240).

In the Sacramento Valley, VELB is closely associated with blue elderberry (*Sambucus mexicana*), which is an obligate host for beetle larvae. Kellner (1986) reported that they appear

to be attracted to "stressed" or unhealthy elderberry trees, which have more yellow in the leaves and have leaves that fall earlier in the year than healthy trees. However, Talley (2005) and Collinge et al. (2001) examined VELB habitat quality in context of habitat in context of fragmentation and identify other features of habitat quality as influences on VELB abundance and distribution. USFWS observations at the Capay Unit Refuge are that healthy elderberry bushes have shown more VELB activity (CDFG and USFWS 2007a).

VELB prefer trees with stems of a certain size class. Exit holes have been found more frequently in trunks or branches that are 5 to 20 cm (2-8 in) in diameter (Kellner 1986), or at least 1.0 inch or greater at ground height (USFWS 1999) and less than one meter off the ground (Collinge et al. 2001). Research also shows that exit holes more consistently occur in clumps or stands than in isolated bushes (Collinge et al. 2001). In two different studies, occurrence frequencies in elderberry by VELB ranged from 20-50 percent along the American River (USFWS 1984), to usually less than 20 percent along the Sacramento River (Jones and Stokes 1985).

Since the spatial distribution of VELB is often minimal (USFWS 1984), the beetle has been assumed to be a poor disperser (Collinge et al. 2001). Due to low dispersing ability and naturally low population densities (USFWS 1984), the beetles are thought to be more vulnerable to impacts from habitat fragmentation (USFWS 1999). Thus, non-fragmented stands of elderberry are essential for dispersal corridors for the species and may be necessary to maintain long-term gene flow over large areas.

ABUNDANCE

A California endemic species, VELB is found in scattered populations throughout its range. The species' range includes most of the California Central Valley (Barr 1991). At the time of listing, it was known from 10 occurrence records at three locations, including Merced County, Sacramento County, and Yolo County (77 FR 60238). In surveys conducted from 1984 through 1991, only 12 patches of natural riparian forests along the Sacramento, American, and San Joaquin rivers and their tributaries yielded either beetles or emergence holes indicating their presence (CDFG 2002a). Consequently, the low numbers of VELB were attributed to the fact that over 90 percent of riparian habitat in the Central Valley has been lost to agricultural and urban development, and the remaining habitat is fragmented (CDFG 2002a). Virtually all major rivers and tributaries in the Central Valley are subject to some level of effect from flood control operations and vegetative maintenance that affects or suppresses riparian vegetation (and associated beetle habitat if present), although this effect on VELB varies among locations and reaches within a location (77 FR 60269).

As of October 2, 2012, 201 occurrence records are known at 26 locations, including much of the San Joaquin and Sacramento Valleys from Shasta County in the northern Sacramento Valley to Kern County in the southern San Joaquin Valley (77 FR 60238).

Within the Action Area, elderberry shrub surveys were previously performed by Gallaway Consulting, Inc. on August 12, 2005, October 4, 2005 and June 15, 2006. These surveys were

conducted in accordance with *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999). Fifty-five (55) elderberry shrubs were found within 100 feet of the Action Area, with 22 of the shrubs containing VELB exit holes. The surveys were conducted by walking the study area, associated valley/foothill riparian forest, and adjacent upland cropland.

More recently, an assessment of VELB habitat present within 100 feet of the Action Area, was conducted by biologists from Robertson-Bryan, Inc. from June 25 through 28, 2012. The assessment was conducted based on the requirements of the USFWS VELB Conservation Guidelines (USFWS 1999).

Biologists surveyed the Action Area for VELB habitat and documented the location of each elderberry shrub. In addition, because the USFWS generally requires a 100-foot protective buffer for VELB around a construction area (USFWS 1999b), a 100-foot buffer around the Action Area also was surveyed (RBI 2012). For each elderberry shrub identified within 100 feet of the Action Area, biologists obtained the following data: (1) whether shrub is in riparian or upland habitat; (2) approximate height of shrub; (3) number of live stems measuring 1 inch or greater in diameter at ground level, tallied by diameter size class (≥ 1 inch and ≤ 3 inches; >3 and ≤ 5 inches, > 5 inches); and (4) presence of exit holes. The survey recorded a total of 440 elderberry shrubs[2] within the vicinity of the Action Area, 372 of which are within 100 feet of the Action Area, and 274 of which are within the Action Area boundaries (**Figure 5-1a** and **Figure 5-1b**). Three of the shrubs located in valley oak woodlands along Big Chico Creek showed signs of VELB occupation (i.e., exit holes). A portion of the Action Area on the west side of the Sacramento River is within the Capay Unit of the SRNWR.

Beginning in 2007, the USFWS and TNC implemented a CALFED Bay-Delta funded large scale riparian restoration project totally approximately 570 acres on portions of the Capay Unit with native riparian and grassland species. Of the 440 recorded elderberry shrubs, 300 were located within riparian blue elderberry stands planted and maintained by the USFWS. For detailed survey results including representative photos and field data sheets, see Appendix F.

[2] When mapped using GIS, several shrubs were found to be more than 100 feet outside the survey area, and therefore were not discussed further in the survey report (RBI 2012). However, for completeness, these surveyed shrubs are presented in Figures 5-1a and 5-1b.

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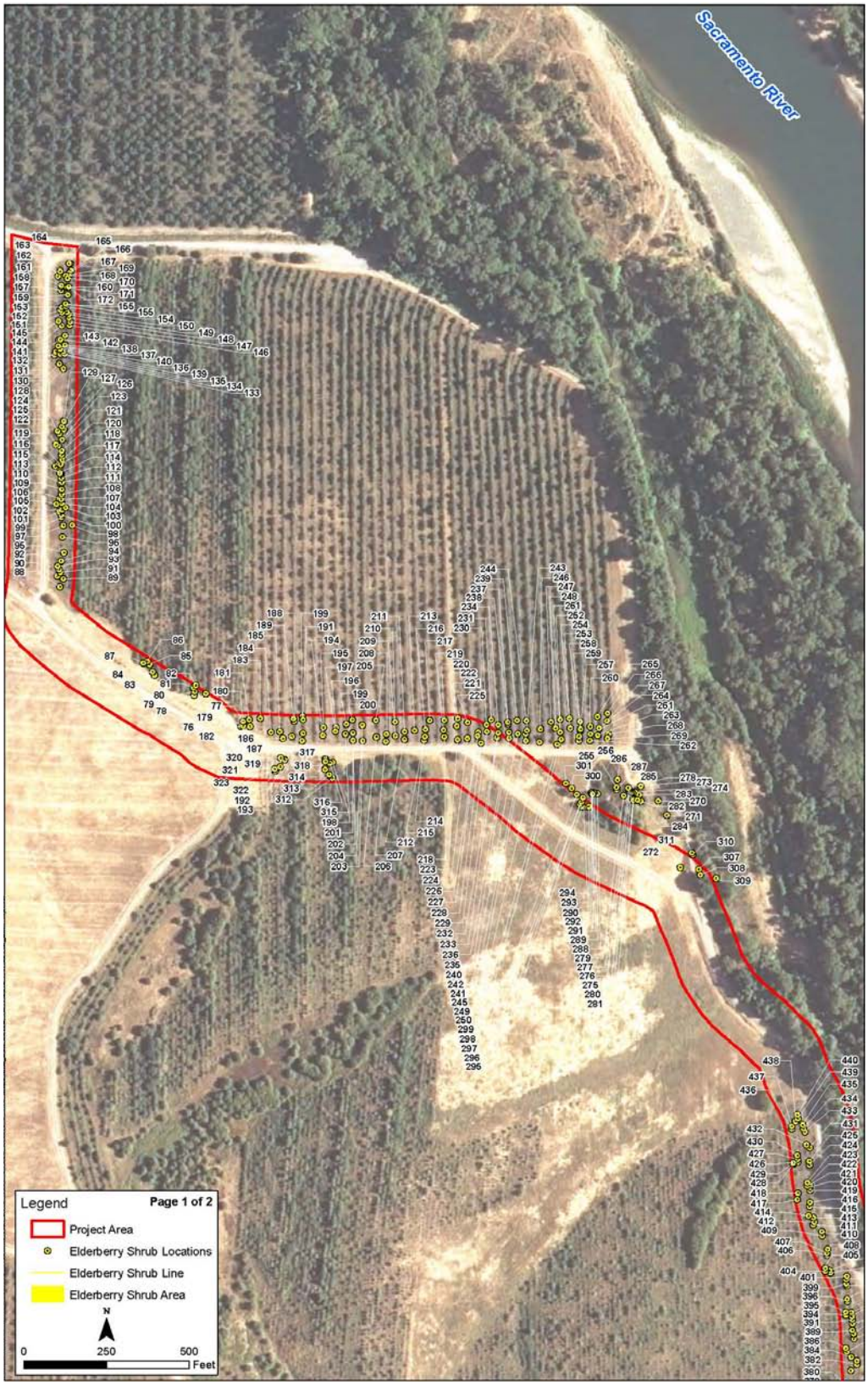

Figure 5-1a. VELB Habitat within 100 Feet of the Action Area, Defined as the Centerline of the Access Road for this Assessment.

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Figure 5-1b. VELB Habitat within 100 Feet of the Action Area, Defined as the Centerline of the Access Road for this Assessment.

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LIMITING FACTORS, THREATS AND STRESSORS

At the time of listing in 1980, the loss of habitat was identified as a major threat to VELB (USFWS 2006). Loss of riparian habitat between 1900 and 1990 in the Central Valley was about 96% in the southern portion of the Valley (Kern County to Fresno County) (16,000 acres remaining), 84% in the middle Valley (Merced County to San Joaquin County) (21,000 acres remaining) and 80% in the northern Valley (Sacramento and Solano counties to Shasta County) (96,000 acres remaining) (USFWS 2006). Between 1960 and 1990, loss rates slowed somewhat, but were still high with 59% loss in the south, 65% loss in the middle, and 35% loss in the northern Central Valley (Geographic Information Center 2003 in USFWS 2006). Riparian habitat loss has resulted in fragmented and isolated remnants of VELB habitat.

Ongoing maintenance of levees and canals for purposes of flood control and agriculture may have also resulted in loss of VELB habitat. Flood control activities appear to be responsible for there being fewer elderberry shrubs and beetles along the lower Sacramento River than the upper Sacramento River (Talley et al. 2006b). The lower Sacramento River is constrained by flood control levees and the limitation of available restoration sites will limit future restoration opportunities along this waterway. Additionally, Reclamation Board concerns over potential negative consequences from allowing a Federally-listed species to inhabit their facilities and the actions taken prevents the establishment of beetle habitat in many riparian areas that would otherwise be suitable for the beetle (USFWS 2006). Insecticide use and vegetation control practices also may impact beetle populations (USFWS 1999).

At the time of listing in 1980, the threats noted in the Final Rule did not include predation. The introduced, invasive Argentine ant (*Linepithema humile*) is a potential threat because it may exclude or displace populations of VELB from otherwise suitable habitat (Huxel 2000). Non-native invasive plant species, particularly sharp-leaved fluellen (*Kickxia elatine*), morning glory (*Convolulus arvensis*) and Johnsongrass (*Sorghum halepense*) are known to impede germination and growth on woody floodplain plant species. Additionally, non-native or invasive plant species such as giant reed (*Arundo donax*), Himalayan blackberry (*Rubus discolor*), and fig (*Ficus carica*) may also negatively affect the health and vigor of the host plant for VELB.

The north Central Valley has seven major locations, or portions thereof, where the persistence of VELB in the foreseeable future is likely due to a combination of: (1) low threats and adequate protection measures; and (2) multiple and recent records, some with confirmation of adult beetles (Sacramento River north of Colusa, the lower American, Feather, and Bear Rivers, and Big Chico, Cache, and Putah Creeks) (77 FR 60269). The protection measures include an array of existing and initially restored beetle habitat, and many have a wide or relatively unchanged riparian vegetation corridor with limited adjacent land-use, suggesting development or agriculture-related threats to these locations are reduced. Threats, and the likelihood of VELB persistence, vary markedly along the Sacramento River. Threats are minimal and VELB persistence is considered at least average north of Colusa to Redding, where there is protected

habitat on refuge lands and reports of beetle occupation (River Partners 2004 in 77 FR 60269). Threats are increased and VELB persistence is considered fair to poor on the Sacramento River south of Colusa to its Delta confluence; most of this area has limited or no woody vegetation due to extensive rock bank protection (77 FR 60269). With the possible exceptions of the lower American River, the best known location of VELB, every other location in the Sacramento and San Joaquin valleys has a major section lacking riparian vegetation that probably does not support VELB due to complete absence of habitat (77 FR 60269).

RECOVERY PLAN IMPLEMENTATION

When the USFWS completed the Final VELB Recovery Plan (Recovery Plan) in 1984, there was little information available regarding the beetle's life history, distribution, and habitat requirements to develop specific recovery objectives (77 FR 60246; USFWS 1984). The development of these objectives was left for a later date, and the Recovery Plan (USFWS 1984) instead described four primary interim objectives, including:

- Primary Interim Objective 1 – Protect the Three Localities of Valley Elderberry Longhorn Beetles.
- Primary Interim Objective 2 – Survey Riparian Vegetation Along Certain Central Valley Rivers for Additional Valley Elderberry Longhorn Beetle Colonies and Habitat.
- Primary Interim Objective 3 – Protect Remaining Beetle Habitat Within Its Suspected Historical Range.
- Primary Interim Objective 4 – Determine the Number of Sites and Populations Necessary To Eventually Delist the Species.

The Recovery Plan was followed by an outline and narrative (referred to as the Step-Down Outline that includes many discrete recovery actions), which included four additional objectives that are interpreted as recovery actions (77 FR 60246). The four additional recovery actions are directly related to the primary interim objectives and include: (1) determining VELB's ecological requirements and management needs; (2) reestablishing VELB at rehabilitated sites; (3) increasing public awareness of the beetle; and (4) enforcing existing laws and regulations protecting VELB.

Eight agencies and private organizations have completed 26 projects to enhance or restore 4,950 acres by planting elderberry (Talley et al. 2006a). The largest effort to protect and restore VELB habitat through elderberry plantings has occurred at the SRNWR. VELB habitat on the SRNWR currently totals more than 2,400 acres (77 FR 60256). Over 100,000 elderberry seedlings or transplanted shrubs have been planted at the refuge (Talley et al. 2006a). If any significant number of elderberry shrubs were lost at the refuge, they would be replanted as described in the SRNWR CCP, which identifies conservation of VELB as one of its management goals (USFWS 2005). These areas are considered fully protected (77 FR 60256).

USFWS' October 2, 2012 review indicates that Interim Objective 1 is partially met by management and planning efforts at two of the three originally known locations of VELB. Interim Objective 2 is met because surveys were conducted throughout the range of the subspecies and identified 23 additional locations at which the VELB was present. However, much of this information was collected several years ago, and additional surveys should be conducted at these locations and others. Interim Objective 3 is considered partially met because the protections discussed in the Recovery Plan have been applied to all or portions of 13 of the 23 locations discovered since listing (or since the Recovery Plan was finalized). Interim Objective 4 is considered partially met, noting that recovery of species is a dynamic process requiring adaptive management, planning, implementing, and evaluating the degree of recovery of a species that may, or may not, fully follow the guidance provided in a recovery plan. Notwithstanding data uncertainties and the absence of protections or enhancements at some locations, there are a significantly greater number of known occurrences and locations of the beetle (resulting in a significantly greater range size as compared to the time of listing) across the Central Valley. Based on USFWS' review of the Recovery Plan for the subspecies and review of the beetle's status under Section 4(a)(1) of the ESA, USFWS is proposing to remove VELB from the List of Endangered and Threatened Wildlife (77 FR 60249).

5.5.3.2 WESTERN YELLOW-BILLED CUCKOO

ESA LISTING STATUS

The western population of the yellow-billed cuckoo (*Coccyzus americanus*, or "cuckoo"), considered a distinct population segment by the USFWS, was identified as a candidate for Federal listing in 2001 (USFWS 2001). As described in the November 21, 2012 Candidate Notice of Review (77 FR 69994), the USFWS continues to find that listing this species is warranted, but precluded by higher priority listing actions. On October 3, 2013, the USFWS issued a proposed rule to list the yellow-billed cuckoo in the western portions of the United States, Canada, and Mexico (western yellow-billed cuckoo) as a threatened distinct vertebrate population segment under the Federal ESA (78 FR 61622). The public comment period on the proposed listing rule closed on December 2, 2013 (78 FR 61622). The species was listed by the State of California as threatened in 1971, and was reclassified as endangered in 1987.

CRITICAL HABITAT DESIGNATION

Critical habitat is not currently designated for the western population of the yellow-billed cuckoo.

GENERAL LIFE HISTORY AND HABITAT REQUIREMENTS

The western yellow-billed cuckoo is a rare summer resident in California with a disjunct breeding distribution extending through the interior of the Central Valley (BDCP 2013). While a few occurrences have been detected elsewhere recently (BDCP 2013), the only locations in

California that currently sustain breeding populations include the Colorado River system in southern California, the South Fork Kern River east of Bakersfield, and isolated sites in remnant riparian patches along the Sacramento River in Glenn, Butte, and Tehama Counties (Laymon and Halterman 1989; Laymon 11 1998).

The breeding range of the western yellow-billed cuckoo formerly included most of North America from southern Canada to the Greater Antilles and northern Mexico (USFWS 2001). During recent years, the species' distribution in the west has contracted. The northern limit of breeding in the coastal States is now in the Sacramento Valley and the northern limit of breeding in the western interior States is southern Idaho (USFWS 2001).

Western yellow-billed cuckoos breed in large blocks of riparian habitats, particularly in woodlands with cottonwoods and willows (USFWS 2001). In California, Halterman (1991) found that three factors explained 47 percent of the variance in the density of cuckoos nesting on the Sacramento River, including: (1) patch size; (2) extent of riparian habitat in 8-kilometer river sections; and (3) presence of low woody vegetation. Dense understory foliage appears to be an important factor in nest site selection, while cottonwood trees are an important foraging habitat in areas where the species has been studied in California (USFWS 2001). Nests are found primarily in willow (*Salix* spp.) trees, but other tree species used for nesting include cottonwood and alder (Butte County 2011). The average nest site height in willow trees is 14 feet, while nests in cottonwood trees have been reported at 100 feet (Butte County 2011). Along the Sacramento River, English walnut trees also have been reportedly used for nesting (Laymon 1980).

In California on the Sacramento River, western yellow-billed cuckoos arrive onto breeding territories and form pairs from late June to mid-July after their northward migration from South America, which is followed by nest building and the raising of young (Halterman 1991; Butte County 2011). Western yellow-billed cuckoo breeding is restricted to the mid-summer period, presumably due to a seasonal peak in large insect abundance (Rosenberg et al. 1982, as cited in Butte County 2011). The species is inconspicuous in its breeding habitat, except when calling to attract or to contact mates. Development of young is very rapid with a breeding cycle of only 17 days from egg-laying to fledging. Following a relatively short period of post-fledging juvenile dependency, cuckoos migrate out of California.

Fall migration begins during late August and lasts until mid-September. Like most songbirds, the yellow-billed cuckoo migrates at night. The species over-winters from Columbia and Venezuela, south to northern Argentina (Ehrlich et al. 1988; AOU 1998). The extent to which yellow-billed cuckoos nesting in different regions of North America commingle during migration, or while overwintering, is largely unknown.

In California, western yellow-billed cuckoos return annually to nearly all of the few recently occupied breeding locations remaining in suitable condition, suggesting strong nest-site fidelity. Along the Sacramento River, nesting yellow-billed cuckoos occupied home ranges, which included 25 acres or more of riparian habitat (USFWS 2001). Another study on the same river found riparian patches averaging 99 acres occupied by yellow-billed cuckoo pairs (USFWS

2001). Estimates from a 2010 survey suggest occupancy rates of cuckoos between 10 and 34 percent, depending on home territory assumptions (e.g., 37 to 148 acres) (Dettling and Howell 2011).

According to RHJV (2004), western yellow-billed cuckoos utilize two different successional stages of the riparian zone, making this species sensitive to patch size. According to Laymon (2000), an average of 50 to 60 acres of suitable habitat is needed for colonization. Upland cottonwood forest is used for nesting, while lowland willow scrub is used for foraging (RHJV 2004). Researchers have shown that the width of the riparian forest is also important, and should be at least 100 meters wide for the cuckoo to inhabit. Consequently, RHJV (2004) suggest that restoration efforts to benefit the western yellow-billed cuckoo require patches that are a minimum of 50 to 100 acres in size, with a minimum width of 100 meters. RHJV (2004) states that research conducted by Laymon and Halterman (1989) led to the development of these parameters based on occupancy rates of existing habitat patches along the Sacramento River.

Nesting west of the Continental Divide occurs almost exclusively near water, and biologists have hypothesized that the species may be restricted to nesting in moist river valley bottoms in the west because of humidity requirements for successful hatching and rearing of young (USFWS 2001). Nesting peaks later (mid-June through August) than in most co-occurring bird species, and may be triggered by an abundance of the cicadas, katydids, caterpillars, or other large prey which form the bulk of the species' diet (USFWS 2001).

Laymon et al. (1997) report that food resources significantly affect western yellow-billed cuckoo reproductive success, and food availability can vary greatly from year to year. The most suitable habitats for cuckoo nesting are at large sites with high canopy cover and foliage volume, and moderately large and tall trees (RHJV 2004). The cuckoo's primary food sources - katydid and sphinx moth larvae, are associated with cottonwood trees; hence the high reported use of cottonwood trees as cuckoo foraging habitat (Laymon and Halterman 1985). However, these prey species hibernate underground and are frequently not available in lowland floodplains during wet years when late-spring flooding occurs (RHJV 2004).

Occupied habitat within Butte County is described as great valley cottonwood riparian forest and great valley mixed riparian forest, including willows, box elder, and white alder (Halterman 1991). Potential habitat also occurs in valley marshland with willow riparian corridors, such as those found in the Llano Seco area (Butte County 2011).

According to USFWS (2005), cuckoos need to have larger nesting trees located in close proximity to foraging areas. In the past, cuckoos have been documented nesting at Phelan Island, less than two miles south of the Capay Unit (Small et al. 2000 as cited in CBDA and TNC 2005), and they were detected at Bidwell-Sacramento River State Park, across the Sacramento River from the Capay Unit, in 1998 (Manolis 1998) and 2002 (Gilchrist et al. 2002, as cited in CBDA and TNC 2005). Suitable habitat for the western yellow-billed cuckoo exists in the Action Area, although there are no known occurrences of the species in the Action Area. As described in Chapter 3, there were no observations of yellow-billed cuckoo in the Action Area, or at the

adjacent Pine Creek and Phelan Island survey sites during 2012. The nearest detection along the Sacramento River was located near Ord Ferry Road, which is south of the Action Area (Dettling and Seavy 2012).

Recent restoration efforts on the Capay Unit have focused on restoring refuge agricultural lands to willow scrub, cottonwood, and mixed-riparian forests, which are anticipated to provide increased nesting and foraging habitat for the species.

ABUNDANCE

Historically, the range of western yellow-billed cuckoo extended from southern British Columbia in the north to the Rio Grande River in northern Mexico in the south, and east to the Rocky Mountains (Bent 1940). It is generally believed that a significant decline of the yellow-billed cuckoo in California occurred following the start of the major era of development beginning about the mid-1800s (66 FR 38611, July 25, 2001).

In California prior to the 1930s, the species was widely distributed in suitable river bottom habitats, and was locally common (66 FR 38611, July 25, 2001). Yellow-billed cuckoos nested primarily in coastal counties from San Diego County near the Mexico border to Sonoma County in the San Francisco Bay region, in the Central Valley from Kern County through Shasta County, and along the lower Colorado River (66 FR 38611, July 25, 2001). Yellow-billed cuckoos also bred locally elsewhere in the State, including in Inyo, San Bernardino, and Siskiyou counties (66 FR 38611, July 25, 2001).

Large-scale Cuckoo surveys were conducted along the Sacramento River in 1972-73 (Gaines 1974; Gaines and Laymon 1984), 1977 (Gaines and Laymon 1984), 1987-90 (Laymon and Halterman 1989, Halterman 1991), and 1999-2000 (Halterman et al. 2001). Although the effort in each study varied, these surveys suggested a population of between 28 and 142 individuals (Dettling and Seavy 2012).

The species' range is now restricted to remaining isolated riparian forest fragments, and in California to the Sacramento Valley, the Kern River, and the lower Colorado River with individuals occasionally reported in other areas (Laymon and Halterman 1987, as cited in Dettling and Seavy 2012). Presently, the Sacramento Valley is believed to have one of the largest yellow-billed cuckoo populations in California (Halterman et al. 2001, as cited in Dettling and Seavy 2012), due in part to the riparian vegetation that has increased by nearly 5,000 acres due to restoration efforts that have occurred since 1996 (Golet et al. 2008, as cited in Dettling and Seavy 2012).

Yellow-billed cuckoos were surveyed for along both the Sacramento and Feather rivers during the summer of 2010 and again during 2012 (Dettling and Seavy 2012). Surveys in 2010 along the Sacramento River from Red Bluff to Colusa detected 18 individual cuckoos, but did not observe any breeding behavior (Dettling and Howell 2011). In 2012, a total of 10 to 12 cuckoos were detected, and cuckoos were found in four surveyed areas where none were recorded in

2010. As a conservative estimate, Dettling and Seavy (2012) suggest that the population currently could be about 26 pairs (52 individuals) for the Sacramento River. However, population objectives developed for the region are 150 pairs (300 individuals) along the Sacramento River, and 25 (50 individuals) pairs along the Feather River (Laymon 1998).

As described in Butte County (2011), the CNDDB reports cuckoo occurrences along Butte Creek in the 1970s and 1980s, and breeding pairs have been reported from portions of the Feather River between Oroville and the Butte County border. According to Butte County (2011), yellow-billed cuckoos only occupy habitat areas in Butte County during their compressed breeding season (i.e., about late-June to August), after which they then begin their migration to South America (Laymon and Halterman 1985).

LIMITING FACTORS, THREATS AND STRESSORS

Habitat Loss and Fragmentation

Principal causes of riparian habitat losses are dams and river flow management, conversion to agricultural and other uses, stream channelization and stabilization, and livestock grazing (USFWS 2011). According to CDFG (1987), the major threat to the continued existence of the western yellow-billed cuckoo in California is the loss or degradation of its habitat.

Since the late 1800's, the mature, floodplain riparian forest in the Sacramento Valley has been reduced by being cut or cleared for fuel, and for agricultural, flood control and urban expansion purposes (Gaines and Layroon 1984). The majority of habitat for the cuckoo is located on private lands and continues to be lost or significantly altered (USFWS 2011). The yellow-billed cuckoo also is considered vulnerable to tropical deforestation on its wintering grounds (Morton 1992), and while losses of neotropical forests and woodlands have been substantial and ongoing, particularly in Central America and northern South America (Hartshorn 1992; Brown and Lomolino 1998), the relationship between over-wintering habitat and yellow-billed cuckoo populations has not been studied (USFWS 2011).

Fragmentation effects include the loss of patches large enough to sustain local populations, leading to local extinctions, and the potential loss of migratory corridors, affecting the ability to recolonize habitat patches (Hunter 1996). Nesting cuckoos are sensitive to habitat fragmentation that reduces patch size to less than 325 feet by 1,000 feet (Hughes 1999 in Butte County 2011). Fragmentation of occupied habitats could make nest sites more accessible and more vulnerable to predation (Technology Associates 2009).

Pesticides

Heavy use of chlorinated hydrocarbon insecticides was popular in the 1940's and 1950's, when aerial spraying became common in fields, orchards, and river bottoms (Gaines and Layrron1984, citing others). In California, spraying of larvicides and other pesticides (for mosquito control and in orchards) has been cited as a continuing problem for yellow-billed cuckoos (Laymon 1998).

Aside from the adverse effects of toxin accumulation in cuckoo body tissues, pesticide use also can significantly reduce prey abundance, thus lowering cuckoo reproductive success (USFWS 2005). Although there have been no experimental studies linking local pesticide applications with cuckoo reproductive success, cuckoo population declines have been noted in areas (e.g., central valley of California) where heavy pesticide use is common in agricultural areas bordering riparian zones (Laymon and Halterman 1989).

Disease and Predation

The National Wildlife Health Center of the USGS has identified the yellow-billed cuckoo as a species that may be affected by West Nile virus (USGS 2005).

Predation is also a potential threat to the western yellow-billed cuckoo. Adult cuckoos have been preyed upon by falcons (Hector 1985), and nestlings have been taken by hawks, jays and grackles (Nolan and Thompson 1975; Launer et al. 1990; Hughes 1999) and by various snake and mammal species (Nolan 1963). Predation also reportedly is a significant source of nest failures, which have been recorded at 80 percent in some areas (Hughes 1999). Fragmentation of occupied habitats could make nest sites more accessible and more vulnerable to predation by red-tailed hawks and Cooper's hawks (Butte County 2011).

Climate Change

Climate change may be a stressor on yellow-billed cuckoos. Although information for western yellow-billed cuckoo is not available, eastern cuckoo declines have been linked to global climate patterns causing warmer winters, which reduce prey biomass the following summer (Anders and Post 2006).

RECOVERY PLAN IMPLEMENTATION

A recovery plan for the western yellow-billed cuckoo has not been developed, and species-specific recovery goals have not yet been established.

General conservation recommendations identified in USFWS (2011) include: (1) determination of the numbers and locations of remnant populations; (2) acquire and improve riparian habitats; (3) eliminate pesticide spraying in orchards adjacent to riparian areas; (4) restore hydrologic functioning of riparian areas in managed river systems and investigate feasibility reintroduction to naturally regenerated or reforested habitat. USFWS (2011) further identified the need to continue to work with Federal and State wildlife and land management agencies to determine population status of the species throughout the western DPS range.

In California, general conservation efforts are focused on limiting the amount of riparian habitat removed or converted to other habitat types. The Riparian Habitat Joint Venture (2004) identified conservation efforts for multiple riparian bird species, including western yellow-billed cuckoo. Additionally, the SRNWR has identified restoration for yellow-billed cuckoo (i.e., cottonwood forest and mixed riparian forest associated with early succession stage habitat), and

cooperative monitoring and research as conservation strategies for endangered species objectives of the wildlife and habitat goal for the SRNWR Comprehensive Conservation Plan (USFWS 2005).

5.6 ENVIRONMENTAL BASELINE

The regulations governing ESA consultations (50 CFR 402.02) define "Environmental Baseline" as follows:

> *"The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early Section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process."*

According to NMFS (2005c) "*Recommendations for the Contents of Biological Assessments and Biological Evaluations*," the environmental baseline analysis should:

- Provide information on past, present and future State, local, private, or tribal activities in the action area - specifically, the positive or negative impacts those activities have had on the species or habitat in the area in terms of abundance, reproduction, distribution, diversity, and habitat quality or function.
- Include the impacts of past and present Federal actions.
- Describe the impacts of the past existence and operation of the action under consultation (for continuing actions).
- Present all known and relative effects on the population (e.g., fish stocking, fishing, hunting, other recreation, illegal collecting, private wells, development, grazing, local trust programs).
- Include impacts to the listed and proposed species in the Action Area that are occurring, and that are unrelated to the Proposed Action (e.g., poaching, road kills from off-road vehicle use, trespass).

The ESA Consultation Handbook (USFWS and NMFS 1998) explains that the Environmental Baseline should provide an "*analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including designated critical habitat), and ecosystem, within the action area.*" While the Environmental Baseline includes ongoing effects, it does not include the future effects of the Proposed Action under review.

5.6.1 EFFECTS OF THE ENVIRONMENTAL BASELINE

Under what is commonly called the "aggregate effects" assessment approach, the Environmental Baseline and the status of the species are viewed together for NMFS to determine the ability of each listed species to withstand additional stressors associated with subsequent actions without

jeopardizing the continued existence of the species. As NMFS (2009a) indicates: "*if the species' status is poor and the baseline is degraded at the time of consultation, it is more likely that any additional adverse effects caused by the proposed or continuing action will be significant.*"

The Environmental Baseline is characterized by the existing physical features and habitat conditions in the Action Area, as well as the anticipated future baseline conditions that will result from ongoing present activities, from proposed Federal projects in the Action Area that have already undergone formal or early Section 7 consultation, and from State or private actions that are contemporaneous with the consultation in process. Therefore, the ongoing and future effects from the limiting factors, threats, and stressors previously addressed in this chapter are included in the Environmental Baseline. The limiting factors, threats and stressors associated with the Environmental Baseline, which have led to the current status of each of the listed species, are described in detail in Chapter 3.0 and Section 5.5, and are summarily discussed by ESU and DPS below.

5.6.1.1 SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON ESU

The key limiting factors, threats and stressors associated with the Environmental Baseline affecting the winter-run Chinook salmon ESU include the following.

- Habitat Blockage
- Passage Constraints
- Water Quality
- Water Diversions
- Habitat Modification
- Environmental Variation (natural environmental cycles, ocean productivity, global climate change, ocean acidification)
- Water Development
- Non-Native Invasive Species
- Disease and Predation
- Over Utilization

The abundance of winter-run Chinook salmon has fluctuated over the years. In recent years, the carcass survey population estimates of in-river spawning winter-run Chinook salmon in the mainstem Sacramento River has precipitously declined from a high in 2006. The estimated abundance of winter-run Chinook salmon has declined continuously for the last three years.

The biological opinion for the CVP/SWP OCAP consultation (NMFS 2009a) covered CVP and SWP facilities and potentially affected waterbodies. The winter-run Chinook salmon ESU would be subject to CVP/SWP operational and ESU-wide effects associated with the Environmental Baseline while in the Sacramento River and Delta, as well as well as in the Pacific Ocean. The NMFS (2009a) biological opinion therefore can be used in this effects assessment for an ESU-wide assessment of the Sacramento River winter-run Chinook salmon ESU.

The NMFS evaluation of potential effects of the CVP/SWP OCAP (NMFS 2009a) included an assessment of the VSP parameters of abundance, productivity, spatial structure, and diversity. NMFS (2009a) stated that near term and future operations would likely result in more of the

Sacramento River being diverted to the Central and South Delta through the Delta Cross Channel, thereby resulting in increased entrainment, subsequent mortality, and reduced abundance of winter-run smolts during the early part of their outmigration period.

NMFS (2009a) also states that the winter-run Chinook salmon ESU is currently at a high risk of extinction, and weaknesses in all four VSP parameters, including population growth rate, contribute to this risk. The CVP/SWP OCAP Proposed Action increases the population's extinction risk (NMFS 2009a). According to NMFS (2009a), habitat conditions in the Sacramento River and Delta are adversely affected by the CVP/SWP OCAP Proposed Action in a number of ways which reduces the population's current spatial structure (by reducing habitat quantity and quality), which increases the risk of extinction of the winter-run population, and consequently the ESU.

According to NMFS (2009a), the diversity of winter-run continues to be limited as a result of the CVP/SWP OCAP Proposed Action. The release of cold water to accommodate adult winter-run migration, holding, spawning, and egg incubation is predictable, beginning and ending on specific dates, leaving little room for variability in both the run and spawn timing within the species, both of which have been identified as key diversity traits (McElhany et al. 2000). In addition, the diversity of winter-run is reduced by proposed operations due to effects which truncate the timing of particular life stages, including the first part of the outmigration period of smolts due to entrainment of juveniles through the Delta Cross Channel again (NMFS 2009a).

Critical habitat for winter-run Chinook salmon is composed of physical and biological features that are essential for the conservation of winter-run Chinook salmon, including up and downstream access, and the availability of certain habitat conditions necessary to meet the biological requirements of the species (NMFS 2009a). Winter-run Chinook salmon have been blocked from all historical spawning habitat, and is now restricted to one population. Currently, many of the physical and biological features of winter-run Chinook salmon critical habitat are impaired, and provide limited conservation value. According to NMFS (2009a), the current condition of winter-run Chinook salmon critical habitat is degraded, and has low value for the conservation of the species, and the CVP/SWP OCAP Proposed Action increases the population's extinction risk and continues to degrade the PCEs of critical habitat by adding numerous stressors to the species' baseline stress regime. In addition, climate change is expected to further degrade the suitability of habitats in the Central Valley through increased temperatures, increased frequency of drought, increased frequency of flood flows, and overall drier conditions (Lindley et al. 2007).

Due to abundance, productivity, diversity and spatial structure considerations, NMFS (2009a) concluded that the Sacramento River winter-run Chinook salmon ESU is at a "high risk of extinction."

NMFS (2009a) concluded that long-term CVP/SWP operations are likely to jeopardize the continued existence of Sacramento River winter-run Chinook salmon, and are likely to destroy or adversely modify critical habitat for Sacramento River winter-run Chinook salmon.

Consequently, NMFS (2009a) developed focused actions designed to compensate for particular stressors, considering the full range of authorities that Reclamation and DWR may use to implement these actions. NMFS concentrated on actions that have the highest likelihood of alleviating the stressors with the most significant effects on the species, rather than attempting to address every project stressor for each species or every PCE for critical habitat.

The NMFS (2009a) Reasonable and Prudent Alternative (RPA) is composed of numerous elements for each of the various CVP/SWP project divisions and associated stressors, and must be implemented in its entirety to avoid jeopardy and adverse modification of critical habitat. NMFS recognized that the RPA must be an alternative that is likely to avoid jeopardizing listed species or adversely modifying their critical habitats, rather than a plan that will achieve recovery. Both the jeopardy and adverse modification standards, however, include consideration of effects of an action on listed species' chances of recovery. Short-term actions are presented in NMFS (2009a) for each division of the CVP/SWP, and are summarized for each species to ensure that the likelihood of survival and recovery is not appreciably reduced in the short term (i.e., one to five years). In addition, because evaluated long-term CVP/SWP system-wide operations extend until 2030, the consultation also included long-term actions that NMFS identified as being necessary to address CVP/SWP project-related adverse effects on the likelihood of survival and recovery of the species over the next two decades. NMFS (2009a) states that the RPA cannot and does not include all steps that would be necessary to achieve recovery.

Presently, not all of the actions identified in the RPAs for the various divisions of the CVP and SWP have been implemented. Consequently, for the ESU-wide Environmental Baseline effects assessment of the Sacramento River winter-run Chinook salmon ESU, the entire suite of limiting factors, threats and stressors associated with the Environmental Baseline result in an unstable ESU at high risk of extinction, and the Environmental Baseline therefore is likely to "*reduce appreciably the likelihood of both the survival and recovery*," and "*appreciably diminish[] the value of critical habitat.*"

5.6.1.2 CENTRAL VALLEY SPRING-RUN CHINOOK SALMON ESU

The key limiting factors, threats and stressors associated with the Environmental Baseline affecting the spring-run Chinook salmon ESU include the following.

- Habitat Blockage
- Water Conveyance and Flood Control
- Water Quality
- Hatchery Operations and Practices
- Water Development
- Land Use Activities
- Non-Native Invasive Species
- Disease and Predation
- Over Utilization (ocean commercial and sport harvest, inland sport harvest)
- Environmental Variation (natural environmental cycles, ocean productivity, global climate change, ocean acidification)

The Central Valley spring-run Chinook salmon ESU continues to display broad fluctuations in abundance. According to NMFS (2011), recent anomalous conditions in the coastal ocean, along with consecutive dry years affecting inland freshwater conditions, have contributed to statewide spring-run Chinook salmon escapement declines. As a species' abundance decreases, and spatial structure of the ESU is reduced, a species has less flexibility to withstand changes in the environment.

The BO for the CVP/SWP OCAP consultation (NMFS 2009a) covered CVP/SWP operational and ESU-wide effects associated with the Environmental Baseline including the Sacramento River and Delta, as well as well as the Pacific Ocean. The NMFS (2009a) BO therefore can be used in this effects assessment for an ESU-wide assessment of the entire Central Valley spring-run Chinook salmon ESU.

The NMFS evaluation of potential effects of the CVP/SWP OCAP (NMFS 2009a) included an assessment of the VSP parameters of abundance, productivity, spatial structure, and diversity. Regarding abundance, NMFS (2009a) stated that long-term CVP/SWP system-wide operations are expected to result in substantial mortality to juvenile spring-run Chinook salmon, and that CVP/SWP-related entrainment into the Central and South Delta greatly increase the risk of mortality from direct (entrainment and impingement at the pumps) and indirect (predation) effects. NMFS (2009a) also stated that population growth rate of spring-run Chinook salmon would be expected to decline in the future.

According to NMFS (2009a), operations of the CVP and SWP reduce the population's current spatial structure (by reducing habitat quantity and quality) and negatively affect the diversity of spring-run Chinook salmon in the mainstem Sacramento River. CVP/SWP operations are expected to continue these effects. The operations of the DCC and RBDD affect the temporal distribution of adult spring-run on their spawning migration to mainstem Sacramento River spawning grounds, and potentially results in introgression with fall-run Chinook salmon and continues the pattern of genetic introgression and hybridization that has occurred since RBDD was built in the late 1960s (CDFG 1988; NMFS 2004b; TCCA 2008; all as cited in NMFS 2009a). In addition, NMFS (2009a) suggest that the Feather River Fish Hatchery program has affected the diversity of the Central Valley spring-run Chinook salmon and, together with the loss of the San Joaquin River Basin spring-run populations, the diversity of the Central Valley spring-run Chinook salmon ESU has been reduced (NMFS 2004b).

Critical habitat for spring-run Chinook salmon is composed of primary constituent elements that are essential for the conservation of the species, including but not limited to, spawning habitat, rearing habitat, migratory corridors, and estuarine areas. Most of the historic spawning and rearing habitat for the Central Valley spring-run Chinook salmon ESU is above impassable dams. According to NMFS (2009a), substantial habitat degradation and alteration also has affected the rearing, migratory, and estuarine areas used by spring-run.

Due to past and ongoing effects, the current condition of spring-run Chinook salmon critical habitat is considered to be highly degraded, and does not provide the conservation value

necessary for the survival and recovery of the species (NMFS 2009a). In addition, climate change is expected to further degrade the suitability of habitats in the Central Valley through increased temperatures, increased frequency of drought, increased frequency of flood flows, and overall drier conditions (Lindley et al. 2007).

According to NMFS (2009a), all of the above factors, which reduce the spatial structure, diversity, and abundance, compromise the capacity for the spring-run Chinook salmon ESU to respond and adapt to environmental changes. High quality critical habitat containing spawning sites with adequate water and substrate conditions, or rearing sites with adequate floodplain connectivity, cover, and water conditions (i.e., key primary constituent elements of critical habitat that contribute to its conservation value) is considered to be limited. Future projections over the duration of evaluated long-term CVP/SWP operations (i.e., through 2030), considering both increasing water demands and climate change, exacerbate risks to the Central Valley spring-run Chinook salmon ESU. NMFS (2009a) stated that the Central Valley spring-run Chinook salmon ESU is at moderate risk of extinction.

As previously discussed for winter-run Chinook salmon, NMFS (2009a) concluded that long-term CVP/SWP operations are likely to jeopardize the continued existence of Central Valley spring-run Chinook salmon, and are likely to destroy or adversely modify critical habitat for Central Valley spring-run Chinook salmon. Consequently, NMFS (2009a) developed a RPA for spring-run Chinook salmon, composed of numerous elements for each of the various CVP/SWP project divisions and associated stressors, that must be implemented in its entirety to avoid jeopardy and adverse modification of critical habitat. Because evaluated long-term CVP/SWP system-wide operations extend until 2030, the consultation included both short-term and long-term actions that NMFS identified as being necessary to address CVP/SWP project-related adverse effects on the likelihood of survival and recovery of the species.

Presently, not all of the actions identified in the RPAs for the various divisions of the CVP and SWP have been implemented. Consequently, for the ESU-wide Environmental Baseline effects assessment of the spring-run Chinook salmon ESU, the entire suite of limiting factors, threats and stressors associated with the Environmental Baseline result in an unstable ESU at moderate risk of extinction, and the Environmental Baseline therefore is likely to "*reduce appreciably the likelihood of both the survival and recovery*," and "*appreciably diminish[] the value of critical habitat.*"

5.6.1.3 CENTRAL VALLEY STEELHEAD DPS

The aforementioned list of limiting factors and stressors pertinent to the spring-run Chinook salmon ESU also pertain to the steelhead DPS. Stressors that are unique to the steelhead DPS, or substantially differ in the severity from the stressor for the previously described spring-run Chinook salmon ESU, are discussed in Chapter 3 of this document and include the following.

- Destruction, Modification, or Curtailment of Habitat or Range
- Overutilization for Commercial, Recreational, Scientific or Education Purposes (inland sport harvest)
- Disease or Predation
- Inadequacy of Existing Regulatory Mechanisms (Federal efforts, non-Federal efforts)
- Other Natural and Man-Made Factors Affecting Its Continued Existence
- Non-Lifestage Specific Threats and Stressors (artificial propagation programs, small population size, genetic integrity and long-term climate change)

As previously discussed for the Central Valley spring-run Chinook salmon ESU, the biological opinion for the CVP/SWP OCAP consultation (NMFS 2009a) covered CVP and SWP facilities and potentially affected waterbodies, which encompass the Action Area.

NMFS (2009a) stated that CVP/SWP system-wide operations are expected to result in direct mortality to steelhead, including: (1) increased predation of juveniles when the RBDD gates are down; (2) entrainment of juveniles into the Central and South Delta; (3) entrainment and impingement of juveniles at the CVP/SWP pumps in the South Delta (both direct and indirect loss); and (4) loss associated with the collection, handling, trucking and release program.

According to NMFS (2009a), steelhead habitat conditions in the mainstem Sacramento River and the Delta are adversely affected by long-term CVP/SWP system-wide operations in several ways, including but not limited to: (1) delaying the upstream migration of adult steelhead through RBDD operations; (2) reducing the availability of quality rearing habitat through the seasonal creation of Lake Red Bluff; and (3) creating improved feeding opportunities at RBDD for predators such as pikeminnow and striped bass. In these ways, the CVP/SWP system-wide operations reduce the population's current spatial structure (by reducing habitat quantity and quality), which increases the risk of extinction of the mainstem Sacramento River steelhead population (NMFS 2009a).

NMFS (2009a) stated that the diversity of mainstem Sacramento River steelhead also may be affected by CVP/SWP system-wide operations due to changed thermal regimes and food web structures in the Sacramento River such that a resident life history strategy may have fitness advantages over anadromous forms, although little is known about the relationship of resident and anadromous forms of *O. mykiss*. Without knowing the roles that resident *O. mykiss* play in population maintenance and persistence of anadromous *O. mykiss*, it is difficult to assess whether the current conditions on the Sacramento River, which may favor residency, are detrimental to the anadromous population in the Sacramento River or not (Lindley et al. 2007). In addition, widespread hatchery steelhead production within this DPS also raises concerns about the potential ecological interactions between introduced stocks and native stocks (USACE 2007).

According to NMFS (2009a), critical habitat for steelhead is composed of PCEs that are essential for the conservation of the species including, but not limited to, spawning habitat, rearing habitat, migratory corridors, and estuarine areas. Based on the host of stressors to spawning, rearing,

migratory, and estuarine habitats in the Central Valley, it is apparent that the current condition of steelhead critical habitat is degraded, and does not provide the conservation values necessary for the survival and recovery of the species (NMFS 2009a).

NMFS (2009a) stated that CVP/SWP system-wide operations are expected to place critical habitat for mainstem Sacramento River steelhead at considerable risk. The status of steelhead critical habitat within the mainstem Sacramento River is suggested by NMFS (2009a) to be substantially degraded due to factors such as warm water temperatures and low flows, loss of natural river function and floodplain connectivity through levee construction, direct loss of floodplain and riparian habitat, loss of tidal wetland habitat, a collapsed pelagic community in the Delta, and poor water quality associated with agricultural, urban, and industrial land use. Additionally, NMFS (2009a) stated that climate change is expected to further degrade the suitability of habitats in the Central Valley through increased temperatures, increased frequency of drought, increased frequency of flood flows, and overall drier conditions. Estuarine habitats also have been substantially degraded (e.g., Sommer et al. 2007) and climate change is expected to further alter these habitats through sea level rise and hydrological changes.

As described by NMFS (2009a), there are few data with which to assess the status of Central Valley steelhead populations.

According to NMFS (2009a), data are lacking to suggest that the Central Valley steelhead DPS is at low risk of extinction, or that there are viable populations of steelhead anywhere in the DPS. Conversely, NMFS (2009a) states that there is evidence to suggest that the Central Valley steelhead DPS is at moderate or high risk of extinction. Most of the historical habitat once available to steelhead has been lost, and the observation that anadromous *O. mykiss* are becoming rare in areas where they were probably once abundant indicates that an important component of life history diversity is being suppressed or lost (NMFS 2009a). Lindley et al. (2007) stated that even if there were adequate data on the distribution and abundance of steelhead in the Central Valley, approaches for assessing steelhead population and DPS viability might be problematic because the effect of resident *O. mykiss* on the viability of steelhead populations and the DPS is unknown.

NMFS (2009a) concluded that long-term CVP/SWP operations are likely to jeopardize the continued existence of Central Valley steelhead and are likely to destroy or adversely modify critical habitat for Central Valley steelhead.

As previously discussed for the Sacramento River winter-run and Central Valley spring-run Chinook salmon ESUs, NMFS (2009a) developed RPAs for each of the various CVP/SWP project divisions and associated waterbodies in order to avoid jeopardy and adverse modification of critical habitat. Presently, not all of the actions identified in the RPAs for the various divisions of the CVP and SWP have been implemented. Consequently, for the DPS-wide Environmental Baseline effects assessment of the Central Valley steelhead DPS, the entire suite of limiting factors, threats and stressors associated with the Environmental Baseline result in an unstable DPS at moderate or high risk of extinction, and the Environmental Baseline therefore is likely to

"*reduce appreciably the likelihood of both the survival and recovery,*" and "*appreciably diminish[] the value of critical habitat.*"

5.6.1.4 SOUTHERN DPS OF THE NORTH AMERICAN GREEN STURGEON

The key limiting factors, threats and stressors associated with the Environmental Baseline affecting the Southern DPS of North American green sturgeon, discussed in Chapter 3 of this document, include the following.

- Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range (reduction in spawning habitat, alteration of habitat - flows, water temperatures, delayed or blocked migration, impaired water quality, dredging and ship traffic, ocean energy projects)
- Commercial, Recreational, Scientific or Educational Overutilization
- Disease and Predation
- Inadequacy of Existing Regulatory Mechanisms
- Other Natural and Man-Made Factors Affecting Its Continued Existence (non-native invasive species)
- Entrainment

As previously discussed, the Biological Opinion for the CVP/SWP OCAP consultation (NMFS 2009a) covered CVP and SWP facilities and potentially affected waterbodies which encompass the Action Area. The NMFS (2009a) biological opinion is used in this document for a DPS-wide assessment of the entire Southern DPS of North American green sturgeon.

The current status of the Southern DPS of North American green sturgeon abundance and productivity is unknown (NMFS 2009a). However, CVP/SWP system-wide operations are expected to result in increased loss of individual fish and reduced abundance of adult fish in the green sturgeon population (NMFS 2009a). Larval and juvenile green sturgeon entrainment or impingement from screened and unscreened agricultural, municipal, and industrial water diversions along the Sacramento River and within the Delta also are considered important threats (71 FR 17757).

The Southern DPS of North American green sturgeon is at substantial risk of future population declines (NMFS 2009a). The potential threats faced by the green sturgeon include increased vulnerability due to the reduction of spawning habitat into one concentrated area on the Sacramento River, lack of good empirical population data, vulnerability of long-term cold water supply for egg incubation and larval survival, loss of juvenile green sturgeon due to entrainment at the project fish collection facilities in the South Delta and agricultural diversions within the Sacramento River and Delta systems, alterations of food resources due to changes in the Sacramento River and Delta habitats, and exposure to various sources of contaminants throughout the basin to juvenile, sub-adult, and adult life stages (NMFS 2009a).

According to NMFS (2009a), RBDD gate closures blocked access to upstream spawning areas and decreased the productivity and spatial structure of the green sturgeon population. Fish that were forced to spawn below RBDD were believed to have a lower rate of spawning success compared to those fish that spawned above the RBDD. Furthermore, NMFS (2009a) stated that reductions in genetic diversity may have occurred due to the separation of upstream and downstream populations created anthropogenically by the closure of the RBDD. NMFS (2009a) mandated an RPA for RBDD that required the gates to be raised year-round. The RBDD Fish Passage Improvement Project is being constructed in phases. According to the RPA, by no later than May 15, 2012 Reclamation must operate RBDD with the gates out all year to allow unimpeded passage for listed anadromous fish (NMFS 2009a).

At the time that NMFS conducted the consultation for the CVP/SWP OCAP, green sturgeon critical habitat had been proposed but a final rule designating critical habitat had not yet been adopted. NMFS (2009a) therefore referred to "proposed" green sturgeon critical habitat in its evaluations.

According to NMFS (2009a), the current condition of proposed critical habitat for the Southern DPS of North American green sturgeon is degraded over its historical conditions. It does not provide the full extent of conservation values necessary for the recovery of the species, particularly in the upstream riverine habitat. In particular, passage and water flow PCEs have been impacted by human actions, substantially altering the historical river characteristics in which green sturgeon evolved. In addition, the alterations to the Sacramento-San Joaquin River Delta may have a particularly strong impact on the survival and recruitment of juvenile green sturgeon due to the protracted rearing time in the delta and estuary. Loss of individuals during this phase of the life history of green sturgeon represents losses to multiple year classes rearing in the Delta, which can ultimately impact the potential population structure for decades to come (NMFS 2009a).

NMFS (2009a) stated that CVP/SWP system-wide operations are expected to reduce the conservation value of green sturgeon critical habitat. The principal factor for the decline of green sturgeon reportedly comes from the reduction of green sturgeon spawning habitat to a limited area of the Sacramento River (70 FR 17391). The potential for catastrophic events to affect such a limited spawning area increases the risk of the green sturgeon's extirpation. Elevated water temperatures in the spawning and rearing habitat likely also pose threats to this species (70 FR 17391). The conservation value of water quality (specifically in terms of water temperature) for successful spawning and egg incubation will likely be compromised downstream of RBDD (NMFS 2009a). The effects of future CVP/SWP system-wide operations under climate change scenarios would likely further degrade the water quality PCE.

As described by NMFS (2009a), there are few data with which to assess the status of green sturgeon in the Central Valley domain. NMFS (2009a) stated that the green sturgeon DPS is data deficient. Nonetheless, NMFS (2009a) concluded that the Southern DPS of North American green sturgeon remains vulnerable to becoming endangered in the future. Key factors upon

which this conclusion was based include: (1) the DPS is comprised of only one spawning population, which has been blocked from a considerable portion of its potential spawning range by dams; (2) the DPS has a risk associated with catastrophes and environmental perturbations (i.e., water temperatures from Shasta Dam) affecting current spawning areas; and (3) mortality rates have significant effects on the adult and sub-adult life history phases of this long-lived species (NMFS 2009a).

NMFS (2009a) concluded that continued operations of the CVP/SWP would be expected to have population level consequences for the single extant population in the mainstem Sacramento River, and greatly increase the extinction risk of the species (NMFS 2009a). Additionally, NMFS (2009a) concluded that the conservation value of the critical habitat, as designated for the conservation of green sturgeon, would be reduced.

NMFS (2009a) developed a RPA in order to avoid jeopardy and adverse modification of critical habitat. The green sturgeon RPA specifies many significant actions that will reduce the adverse effects of the continued operation of the CVP/SWP and bring about the proper functioning of PCEs of its proposed critical habitat (NMFS 2009a). All actions that address green sturgeon in the RPA are necessary to minimize project effects to the extent where they do not appreciably reduce the likelihood of survival and recovery of the DPS in the near-term and the long-term, or adversely modify proposed critical habitat (NMFS 2009a).

Presently, not all of the actions identified in the RPA for green sturgeon have been implemented. The entire suite of limiting factors, threats and stressors associated with the Environmental Baseline are likely to jeopardize the continued existence of the Southern DPS of North American green sturgeon (NMFS 2009a). Consequently, although the Southern DPS of North American green sturgeon is data deficient, for the DPS-wide Environmental Baseline effects assessment of the green sturgeon DPS in this document, it is assumed that the Environmental Baseline may "*reduce appreciably the likelihood of both the survival and recovery*," and "*appreciably diminish the value of critical habitat.*"

5.7 EFFECTS OF THE PROPOSED ACTION

As stated in NMFS (2007), regulations that implement Section 7(b)(2) of the ESA require biological opinions to evaluate the direct and indirect effects of Federal actions and actions that are interrelated with or interdependent to the Federal action to determine if it would be reasonable to expect them to appreciably reduce listed species' likelihood of surviving and recovering in the wild by reducing their reproduction, numbers, or distribution (16 U.S.C. § 1536; 50 CFR 402.02). Section 7 of the ESA and its implementing regulations also require biological opinions to determine if Federal actions would destroy or adversely modify the conservation value of critical habitat (16 U.S.C. §1536). For assessment purposes, 50 CFR 402.02 defines the *"effects of the action"* as *"the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline."*

This effects assessment addresses direct and indirect effects to: (1) listed aquatic species and their designated critical habitat within the Action Area; (2) EFH within the Action Area; and (3) listed terrestrial species and their designated critical habitat within the Action Area.

Section 7(a)(2) of the ESA states that each Federal agency shall, in consultation with the Secretary, insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat (USFWS and NMFS 1998). The effects assessment addresses the presence of listed species in the Action Area and includes an analysis of the likely effects of the Proposed Action on the listed species and their habitat.

As part of the effects assessment approach, the Environmental Baseline and the status of the species are typically viewed together to determine the ability of each listed species to withstand additional stressors associated with subsequent actions.

Additional analyses in this effects assessment consist of performing a "net effects" analysis to assist NMFS in determining whether the Proposed Action will cause "*…some deterioration in the species' pre-action condition*" (*National Wildlife Federation v. NMFS, 524 F.3d 917 (9th Cir. 2008*)). The net effects analysis in this BA considers guidance provided by *National Wildlife Federation v. NMFS, 524 F.3d 917 (9th Cir. 2008),* which stated **"***…an agency may not take action that will tip a species from a state of precarious survival into a state of likely extinction. Likewise, even where baseline conditions already jeopardize a species, an agency may not take action that deepens the jeopardy by causing additional harm.*"

For the critical habitat effects analysis, an evaluation was conducted on the effects of the Proposed Action on the PCEs of critical habitat and, in particular, on the essential features of that critical habitat in the Action Area, by comparing the conditions of the habitat with and without the Proposed Action. In conducting analyses of habitat-altering actions under Section 7 of the ESA, NMFS uses the following steps of the consultation regulations and, when appropriate, combines them with *The Habitat Approach, Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Anadromous Salmonids* (NMFS 1999): (1) consider the status and biological requirements of the affected species; (2) evaluate the relevance of the Environmental Baseline in the Action Area to the species' current status; (3) determine the effects of the proposed or continuing action on the species; (4) consider cumulative effects; (5) determine whether the Proposed Action, considering the above factors, is likely to appreciably reduce the likelihood of species survival in the wild or adversely modify its critical habitat. According to NMFS (1999), the analytical framework described above is consistent with the ESA Consultation Handbook and builds upon the Handbook framework to better reflect the scientific and practical realities of salmon conservation and management on the West Coast.

Several possible determinations exist regarding a proposed action's effects on protected species under the ESA (USFWS and NMFS 1998). These determinations are as follows:

- ***No effect*** - "*No effect*" is the appropriate conclusion when it is determined that the proposed action will not affect a listed species or designated critical habitat.
- ***May affect, but is not likely to adversely affect*** - "*May affect, but is not likely to adversely affect*" is the appropriate finding when effects on ESA protected species are expected to be discountable, insignificant, or completely beneficial. "*Insignificant effects relate to the size of the impact, and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur"* (USFWS and NMFS 1998).
- ***May affect, is likely to adversely affect*** - "*May affect, is likely to adversely affect*" is the appropriate finding if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant or beneficial. In fact, in the event the overall effect of the proposed action is beneficial to an ESA-protected species, but also is likely to cause some adverse effects, then the proposed action "*is likely to adversely affect*" the listed species. If incidental take is anticipated to occur as a result of the proposed action, an "is likely to adversely affect" determination should be made (USFWS and NMFS 1998).
- ***Is likely to jeopardize a proposed species/adversely modify proposed critical habitat*** - "*Is likely to jeopardize a proposed species/adversely modify proposed critical habitat*" is the appropriate conclusion if the proposed action is likely to jeopardize the continued existence of a proposed species or adversely modify proposed critical habitat.

The ESA Consultation Handbook identifies six factors that should be examined, as appropriate for the proposed action under consideration, to assess the direct and indirect effects of a proposed action. These factors are: (1) proximity of the proposed action to the species, management units or designated critical habitat units; (2) geographic areas where the proposed action-induced disturbance occurs; (3) timing of the proposed action in relationship to sensitive periods of a species' lifecycle; (4) the nature of the effects of the proposed action on elements of a species lifecycle, population size or variability, or distribution; or on the primary constituent elements of the critical habitat; (5) duration of the effects (i.e., (a) pulse effect short-term event whose effects are relaxed almost immediately; (b) pulse effect sustained, long-term, or chronic event whose effects are not relaxed; and (c) threshold effect permanent event that sets a new threshold for some feature of a species' environment); and (6) the disturbance frequency of the effects resulting from the Proposed Action, and how it affects a species based on the species recovery rate (USFWS and NMFS 1998).

The factors described above are evaluated, as appropriate, to determine whether the Proposed Action would be associated with consideration of "take", which is the main discriminating factor for selecting the appropriate ESA determination. As can be discerned from the definitions of the possible determinations under ESA (described above), the amount and extent of protected species take determines which conclusion is appropriate for effects associated with a proposed action.

Under the Federal ESA, take is defined as "…*to harm, harass, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct*" [ESA§3(19)]. Harass, pursue, hunt, shoot, wound, kill, trap, capture or collect can be classified as actions that would have a direct effect on a species, at the individual level. Conversely, harm, which is a form of take, is further defined to include "…*significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering*" (USFWS and NMFS 1998). Proposed actions that result in adverse changes of constituent elements of critical habitat (e.g., flows and water temperatures) would result in harm and, thus, result in take of a listed species. When determining the amount and extent of take in order to select the appropriate ESA determination associated with the anticipated effects resulting from a proposed action, both the direct effects on a protected species at the individual level, and the effects to the critical habitat constituent elements of that species should be thoroughly evaluated.

The findings for each evaluated component of the Proposed Action are presented below to assist NMFS in determining the overall effect of the Proposed Action on listed fish species, and designated critical habitat within the Action Area.

5.7.1 LISTED AQUATIC SPECIES, DESIGNATED CRITICAL HABITAT AND EFH

5.7.1.1 DIRECT AND INDIRECT EFFECTS

SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON

In their BO on the integrated CVP/SWP OCAP, NMFS (2009a) found that measures identified in a reasonable and prudent alternative (RPA) to the action would need to be implemented in order to avoid a jeopardy opinion, including the Sacramento River winter-run Chinook salmon ESU. However, because not all of the RPA actions identified by NMFS for the various divisions of the CVP and SWP have yet been implemented, the entire suite of limiting factors, threats and stressors associated with the Environmental Baseline result in a vulnerable winter-run Chinook salmon ESU. Due to population size, population growth rate, diversity and spatial structure considerations, NMFS (2009a) concluded that the Sacramento River winter-run Chinook salmon ESU is at a "high risk of extinction." In their 5-year Status Review, NMFS (2011a) concluded that the Sacramento River winter-run Chinook salmon ESU continues to be at a high risk of extinction, and the ESU remains in danger of extinction and will so until additional low-risk populations are re-established within its historical spawning range. Thus, the Environmental Baseline is likely to "*reduce appreciably the likelihood of both the survival and recovery,*" and "*appreciably diminish the value of critical habitat.*"

However, the net effects of this Proposed Action (i.e., sediment dredging and rock-toe and tree revetment monitoring and maintenance) will not increase the risks to the Sacramento River winter-run Chinook salmon ESU. Actually, it is anticipated that the net effects of the Proposed

Action will represent an improvement over Environmental Baseline conditions in the Action Area.

Adult and juvenile winter-run Chinook salmon utilize the Sacramento River in the Action Area as a migration corridor. Based on available information, adult winter-run Chinook salmon adult upstream migration through the Action Area can extend from November through June. Thus, during the in-river work period (July 1 through October 15), the only lifestage of winter-run Chinook salmon that could occur in the Action Area is juvenile emigration (and transient rearing). Although juvenile winter-run Chinook salmon downstream migration in the Upper Sacramento River reportedly can extend from mid-July through March, it is likely that most juvenile emigration occurs through the Action Area after October. Thus, there is some limited potential that juvenile downstream migrating winter-run Chinook salmon could be exposed to construction-related activities in the Action Area. However, specific construction-related protective measures incorporated into the Proposed Action will avoid or minimize potential impacts to winter-run Chinook salmon associated with dredging of the sediment deposited proximate to the M&T/Llano Seco Pumps Facility intake screens, and with maintenance of the rock-toe and tree revetment.

Reduced mortality to juvenile winter-run Chinook salmon would be expected as the net effects of the Proposed Action. Continued sediment deposition proximate to the M&T/Llano Seco Pumps Facility intake screen is anticipated to result in the inability to meet NMFS/CDFW anadromous salmonid fish screen sweeping velocity criteria. Non-adherence to the criteria would be expected to result in potential increased impingement of juvenile winter-run Chinook salmon, and increased predation risk associated with lower water velocities proximate to the artificial structure in the river.

Further, if continued sediment deposition at the M&T/Llano Seco Pumps Facility intake resulted in the restriction or cessation of diversions, then historical diversions from both Butte and Big Chico creeks could be re-initiated to compensate for the loss of diversion from the Sacramento River. If this were to occur, re-initiation of pumping at the old pumping site in Big Chico Creek would result in localized conditions that would not meet all of NMFS and CDFW screen criteria, and would result in reverse flow conditions – both of which would represent substantial adverse effects to winter-run Chinook salmon. Reverse flows in Big Chico Creek would consist of water drawn from the Sacramento River, which could contain downstream migrating and transient rearing winter-run Chinook salmon. That would increase predation exposure risk in the lower most portion of Big Chico Creek, and impingement and entrainment potential of juvenile winter-run Chinook salmon at the old pumping sight. Implementation of the Proposed Action would avoid these substantive adverse effects on winter-run Chinook salmon.

The net effects of the Proposed Action will not increase the risks to winter-run Chinook salmon critical habitat. Dredging of the deposited sediment proximate to the M&T/Llano Seco Pumps Facility intake screen is short-term in nature, and would not appreciably diminish the value of critical habitat for both the survival and recovery of Sacramento River winter-run Chinook

salmon. In the NMFS (2007a) BO for the Bank Protection and Channel Alignment Project at the M&T Chico Ranch/Llano Seco Rancho, NMFS evaluated "destruction or adverse modification" of critical habitat by determining if the action reduced the value of critical habitat for the conservation of the species. In that BO, NMFS determined that the gravel removal element of that project was not likely to adversely affect Sacramento River winter-run Chinook salmon designated critical habitat.

Implementation of the Proposed Action also includes monitoring and maintenance, as necessary, of the rock-toe and tree revetment. Construction of the rock-toe and tree revetment in 2007 resulted in conditions that benefited juvenile salmonid transient rearing habitat in the Action Area. These conditions include a favorable bank slope and hydraulics (water depth and velocity), instream woody material (brush clusters), and more heterogeneous substrate characteristics. Also, since construction of the rock-toe and tree revetment in 2007, voluntary recruitment of riparian vegetation has occurred in the revetment area on top of the rock-toe, at the base of the bank, and on the lower angle portions of the bank above the rock-toe. These conditions have provided juvenile salmonid foraging areas, velocity refugia, feeding stations, and predator avoidance/escape cover.

Therefore, the Proposed Action will not adversely affect the critical habitat primary constituent elements or Sacramento River winter-run Chinook salmon critical habitat.

CENTRAL VALLEY SPRING-RUN CHINOOK SALMON

Because not all of the RPA actions identified by NMFS (2009a) in the CVP/SWP OCAP BO have been implemented, the entire suite of limiting factors, threats and stressors associated with the Environmental Baseline result in an unstable spring-run Chinook salmon ESU at moderate risk of extinction, which is likely to "*reduce appreciably the likelihood of both the survival and recovery*," and "*appreciably diminish the value of critical habitat*."

However, the net effects of this Proposed Action (i.e., sediment dredging and rock-toe and tree revetment monitoring and maintenance) will not increase the risks to the spring-run Chinook salmon. It is anticipated that the net effects of the Proposed Action will represent an improvement over Environmental Baseline conditions in the Action Area.

Specific construction-related protective measures incorporated into the Proposed Action will avoid or minimize potential impacts to spring-run Chinook salmon. Based on available information, adult upstream migrating spring-run Chinook salmon potentially could occur in the Action Area during the in-river work period (July 1 through October 15). Although it has been generally reported that adult spring-run Chinook salmon upstream migration in the Upper Sacramento River can occur between March and September, peak spawning migration through this area reportedly occurs during May and June. Thus, there is some limited potential that adult upstream migrating spring-run Chinook salmon could be exposed to construction-related activities in the Action Area from July through September. Direct mortality to adult spring-run Chinook salmon is not anticipated because of their ability to avoid dredger suction entrainment,

and their ability to avoid rock-toe and tree revetment maintenance activities. Also, there is a very limited potential that downstream migrating and transient rearing juvenile spring-run Chinook salmon could occur in the Action Area during the in-river work period.

The net effects of the Proposed Action also include reduced mortality to juvenile spring-run Chinook salmon. Continued sediment deposition proximate to the M&T/Llano Seco Pumps Facility intake screen is anticipated to result in the inability to meet NMFS/CDFG anadromous salmonid sweeping velocity criteria. This would result in potential increased impingement of juvenile spring-run Chinook salmon, and increased predation risk associated with lower water velocities proximate to the artificial structure in the river.

Further, if diversions at the M&T/Llano Seco Pumps Facility intake were restricted or could no longer be made, then historical diversions from both Butte and Big Chico creeks could be re-initiated to compensate for the loss of diversion from the Sacramento River. If this were to occur, adverse effects to spring-run Chinook salmon could be shifted from the Sacramento River to Butte and Big Chico creeks. Reduction of flows in Butte Creek would result in less suitable flow conditions during the critical spring-run Chinook salmon adult upstream migration period, and during the juvenile spring-run Chinook salmon downstream migration period. Re-initiation of pumping at the old pumping site in Big Chico Creek would result in localized conditions that would not meet all of NMFS and CDFW screen criteria, and would result in reverse flow conditions – both of which would represent substantial adverse effects to spring-run Chinook salmon. Implementation of the Proposed Action would avoid these substantive adverse effects on spring-run Chinook salmon.

The net effects of the Proposed Action will not increase the risks to the spring-run Chinook salmon critical habitat. Dredging of the deposited sediment proximate to the M&T/Llano Seco Pumps Facility intake screen is short-term in nature, and does not appreciably diminish the value of critical habitat for both the survival and recovery of Central Valley spring-run Chinook salmon. In the NMFS (2007a) BO for the Bank Protection and Channel Alignment Project at the M&T Chico Ranch/Llano Seco Rancho, NMFS determined that the gravel removal element of that project was not likely to adversely affect Central Valley spring-run Chinook salmon designated critical habitat.

Construction of the rock-toe and tree revetment in 2007 resulted in conditions that benefited juvenile salmonid transient rearing habitat in the Action Area. Under the Proposed Action, the favorable bank slope and hydraulics (water depth and velocity), instream woody material (brush clusters), and heterogeneous substrate characteristics would be maintained. Also, voluntary recruitment of riparian vegetation that has occurred since 2007 in the revetment area on top of the rock-toe, at the base of the bank, and on the lower angle portions of the bank above the rock-toe would be maintained. These conditions provide juvenile salmonid foraging areas, velocity refugia, feeding stations, and predator avoidance/escape cover.

The Proposed Action will not adversely affect critical habitat for spring-run Chinook salmon. Nor will the Proposed Action adversely affect critical habitat primary constituent elements.

Therefore, the net effects of the Proposed Action will not result in adverse effects to spring-run Chinook salmon critical habitat.

CENTRAL VALLEY STEELHEAD DPS

The Environmental Baseline results in an unstable steelhead DPS at moderate or high risk of extinction, because not all of the RPA actions identified by NMFS (2009a) for the various divisions of the CVP and SWP in the OCAP consultation have been implemented. Thus, the Environmental Baseline is likely to "*reduce appreciably the likelihood of both the survival and recovery,*" and "*appreciably diminish the value of critical habitat.*"

However, the net effects of the Proposed Action will not increase the risks to the Central Valley steelhead DPS. As previously described for Chinook salmon, the net effects of the Proposed Action will represent an improvement over Environmental Baseline conditions in the Action Area.

Potential effects to spring-run Chinook salmon associated with dredging of the sediment deposits and with maintenance of the rock-toe and tree revetment will be avoided and/or minimized by incorporating specific protective measures incorporated into the Proposed Action.

Some adult upstream migrating steelhead would have the potential to be exposed to construction-related activities during the Proposed Action in-river work window of July 1 through October 15. Direct mortality to adult steelhead is not anticipated because of their ability to avoid dredger suction entrainment, and their ability to avoid rock-toe and tree revetment maintenance activities. Although it has been suggested that steelhead fry and fingerlings rear and move downstream in the Sacramento River year-round, most steelhead juvenile downstream migration likely occurs in the Action Area from January through May. Nonetheless, there is some limited potential that downstream migrating (and transient rearing) juvenile steelhead could be exposed to construction-related activities associated with the Proposed Action.

As with winter-run and spring-run Chinook salmon, the net effects of the Proposed Action also include reduced mortality to juvenile steelhead. Continued sediment deposition proximate to the M&T/Llano Seco Pumps Facility intake screen is anticipated to result in the inability to meet NMFS/CDFW anadromous salmonid sweeping velocity criteria, resulting in potential increased impingement of juvenile steelhead, and increased predation risk associated with lower water velocities proximate to the artificial structure in the river.

Moreover, if historical diversions from both Butte and Big Chico creeks were re-initiated to compensate for the loss of diversion from the Sacramento River, adverse effects to steelhead could be shifted from the Sacramento River to Butte and Big Chico creeks. Reduction of flows in Butte Creek would result in less suitable flow conditions during the steelhead adult upstream migration period, and during the juvenile steelhead downstream migration period. Re-initiation of pumping at the old pumping site in Big Chico Creek would result in substantial adverse effects to steelhead due to the inability to meet all of NMFS and CDFW screen criteria, and due

to reverse flow conditions. Implementation of the Proposed Action would avoid these substantive adverse effects on steelhead.

The net effects of the Proposed Action will not increase the risks to the steelhead critical habitat. Short-term effects associated with dredging will not appreciably diminish the value of critical habitat for both the survival and recovery of Central Valley steelhead. In the NMFS (2007a) BO for the Bank Protection and Channel Alignment Project at the M&T Chico Ranch/Llano Seco Rancho, NMFS determined that the gravel removal element of that project was not likely to adversely affect Central Valley steelhead designated critical habitat.

Maintenance, as necessary, of the rock-toe and tree revetment will promulgate habitat conditions including favorable bank slope and hydraulics (water depth and velocity), instream woody material (brush clusters), and more heterogeneous substrate characteristics for juvenile steelhead transient rearing in the Action Area. Maintenance of the rock-toe and tree revetment also will continue to provide for voluntary recruitment of riparian vegetation on top of the rock-toe, at the base of the bank, and on the lower angle portions of the bank above the rock-toe. These conditions have provided juvenile steelhead foraging areas, velocity refugia, feeding stations, and predator avoidance/escape cover.

The Proposed Action is not likely to adversely affect constituent elements essential to steelhead in the Action Area. Therefore, the Proposed Action is not likely to adversely affect steelhead critical habitat.

SOUTHERN DPS OF NORTH AMERICAN GREEN STURGEON

NMFS (2009a) developed a RPA in order to avoid jeopardy of the Southern DPS of North American green sturgeon due to continued operation of the CVP/SWP. As with listed anadromous salmonids, NMFS (2009a) stated that all actions that address green sturgeon in the RPA are necessary to minimize project effects to the extent where they do not appreciably reduce the likelihood of survival and recovery of the DPS in the near-term and the long-term.

Presently, not all of the actions identified by NMFS (2009a) in the RPA for green sturgeon have been implemented. NMFS (2009a) concluded that the Southern DPS of North American green sturgeon remains vulnerable to becoming endangered in the future, and that continued operations of the CVP/SWP would be expected to have population level consequences for the single extant population in the mainstem Sacramento River, and greatly increase the extinction risk of the species. Consequently, although the Southern DPS of North American green sturgeon is data deficient, for the DPS-wide Environmental Baseline effects assessment of the green sturgeon DPS in this document, it is assumed that the Environmental Baseline may "*reduce appreciably the likelihood of both the survival and recovery,*" and "*appreciably diminish the value of critical habitat.*"

The net effects of this Proposed Action (i.e., sediment dredging and rock-toe and tree revetment monitoring and maintenance) will not substantively increase the risks to the Southern DPS of

North American green sturgeon. Green sturgeon spawning habitat in the Sacramento River is located upstream of the Action Area. Therefore, green sturgeon utilize the Sacramento River in the Action Area as a migration corridor. During the in-river work period (July 1 through October 15), the only lifestage of green sturgeon expected in the Action Area is juvenile emigration. Although it has been suggested that juvenile emigration from the upper Sacramento River may extend through September, juveniles may be present in the Action Area during their downstream migration primarily from May through August, and most abundant during June and July. Thus, there is some limited potential that juvenile downstream migrating green sturgeon could be exposed to construction-related activities in the Action Area.

However, direct construction-related effects to green sturgeon juveniles would be expected to be minimal under the Proposed Action considering: (1) larvae and juvenile green sturgeon appear to be nocturnal, their foraging activity is reported to peak at night, they move downstream at night, and habitat preference suggests that juveniles prefer deep pools; and (2) incorporation of impact avoidance/minimization and mitigation measures and adherence to BMPs, the SWPPP, and requirements specified through the ESA consultations, the Streambed Alteration Agreement, and the Section 401 Permit.

Reduced mortality to juvenile green sturgeon would be expected as the net effects of the Proposed Action. Continued sediment deposition proximate to the M&T/Llano Seco Pumps Facility intake screen is anticipated to result in the inability to meet NMFS/CDFG anadromous salmonid fish screen sweeping velocity criteria. Although specific screening criteria have not been developed for green sturgeon, reduced sweeping velocities have potential for increased impingement and entrainment, and increased predation risk of juvenile green sturgeon associated with lower water velocities proximate to the artificial structure in the river.

If continued sediment deposition at the M&T/Llano Seco Pumps Facility intake screen resulted in re-initiation of pumping at the old pumping site in Big Chico Creek, then direct mortality to green sturgeon juveniles could occur. As previously discussed, reverse flows in Big Chico Creek would consist of water drawn from the Sacramento River, which could contain downstream migrating juvenile green sturgeon. That would increase predation exposure risk in the lowermost portion of Big Chico Creek, and impingement and entrainment potential of juvenile green sturgeon at the old pumping sight. Implementation of the Proposed Action would avoid these substantive adverse effects on green sturgeon.

The net effects of the Proposed Action will not increase the risks to green sturgeon critical habitat. Dredging of the deposited sediment proximate to the M&T/Llano Seco Pumps Facility intake screen is short-term in nature, and would not appreciably diminish the value of critical habitat for both the survival and recovery of green sturgeon. At the time that NMFS conducted the 2007 consultation for the Bank Protection and Channel Alignment Project at the M&T Chico Ranch/Llano Seco Rancho, green sturgeon critical habitat had not been designated. However, in the NMFS (2007a) Biological Opinion, the statement was made that *"…NMFS has determined that the gravel removal element of the proposed project is not likely to adversely affect*

Sacramento River winter-run Chinook salmon. Central Valley spring-run Chinook salmon, Central Valley steelhead, and their designated critical habitat, and the southern DPS of North American green sturgeon."

Implementation of the Proposed Action also includes monitoring and maintenance, as necessary, of the rock-toe and tree revetment. According to NMFS (2007a), construction of the rock-toe and tree revetment in 2007 resulted in a net increase in habitat features beneficial to juvenile green sturgeon. Also, since construction of the rock-toe and tree revetment in 2007, voluntary recruitment of riparian vegetation has occurred in the revetment area on top of the rock-toe, at the base of the bank, and on the lower angle portions of the bank above the rock-toe. These conditions have provided habitat features that also may be beneficial to juvenile green sturgeon.

The Proposed Action will not adversely affect the critical habitat primary constituent elements or green sturgeon critical habitat.

ESSENTIAL FISH HABITAT

The purpose of this EFH assessment is to assist NMFS in determining whether the Proposed Action *"may adversely affect"* Pacific salmon EFH for Federally managed commercial fishery species (i.e., Chinook salmon) within the Action Area. An *"adverse effect"* is defined as any impact which reduces the quality and/or quantity of EFH (50 CFR 600.810).

Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

Rather than repeating previously provided information, the EFH assessment may cross-reference relevant sections that analyze potential project impacts on species or critical habitat (NMFS 2004a). Therefore, the information presented herein is based upon and is intended to supplement the effects assessment presented in Section 3.3 of this document, as well as assessment of potential effects of the Proposed Action previously presented in this chapter.

In assessing the potential impacts of a proposed action, PFMC and NMFS also are guided by several general considerations, including the extent to which: (1) the activity would directly and indirectly affect the distribution, abundance, health, and continued existence of salmon and their EFH; (2) potential cumulative impacts would be expected to occur; (3) adverse impacts could be avoided through project modification or alternative site selection; and (4) minimization or mitigation measures may be used to reduce unavoidable loss of habitat functions and values (PFMC 1999).

NMFS (2009f) recommends a three-step approach for determining the potential effects of a Proposed Action to EFH, which include the following.

1. Evaluate the current habitat condition at the time of consultation. This step serves as a reference point for the next two steps.
2. Evaluate the anticipated future habitat conditions that would exist assuming that the Proposed Action and/or continuing action is not authorized, funded, or carried out. This step serves as a control for discerning the effects of the Proposed Action.
3. Evaluate the anticipated future habitat condition assuming that the Proposed Action and/or continuing action does occur.

Current EFH Conditions in the Central Valley

PFMC (1999) states that maintaining or restoring habitat necessary for a sustainable salmon fishery requires the biophysical processes producing properly functioning habitat. **Table 5-1** presents the general major habitat requirements and habitat concerns during each lifestage of Chinook salmon (PFMC 1999).

Under the Magnuson-Stevens Act, NMFS and PFMC have more recently (2011) identified non-fishing activities that may adversely affect EFH, as well as actions to encourage the conservation and enhancement of EFH, including recommended options to avoid, minimize, or mitigate for the adverse effects identified in the FMP. Although Amendment 14 includes 21 such activities and conservation measures, 10 additional non-fishing threats (**Table 5-2**) were identified by NMFS and PFMC (2011) during the 5-Year EFH Review. The direct results of these threats is that salmonid EFH may be eliminated, diminished, or disrupted (PFMC 1999).

Presently, conservations measures to address the 10 new threats have not been developed by PFMC or NMFS. If the PFMC decides to amend the Pacific Coast Salmon FMP in the future, then the descriptions of all 31 threats will be expanded upon and refined, and conservation measures developed for each threat (NMFS and PFMC 2011).

As part of an EFH Assessment, NMFS (2004c) states that Federal action agencies should indicate whether a proposed action may adversely affect HAPCs. As previously discussed, NMFS and PFMC (2011) developed five potential HAPCs for Pacific Coast salmon as part of the 2011 5 year review. Two of the five HAPCs occur in estuarine and marine environments and, thus, while these two HAPCs are important to the Chinook salmon ESUs, they are not found within the EFH Action Area for the Proposed Action. The other three potential HAPCs include: (1) spawning habitat; (2) thermal refugia; and (3) complex channels and floodplain habitats. Within the Central Valley, high quality habitat containing spawning sites with adequate water and substrate conditions, or rearing sites with adequate floodplain connectivity, cover, and water conditions is considered to be limited. Most of the historic spawning and rearing habitat for Chinook salmon in the Central Valley of California is located above impassable dams. Due to past and ongoing effects, the current condition of Chinook salmon habitat is considered to be highly degraded, and does not provide the conservation value necessary for the survival and recovery of the species (NMFS 2009a). In addition, climate change is expected to further

degrade the suitability of habitats in the Central Valley through increased water temperatures, drought frequency, flood flows frequency, and overall drier conditions (Lindley et al. 2007).

Table 5-1. Lifestage-Specific Habitat Concerns Associated with Pacific Coast Salmon EFH (PFMC 1999).

Adult Immigration Pathways	
❑ Passage blockage (e.g., culverts, dams)	❑ Reduced frequency of holding pools
❑ Water quality (high temperatures, pollutants)	❑ Lack of cover, reduced depth of holding pool
❑ High flows/low flows/water diversions	❑ Reduced cold-water refugia
❑ Channel modification/simplification	❑ Increased predation resulting from habitat modification
Spawning and Embyro Incubation	
❑ Availability of spawning gravel of suitable size	❑ Redd dewatering
❑ Siltation of spawning gravels	❑ Temperature/water quality problems
❑ Redd scour caused by high flows	❑ Redd disturbance from trampling (human, animal)
Juvenile Rearing Habitat	
❑ Diminished pool frequency, area, or depth	❑ Low water flows/high water flows
❑ Temperature/water quality problems	❑ Nutrient availability
❑ Diminished prey/competition for prey	❑ Diminished channel complexity and cover
❑ Blockage of access to habitat (upstream or down)	❑ Predation caused by habitat simplification or loss of cover
❑ Loss of off-channel areas, wetlands	
Juvenile and Smolt Emigration Pathways	
❑ Water quality	❑ Passage blockage/diversion away from stream
❑ Low water flows/high water flows	❑ Increased predation as a result of habitat simplification or modification
❑ Altered timing/quantity of water flows	
Estuarine Habitat	
❑ Water quality	❑ Loss of channels, eel grass beds, woody debris
❑ Altered timing/quantity of fresh water in-flow	❑ Diminished prey/competition for prey
❑ Loss of habitat resulting from diking dredging, filling	❑ Increased predation as a result of habitat simplification or modification
❑ Diminished habitat complexity	
Marine Habitat	
❑ Water quality	❑ Diminished prey/competition for prey
❑ Increased predation	❑ Altered timing/quantity/composition of river water plumes

Table 5-2. Non-fishing Threats to Pacific Salmon EFH. Newly Identified Threats Appear in the Right Column. Detailed Information on the Threats Identified in the First Column can be Found in Amendment 14.

Threats Identified in Amendment 14 (1999)	New Threats Identified During the EFH 5-Year Review (2011)
❑ Agriculture	❑ Pile Driving
❑ Artificial Propagation of Fish and Shellfish	❑ Over-Water Structures
❑ Bank Stabilization	❑ Alternative Energy Development
❑ Beaver Removal and Habitat Alteration	❑ Liquefied Natural Gas Projects
❑ Construction/Urbanization	❑ Desalination
❑ Dam Construction/Operation	❑ Power Plant Intakes
❑ Dredging and Dredged Spoil Disposal	❑ Pesticide Use
❑ Estuarine Alteration	❑ Flood Control Maintenance
❑ Forestry	❑ Culvert Construction
❑ Grazing	❑ Climate Change
❑ Habitat Restoration Projects	
❑ Irrigation/Water Management	
❑ Mineral Mining	
❑ Introduction/Spread of Nonnative Species	
❑ Offshore Oil and Gas Drilling	
❑ Road Building and Maintenance	
❑ Sand and Gravel Mining	
❑ Vessel Operation	
❑ Wastewater/Pollutant Discharge	
❑ Wetland and Floodplain Alteration	
❑ Woody Debris/Structure Removal	

Overall, NMFS (2009a) states that, based on the available evidence, CVP/SWP system-wide operations are expected to continue to adversely impact Chinook salmon EFH through continued degradation of spawning and rearing habitat, water temperature-related impacts, reduced flows, and entrainment of juveniles at unscreened water diversions.

Freshwater EFH for Chinook salmon consists of four major habitat functions: (1) adult migration corridors and adult holding habitat; (2) spawning and incubation; (3) juvenile rearing; and (4) juvenile migration corridors (PFMC 1999). Each of these major habitat functions within the Central Valley, as well as the three freshwater HAPCs, are described below.

Migratory Habitat

Migratory habitat, both for upstream migrating adults and downstream migrating juveniles, comprise two of the four major habitat functions for Chinook salmon EFH. Freshwater migration corridors provide upstream passage for adults to upstream spawning areas, and downstream passage of outmigrant juveniles to estuarine and marine areas.

Excluding the lower river reaches that were used as adult migration corridors (and, to a lesser degree, for juvenile rearing), it has been estimated that at least 72% of the original Chinook salmon spawning and holding habitat in the Central Valley drainage is no longer available due to the construction of non-passable dams (Yoshiyama et al. 2001). Adult migrations to the upper reaches of the Sacramento, Feather, and Yuba rivers were eliminated with the construction of major dams during the 1940s, 1950s and 1960s. As described in ISG (1996), the timing of adult entry and movement in rivers and tributary streams, and even the size, shape, and strength of adult fish represent adaptations to the physical and biological challenges presented by the upstream route to a specific spawning area.

Generally, adequate flow is an important component of adult upstream migration habitat because it can serve as an immigration cue and provide adequate depths for passage at critical locations (e.g., shallow riffles). Additionally, flow can provide outmigration cues for emigrating juveniles or smolts. Available cover is not necessarily an important migration corridor habitat component for adult immigrants, but serves as predator and thermal refugia for outmigrating juveniles.

Migratory habitat conditions are strongly affected by the presence of barriers, which can include dams (i.e., hydropower, flood control, and irrigation flashboard dams), unscreened or poorly screened diversions, degraded water quality, or behavioral impediments to migration (Reclamation 2008). For fall-spawning Chinook salmon, warm water conditions in late summer often present thermal barriers to movement and there may be little suitable habitat for resting (Berman and Quinn 1991, cited in ISG 1996). Thermal refugia include habitat areas where fish may escape high water temperatures, especially during hot, dry summers in California. Thermal refugia have been identified as an HAPC that provides important holding habitat for adult Chinook salmon (Goniea et al. 2006; Sutton et al. 2007 as cited in NMFS 2010). However, high water temperatures and reduced cold water refugia are concerns associated with adult Chinook salmon upstream migration and holding. In certain areas with hot, dry summers (e.g., lower Sacramento River) it is likely that little, if any, suitable holding habitat exists for salmon to take refuge from elevated water temperatures (NMFS 2009a).

Spawning and Embryo Incubation Habitat

Spawning and incubation habitat is one of the four major habitat functions for Chinook salmon EFH. NMFS and PFMC (2011) also describe spawning habitat as an HAPC that has an extremely high ecological importance, and it is especially sensitive to stress and degradation by a number of land- and water-use activities that affect the quality, quantity and stability of spawning habitat (e.g., water withdrawals, sediment deposition from land disturbance,

streambank armoring) (ISG 2000). All salmon require cold, highly oxygenated, flowing water as suitable spawning habitat. Spawning habitat consists of the combination of gravel, depth, flow, temperature, and dissolved oxygen (NMFS and PFMC 2011). As previously discussed, most of the historic Chinook salmon spawning habitat in the Central Valley has been lost due to construction of impassible barriers, and high quality habitat containing spawning sites with adequate water and substrate conditions is considered to be limited.

Juvenile Rearing Habitat

Juvenile rearing habitat is the remaining major function for freshwater Chinook salmon EFH. HAPCs associated with juvenile Chinook salmon rearing habitat include complex channels and floodplain habitats, as well as thermal refugia (NMFS and PFMC 2011). In general, complex channels and floodplain habitats, including wetlands, oxbows, side channels, and steeper, more constrained channels with high levels of large woody material (LWM), provide valuable habitat for all Pacific salmon species (NMFS and PFMC 2011). LWM is generally considered to be an important component of these habitats. LWM helps to create complex channels and floodplain habitats and important spawning and rearing habitat by trapping sediment, nutrients, and organic matter, creating pools, sorting gravels, providing cover and hydrologic heterogeneity, and creating important spawning and rearing areas for salmon (Abbe and Montgomery 1996; Bilby and Bisson 1998). These areas also provide pools, off-channel areas, shade, cooler temperatures, and thermal refugia during both summer and winter (Crispin et al. 1993).

In most river systems throughout California, including the Sacramento River, complex floodplain habitats have been subject to a high degree of direct anthropogenic modification. Floodplain areas have been cleared of woodland vegetation, drained, and filled to allow agricultural, residential, and urban development (Pess et al. 2002). Historical land-use practices including logging of riparian forests, splash damming, and active removal of wood from the stream channel to facilitate fish passage and protect local infrastructure has fundamentally altered the structure and function of salmon habitats (NMFS and PFMC 2011). Despite improvements in forest and land management that have occurred in the last 40 to 50 years, the legacy of early practices remains apparent in diminished sources for recruitment of large wood (particularly of coniferous origin), decreased quantities of large wood in stream channels, and a shift in composition of large wood pieces from large-diameter pieces of coniferous origin to smaller diameter pieces of hardwood origin, which decompose at a much faster rate (Bilby and Bisson 1998). Historically, neither complex floodplain habitats nor mid-gradient channels with large quantities of in-channel wood were inherently rare within forested landscapes of California, but they have become increasingly so in response to human alterations of the landscape.

Thermal refugia are defined as areas where fish may escape high water temperatures, especially during hot, dry summers in California (NMFS and PFMC 2011). Thermal refugia provide important rearing habitat for juveniles (Goniea et al. 2006; Sutton et al. 2007, as cited in NMFS 2010). Reduced flows that are either anthropogenic, natural or climate-change induced may

reduce or eliminate access to refugia (Battin et al. 2007; Riley et al. 2009). Loss of structural elements such as large wood can also influence the formation of thermal refugia.

Thermal refugia can occur at spatial scales ranging from entire tributaries (e.g., spring-fed streams), to stream reaches (e.g., alluvial reaches with high hyporheic flow), to highly localized pockets of water only a few square meters in size embedded within larger rivers (NMFS and PFMC 2011). The abundance of cool water habitat features can vary substantially depending upon many factors including geographic location, flow characteristics and time of year (NMFS and PFMC 2011). Elevated water temperatures that occur from late spring through fall, corresponding to the rearing and outmigration period for various runs of Chinook salmon, remain a stressor and an important concern regarding EFH in the Central Valley.

Current EFH Conservation Measures

In developing its EFH conservation recommendations for CVP/SWP system-wide operations, NMFS (2009a) recognized that the appropriate and practicable steps to avoid adverse effects to EFH and measures to minimize remaining adverse effects are constrained due to the existing CVP/SWP operational conditions that have transpired over the time span in which water in the Central Valley has been managed. Consequently, available opportunities to avoid and minimize adverse effects may be limited. In addition, NMFS (2009a) states that its highest priority is to fulfill its conservation mandates for protecting winter- and spring-run Chinook salmon and steelhead listed under the ESA, and in some instances, this priority may take precedent over protecting the EFH of fall and late-fall run Chinook salmon for particular locations. Due to these limitations to avoid and minimize EFH impacts, NMFS (2009a) believes that available conservation measures may be insufficient to offset the expected further deterioration of EFH habitat functions in parts of the CVP/SWP project area. However, many actions within the RPA described in NMFS (2009a) will generally improve EFH for Chinook salmon by improving adult fish passage at RBDD, increasing juvenile survival (i.e., reducing predation, and entrainment at diversions), reducing water temperature-related impacts, increasing reservoir storage, and restoring EFH in tributary spawning areas (NMFS 2009a). Generally, actions to protect listed anadromous fish species will provide benefits to non-listed salmonids (e.g., fall- and late fall-run Chinook salmon) because they share similar habitats and respond to environmental impacts in a comparable fashion (NMFS 2009a).

Current EFH Conditions in the Action Area

Freshwater EFH for Chinook salmon in the Action Area functionally consists of adult upstream migration, and juvenile downstream migration and transient rearing. Information presented in Section 3.3 and previously in this chapter demonstrated that minimal amounts of fall-run and late fall-run Chinook salmon spawning reportedly have the potential to occur in the Action Area. Specifically: (1) of all fall-run Chinook salmon spawning in the upper Sacramento River extending from Princeton Ferry to Keswick Dam, an average of only about 1.5% occurred in the approximate 15-mile long reach from Ord Ferry Bridge to Hamilton City Bridge, which

encompasses the less than 1-mile long Action Area; and (2) average of less than 1% of all reported late fall-run Chinook salmon spawning in the upper Sacramento River occurred in the 15-mile long reach containing the less than 1-mile long Action Area.

Within the Action Area, there are no barriers or impediments to adult upstream or juvenile downstream passage. There are two infrastructure components within the Action Area – the City of Chico Wastewater Treatment Plant outfall, and the M&T/Llano Seco Pumps Facility intake structure. Currently, neither of these components presents a barrier or impediment to adult upstream or juvenile downstream Chinook salmon passage.

In addition to artificial structures, there are no natural barriers or impediments to adult upstream passage within the Action Area. Water depths and velocities throughout the area change in response to change in the flow, but are not known or anticipated to represent impediments to adult Chinook salmon upstream migration. Naturally-occurring areas of potential passage impediment such as "critical riffles" have not been identified within the Action Area. Although sediment deposition has occurred, and continues to occur proximate to the M&T/Llano Seco Pumps Facility intake structure, it has not resulted in water depth prohibiting passage, or in the elimination of migratory pathways for either adult upstream or juvenile downstream Chinook salmon passage.

As previously discussed, it is expected that transient rearing occurs in the Action Area associated with juvenile Chinook salmon downstream migration. Construction of the rock-toe and tree revetment in 2007 resulted in conditions that benefited juvenile salmonid transient rearing habitat in the Action Area. Habitat attributes associated with the rock-toe and tree revetment include favorable bank slope and hydraulics (water depth and velocity), instream woody material (brush clusters), and heterogeneous substrate characteristics. According to NMFS (2007), construction of the rock-toe and tree revetment in 2007 resulted in a net increase in habitat features beneficial to juvenile green sturgeon. Also, voluntary recruitment of riparian vegetation has occurred since 2007 in the revetment area on top of the rock-toe, at the base of the bank, and on the lower angle portions of the bank above the rock-toe. These conditions provide juvenile salmonid foraging areas, velocity refugia, feeding stations, and predator avoidance/escape cover.

Future EFH Conditions Without the Proposed Action

According to NMFS (2009a), increased level of water demands through 2030, reduced diversions from the Trinity River, and future climate change are anticipated to exacerbate risks to the Chinook salmon in the Central Valley, and water temperature-related impacts to EFH. Overall, NMFS (2009a) states that, based on the available evidence, CVP/SWP system-wide operations are expected to adversely impact Chinook salmon EFH through continuing degradation of spawning and rearing habitat, water temperature-related impacts, reduced flows, and entrainment at unscreened water diversions. Because climate change is expected to cause an increase in freshwater temperatures and prolonged summer drought periods (Battin et al. 2007; Mote 2003), thermal refugia can be expected to become more rare (ISAB 2007).

Within the Action Area, future EFH conditions without the Proposed Action would, for the most part, be analogous to habitat conditions previously described for the No Action Alternative. More specifically, future conditions of EFH within the Action Area would be influenced by removal of the existing rock-toe and tree revetment. Also, dredging of sediment deposited in the vicinity of the M&T/Llano Seco Pumps Facility intake would not occur, which would lead to additional alterations in habitat conditions.

Because the existing 1,520-foot long rock-toe and tree revetment on the west bank of the Sacramento River in the Action Area was originally anticipated to be a temporary structure, it is anticipated that the revetment would be removed once available funding was secured and appropriate regulatory compliance activities completed.

Removal of the rock-toe and tree revetment would be expected to provide an overall decrease in the amount of riparian vegetation (hence, overhanging shade/cover), particularly in consideration of the maturation over time of the riparian vegetation that has become, and will continue to become, established in the bank immediately above the rock-toe (see Section 3.3 for additional discussion). The decrease in overhanging shade/cover associated with revetment removal is expected to provide juvenile Chinook salmon decreased avoidance/escape cover from avian predators, decreased allochthonous food sources, and decreased shading and microhabitat thermal refugia. These adverse EFH habitat conditions could be realized immediately at the time of revetment removal, but then less substantively into the future.

Removal of the rock-toe and tree revetment would result in the removal of wood clusters protruding into the river from the rock-toe, tree clusters anchored to the top of the rock-toe, and removal of volunteer woody vegetation that has become established along the bank immediately above of the rock-toe, and within and proximate to the clusters anchored on top of the rock-toe. Immediately after removal, the only anticipated source of significant contribution of woody material on the west side of the Sacramento River in the Action Area would be associated with approximately 250 linear feet of bankline Valley/Foothill Riparian habitat located at the downstream end of the revetment site. However, woody material recruitment at this site would not be expected until the bank has eroded into this riparian vegetation. The removal of IWM associated with rock-toe and tree revetment removal would be expected to reduce the suitability of juvenile salmonid rearing habitat by reducing or eliminating velocity refugia, feeding stations, and predator avoidance/escape cover immediately after removal. These adverse effects to the EFH major habitat function of juvenile Chinook salmon rearing would be realized immediately at the time of revetment removal. This localized area would not be expected to provide overhanging shade/cover for several years until the bank has eroded and become more proximate to the stands of existing and restored riparian vegetation on the Capay Unit.

As river processes continue to work and the bank retreats from the current bank edge near the revetment, the recently restored habitat located about 60 feet inland would become exposed to the erosive processes of the river. Continued long-term erosion would eventually begin to undercut the root systems of the recently restored riparian habitats on the Capay Unit, which may

include vegetation such as herbland cover, native grassland, blackberry scrub, riparian scrub, mixed riparian forest, cottonwood riparian forest and valley oak. Eventually, as the west bank erodes, larger woody and riparian species near the edge of the migrating river bank could serve as SRA habitat that overhangs above the water's edge and provides shade and cover for aquatic species near the west bank of the Sacramento River.

Over a longer period of time, these potential near-term impacts could be offset as the migrating river bank approaches areas of more mature vegetation in the restored habitat areas on the Capay Unit, which could then serve as SRA habitat and potential sources of IWMbut more substantively into the future. However, achievement of such aquatic habitat benefits would be dependent on the timing and magnitude of hydrologic conditions in the Sacramento River. As previously discussed, it is anticipated that bank erosion could extend into the restored areas within one to a few years. However, the full benefit of SRA habitat and potential sources of IWM may not be realized for several years.

Removal of the rock-toe and tree revetment and changing the bank slope from 10:1 to approximately 1:1 would be expected to result in decreased habitat use immediately, including decreased predator avoidance opportunity, and decreased foraging utilization by juvenile Chinook salmon. Also, changing the substrate composition from a heterogeneous rock-toe material and deposited silt and sand, to an anticipated composition dominated by loose sands and loamy fine sand with little cobble or gravel-sized substrate would be expected to result in decreased habitat use, including decreased predator avoidance opportunity, and decreased foraging utilization by juvenile Chinook salmon. These adverse effects to the EFH major habitat function of juvenile Chinook salmon rearing would be realized immediately at the time of revetment removal. Over a longer period of time, the potential near-term impacts would be expected to dissipate as the migrating river bank approaches areas of more mature vegetation in the restored habitat areas on the Capay Unit, which could then serve as potential sources of IWM.

Following revetment removal, it is probable that erosion of the west bank would continue to occur and the Sacramento River would continue to migrate to the west. Consequently, future conditions without the Proposed Action would be expected to result in continued deposition of sediment proximate to the intake, and the continued downstream extension of deposited materials in the Sacramento River. This would result in the fish screen criteria not being met at the M&T/Llano Seco Pumps Facility intake screen, with the associated potential to adversely affect juvenile Chinook salmon in the vicinity of the intake. Further, if diversions at the M&T/Llano Seco Pumps Facility intake were severely restricted or could no longer be made, then historical diversions from both Butte and Big Chico creeks could be re-initiated to compensate for the loss of diversion from the Sacramento River, with substantial and adverse impacts to EFH in those creeks (see Section 3.3 for additional discussion).

Future EFH Conditions with the Proposed Action

In their Biological Opinion on integrated CVP/SWP operations for the OCAP, NMFS (2009a) state that through 2030, system-wide operations are expected to adversely impact Chinook salmon EFH through continuing degradation of spawning and rearing habitat, water temperature-related impacts, reduced flows, and entrainment at unscreened water diversions. Climate change is expected to result in increased freshwater temperatures and reduction in thermal refugia.

Within the Action Area, the Proposed Action will not directly or indirectly affect migratory habitat because it will not reduce the quality and/or quantity of this habitat function. Habitat modifications associated with the Proposed Action will not block passage of Chinook salmon. The Proposed Action will not result in the creation, or exacerbation of passage barriers or impediments.

Dredging of the deposit sediments proximate to the M&T/Llano Seco Pumps Facility intake structure has the potential to affect benthic macroinvertebrates (BMIs), which serve as a food source for transient rearing downstream migrating juvenile Chinook salmon. Therefore, suction dredge activities could potentially impact fish species' food availability by temporarily reducing aquatic BMI abundance as a result of removing potential colonization substrate, as well as via direct entrainment of BMI. However, relative to the entire upper Sacramento River, the dredge area represents a very small fraction of the area with the potential area for macroinvertebrate production, and likely represents a minimal potential impact on food availability for juvenile Chinook salmon.

In addition, it has been reported that the benthic community is likely to re-colonize dredged areas relatively quickly. Specifically, USACE and Port of West Sacramento (2011) described several reports which indicated that dredging does not substantially impact the BMI community, and specifically does not substantially impact the community as a food source. NMFS (2006) and others indicated that although dredging would initially remove benthic organisms, it is likely that the benthic fauna would re-colonize relatively quickly following dredging (Bradwood Landing 2008; McCauley et al. 1977; Oliver et al. 1977; Rosenberg 1977; Van Dolah et al. 1984; Nichols et al. 1990; Kenny and Rees 1994; Harvey et al. 1998 all as cited in USACE and Port of West Sacramento 2011). Therefore, potential impacts of dredging to prey availability for juvenile Chinook salmon would likely be temporary and minimal, and not represent a long-term adverse effect to the Action Area.

Implementation of the Proposed Action would result in maintaining the operational status of the M&T/Llano Seco Pumps Facility intake structure, conformance with NMFS and CDFW fish screen criteria, and avoidance of direct or indirect harm to juvenile Chinook salmon. Regarding construction-related, temporary potential effects, incorporation of protective measures and adherence to BMPs, the SWPPP, and requirements specified through the ESA consultations, the Streambed Alteration Agreement, and the Section 401 Permit will avoid and/or minimize potential effects on the distribution, abundance, health, and continued existence of Chinook salmon and their EFH.

Implementation of the Proposed Action also includes monitoring and maintenance, as necessary, of the rock-toe and tree revetment. Maintenance of the rock-toe and tree revetment will promulgate habitat conditions including favorable bank slope and hydraulics (water depth and velocity), instream woody material (brush clusters), and more heterogeneous substrate characteristics for juvenile Chinook salmon transient rearing in the Action Area. For example, if the need arises, brush clusters will be resupplied with brush materials (limbs, branches) as necessary to maintain functional instream woody material. Maintenance of the rock-toe and tree revetment also will continue to provide for voluntary recruitment of riparian vegetation on top of the rock-toe, at the base of the bank, and on the lower angle portions of the bank above the rock-toe. These conditions have provided, and would be expected to provide in the future, juvenile Chinook salmon foraging areas, velocity refugia, feeding stations, and predator avoidance/escape cover.

5.7.1.2 EFFECTS OF INTERRELATED AND INTERDEPENDENT ACTIONS

Interrelated actions are defined by the Federal regulations as "*…those that are part of a larger action and depend on the larger action for their justification*" (50 CFR 402.02). The effects of "interrelated actions" (i.e., actions that would not occur "but for" a larger action) (USFWS and NMFS 1998), along with the direct and indirect effects of the Proposed Action, are compared to the Environmental Baseline in determining whether the Proposed Action will jeopardize the continued existence of a listed species (50 CFR 402.02, 402.12(f)(4)).

Interdependent actions are defined by the Federal regulations as "*…those that have no independent utility apart from the action under consideration*" (50 CFR 402.02). The effects of "interdependent actions" (i.e., other actions would not occur "but for" this action (USFWS and NMFS 1998)), along with the direct and indirect effects of the Proposed Action, are compared to the Environmental Baseline to determine whether the Proposed Action will jeopardize the continued existence of a listed species (50 CFR 402.02, 402.12(f)(4)).

USFWS and NMFS (1998) further clarify that if a project would exist independent of a proposed action, it cannot be considered "interrelated" or "interdependent" and included in the effects of the proposed action, even if the proposed action is required to bring the existing facility into compliance with Federal law.

In the NMFS (2007a) Biological Opinion for the Bank Protection and Channel Alignment Project at the M&T Chico Ranch/Llano Seco Rancho, it was stated that *"…NMFS does not anticipate any interdependent or interrelated actions associated with the proposed action."*

It is not anticipated that there are any interdependent or interrelated actions associated with the Proposed Action.

5.7.1.3 CUMULATIVE EFFECTS

In considering effects on EFH, cumulative effects are effects on the environment that result from the incremental impact of an action when added to other past, present, and reasonably

foreseeable future actions, regardless of who undertakes such actions (50 CFR 600.920). Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time (50 CFR 600.815).

The geographic scope for the cumulative fisheries and aquatic resources analysis includes the Action/Project Area, Big Chico Creek, Butte Creek and the Sacramento River system. For the purposes of this EFH assessment, cumulative effects on fisheries and aquatic resources in these geographic areas, as well as in the Action/Project Area would not differ from those that are presented in Chapter 4 for NEPA and CEQA purposes, which are summarized below.

Since the mid-1800s, populations of native Chinook salmon and steelhead in the Central Valley have declined dramatically (NMFS 2009b). Numerous stressors (e.g., hydraulic gold mining, water development projects, diversions, overharvest, hatchery production, entrainment, invasive species, predators and diseases, and water pollution) to anadromous salmonids have affected, and many continue to affect, the viability of anadromous salmonid populations in the Central Valley (NMFS 2009b). In the Central Valley, the vast majority of historic anadromous salmonid spawning and rearing habitat has been lost due to the construction of impassible barriers. Over the years, the decline of fish populations has continued through cycles of beneficial and adverse natural conditions, indicating the need to improve habitat (USFWS 2001). Past and present actions in the Central Valley and in the Sacramento River in particular have led to the current status of the anadromous salmonid ESUs/DPS and the green sturgeon DPS which, according to NMFS (2009a) can be characterized as either moderate or high risk of extinction.

In the Sacramento River system, high-quality salmonid habitat has been fragmented, and converted from complex nearshore aquatic to simplified habitats. Reach-level cumulative impacts that adversely affect fisheries resources include reductions in habitat availability, changes to sediment and organic material storage and transport, reductions of food-chain production, and reduction in IWM (NMFS 2006a).

Loss of near-shore habitat complexity and habitat function has occurred in the Sacramento River – a result of the several historical actions including those of the Sacramento River Bank Protection Project during the 1960s and 1970s. More recently, however, there has been recognition that projects can include enhancement of habitats for fisheries and aquatic resources. Although bank protection and enhancement projects would involve short-term direct and indirect construction-related impacts (e.g., loss of suitable habitat, degradation of water quality, displacement and disruption of individuals from noise, vibration, and other disturbance), they also would have long-term beneficial effects on fisheries and aquatic resources by improving instream habitat complexity and SRA habitat availability in the Sacramento River. As an example, the Sacramento River Bank Protection Project incorporates the placement of IWM and planting of native riparian vegetation to compensate for the loss of habitat value associated with levee repairs. The restoration activities initiated by TNC's Sacramento River Project, USFWS SRNWR system, and the Hamilton City "J" Levee Project have resulted in either plans or actions

that are anticipated to have beneficial effects to fisheries and aquatic resources of the Sacramento River system.

In addition, in 2009 NMFS issued a Draft Recovery Plan that establishes a strategic approach to the recovery and long-term viability of winter- and spring-run Chinook salmon, and steelhead in the Central Valley. The purpose of the Recovery Plan, once finalized, is to guide implementation of recovery of the species by resolving the threats to the species and ensuring self-sustaining populations, thereby promoting viable Chinook salmon ESUs and the steelhead DPS (NMFS 2009b).

Direct and indirect potential construction-related impacts (associated with dredging and rock-toe and tree revetment maintenance) to fish species of focused evaluation, including special status species would be expected to be minimal under the Proposed Action/Project considering the limited exposure of individuals due to life history periodicity and distribution, as well as protective measures incorporated into the Proposed Action/Project and adherence to BMPs, the SWPPP, and requirements specified through the ESA consultations, the Streambed Alteration Agreement, and the Section 401 Permit. Additionally, because the duration of each dredging cycle would be short-term, the dredging cycles would be separated in time, the spatial extent of dredging is relatively small, and the potential impacts associated with each dredging cycle were found to be less-than-significant, the cumulative impacts of up to two dredging cycles on fisheries and aquatic resources, and aquatic habitat, are anticipated to be minimal.

The Proposed Action will not appreciably diminish or preclude the role of critical habitat in the recovery of the listed fish species, nor will the Proposed Action adversely affect critical habitat primary constituent elements. The Proposed Action will not adversely incrementally contribute to the cumulative potential impacts on critical habitat and habitat features in the Action/Project Area. Under the Proposed Action, the favorable bank slope and hydraulics (water depth and velocity), instream woody material (brush clusters), and heterogeneous substrate characteristics associated with the rock-toe and tree revetment would be maintained until a long-term solution is developed and completed. Also, voluntary recruitment of riparian vegetation that has occurred since 2007 in the revetment area on top of the rock-toe, at the base of the bank, and on the lower angle portions of the bank above the rock-toe would be maintained. These conditions provide juvenile salmonid foraging areas, velocity refugia, feeding stations, and predator avoidance/escape cover.

The incremental effect of the Proposed Action/Project will have a less than significant impact to fisheries and aquatic resources, is not cumulatively considerable, and therefore is considered a less-than-significant cumulative impact.

CUMULATIVE EFH EFFECTS

System-wide operations are expected to adversely impact Chinook salmon EFH through continuing degradation of spawning and rearing habitat, water temperature-related impacts, reduced flows, and entrainment at unscreened water diversions through the year 2030 (NMFS

2009a). Climate change is expected to result in increased freshwater temperatures and reduction in thermal refugia.

The foregoing discussions in Chapter 4 addressing the incremental contribution of the Proposed Action to cumulative critical habitat conditions also apply to cumulative EFH considerations. Within the Action Area, the Proposed Action will not reduce the quality and/or quantity of migratory habitat. Implementation of the Proposed Action would result in maintaining the operational status of the M&T/Llano Seco Pumps Facility intake structure, conformance with NMFS and CDFW fish screen criteria. Maintenance of the rock-toe and tree revetment will promulgate habitat conditions including favorable bank slope and hydraulics (water depth and velocity), instream woody material (brush clusters), and more heterogeneous substrate characteristics for juvenile Chinook salmon transient rearing in the Action Area. As previously discussed, if the need arises, brush clusters will be resupplied with brush materials (limbs, branches) as necessary to maintain functional instream woody material.

Applying the three-step approach described by NMFS (2009a), the Proposed Action will not increase the long-term risks to Chinook salmon EFH because no long-term adverse habitat impacts are anticipated, and maintenance of the rock-toe and tree revetment features and functions improve current habitat conditions in the Action Area. Consequently, the net effects of the Proposed Action will not increase the risks to Chinook salmon EFH. Within the Action Area, the Proposed Action would not result in the unavoidable loss of habitat functions and values.

Regarding the habitat parameters previously discussed under the EFH assessment, the Proposed Action would not contribute to cumulative effects that would eliminate, diminish, or disrupt the functions of Chinook salmon EFH within the Action Area. The incremental effect of the Proposed Action will have a less than significant impact to Chinook salmon EFH, is not cumulatively considerable, and therefore is considered a less-than-significant cumulative impact.

5.7.1.4 ENVIRONMENTAL COMMITMENTS/CONSERVATION MEASURES

Fisheries and aquatic resources in and proximately downstream of the Action Area would have the potential to be affected by water pollution associated with construction-related activities. However, implementation of BMPs and other protective measures incorporated into the project description, developed for water quality resources also would serve as impact avoidance, minimization, and mitigation measures for fisheries and aquatic resources. Measures developed to avoid, minimize, or mitigate potential impacts to fisheries and aquatic resources are described below.

- The construction contractor will submerge the cutterhead within the substrate to the maximum extent practicable when the dredge pumps are engaged, and reduce the dredge ladder swing speed to the extent practicable.
- The construction contractor conducting rock-toe and tree revetment maintenance activities, including rock or brush replacement, will be required to implement measures to

scare fish away from the immediate work area. Before submerging a dragline bucket or placing rock below the water surface, the dragline bucket will be operated to splash-cast the bucket into the water, and a person will wade ahead of the equipment to scare fish away from the immediate work area.

- Project personnel will participate in an environmental awareness training program provided by a qualified biologist. Construction workers will be informed by a qualified biologist about any sensitive fisheries and aquatic biological resources associated with the project and that disturbance of sensitive habitat or special-status species is a violation of the Federal ESA and Section 404 of the CWA. Workers will be informed of the potential nearshore presence of juvenile listed fish species, including anadromous salmonids, and that actions causing injury or death to these fish could result in civil or criminal penalties to the individuals who commit such actions.
- The construction contractor will be required to read and implement procedures identified for decontaminating field gear and in-river dredging equipment contained in the CDFG (2008) Field Gear Decontamination Protocols. Procedures for decontaminating field gear (i.e., waders, wading boots, boot insoles, nets, wading sticks, or anything else that comes into contact with the water), as well as in-river equipment, developed by CDFG (2008) will be followed prior to entering the Sacramento River in the Action Area.
- Although entrainment associated with suction dredging is not anticipated, if construction personnel observe fish in dredge slurry entering the containment areas, work would be halted and CDFW, NMFS, and USWFS would be contacted, and a formal entrainment monitoring plan would be developed and implemented prior to the re-initiation of dredging activities.

Pursuant to Section 305(b)(4)(A) of the MSA, if NMFS determines that a proposed Federal or State activity would adversely affect EFH, then NMFS is required to provide EFH conservation recommendations to Federal agencies regarding actions that may adversely affect EFH. Conservation recommendations may include measures to avoid, minimize, mitigate, or otherwise offset adverse effects on EFH (NMFS 1998). Although the concept of EFH is similar to “critical habitat” under the ESA, measures recommended by NMFS or the PFMC to protect EFH are advisory, not proscriptive (NMFS 1998).

Consistent with goals described in NFMS (2010) and to assist NMFS with its EFH assessment for this project, it is anticipated that the protective measures that are part of the Proposed Action would serve as proposed conservation recommendations for Pacific Coast salmon EFH in the Action Area.

5.7.1.5 CONCLUSIONS AND DETERMINATION

ESA

Relative to the Environmental Baseline, the Proposed Action will not result in substantial adverse changes to critical habitat PCEs or their management for spring-run Chinook salmon, steelhead and green sturgeon in the lower Sacramento River.

However, there is a limited potential for "take" of listed fish species associated with the Proposed Action due to direct harm resulting from suction dredging of the sediment deposit, and maintenance of the rock-toe and tree revetment. Given the foregoing considerations of the limited temporal exposure and avoidance capability of adults, and the very limited potential exposure of juveniles to construction-related activities during the in-river work period, it may be reasonable to conclude that effects of the Proposed Action on listed fish species are expected to be discountable or insignificant. However, according to USFWS and NMFS (1998), "*Insignificant effects relate to the size of the impact, and should never reach the scale where take occurs.*" If incidental take is anticipated to occur as a result of the Proposed Action, an "*is likely to adversely affect*" determination should be made (USFWS and NMFS 1998). Consequently, the Proposed Action "*may affect, is likely to adversely affect*" the Sacramento River winter-run Chinook salmon ESU, the Central Valley spring-run Chinook salmon ESU, the Central Valley steelhead DPS, and the Southern DPS of North American green sturgeon.

EFH

Overall, based upon the analyses presented in the EFH assessment, the Proposed Action will not adversely affect EFH, including potential HAPCs in the Action Area, or their management, in a manner that would: (1) reduce the quality or quantity of EFH; or (2) eliminate, diminish or disrupt the utilization of these habitats by various lifestages of Chinook salmon. Therefore, the overall effects of the Proposed Action will not adversely affect EFH used by Chinook salmon.

5.7.2 LISTED TERRESTRIAL SPECIES AND DESIGNATED CRITICAL HABITAT

5.7.2.1 VALLEY ELDERBERRY LONGHORN BEETLE

DIRECT AND INDIRECT EFFECTS

Elderberry shrubs that could potentially be inhabited by VELB and, therefore, potentially be affected by the Proposed Action within 100 feet of the Action Area, defined as the centerline of the access road for this assessment, were surveyed during June 2012. Surveys were conducted according to the protocols described in the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999). The survey recorded a total of 440 elderberry shrubs within the

vicinity[3] of the Action Area, 372 elderberry shrubs were documented within 100 feet of the Action/Project Area, and 274 of which are within 100 feet of the Action Area (Figure 5-1a and Figure 5-1b).

USFWS (1999) states that if suitable habitat for the beetle occurs on the project site, or within close proximity where VELB will be affected by the Proposed Action, these areas must be designated as avoidance areas and must be protected from disturbance during the construction and operation of a project. Any VELB habitat that cannot be avoided should be considered adversely affected and appropriate minimization measures should be proposed (see ***Environmental Commitment TR-1*** and USFWS (1999)). Complete avoidance (i.e., no adverse effects) may be assumed when a 100-foot (or wider) buffer is established and maintained around elderberry plants containing stems measuring 1.0 inch or greater in diameter at ground level (USFWS 1999). Detailed survey results are presented in Appendix F.

In-river Dredging and Spoils Disposal

VELB habitat would be affected by construction activities and equipment associated with dredging operations and spoils disposal. **Figure 5-2** presents the location of individual elderberry shrubs in proximity to key project features associated with dredging and spoils disposal operations associated with the Proposed Action. Three of the shrubs documented (i.e., EB24, EB59 and EB64) contained exit holes, frequently the only evidence of use by the beetle. All three shrubs are located in valley oak woodlands adjacent to Big Chico Creek to the west and near the existing spoils stockpile to the east.

Project activities with the greatest potential to affect elderberry shrubs would be associated with: (1) the placement and removal of the suction dredge line that would run from the dredge barge to Containment Area #1; and (2) the placement and removal of two dewatering pipelines that would run from Containment Area #2 to the stilling well at the M&T/Llano Seco pumping plant (Figure 5-2). Other activities related to spoils disposal would occur on the existing access road leading from the M&T/Llano Seco pumping plant to the existing stockpile, at existing staging areas and at the existing spoils stockpile.

[3] When mapped using GIS, some shrubs were found to be more than 100 feet outside the survey area, and therefore were not discussed further in the survey report (RBI 2012).

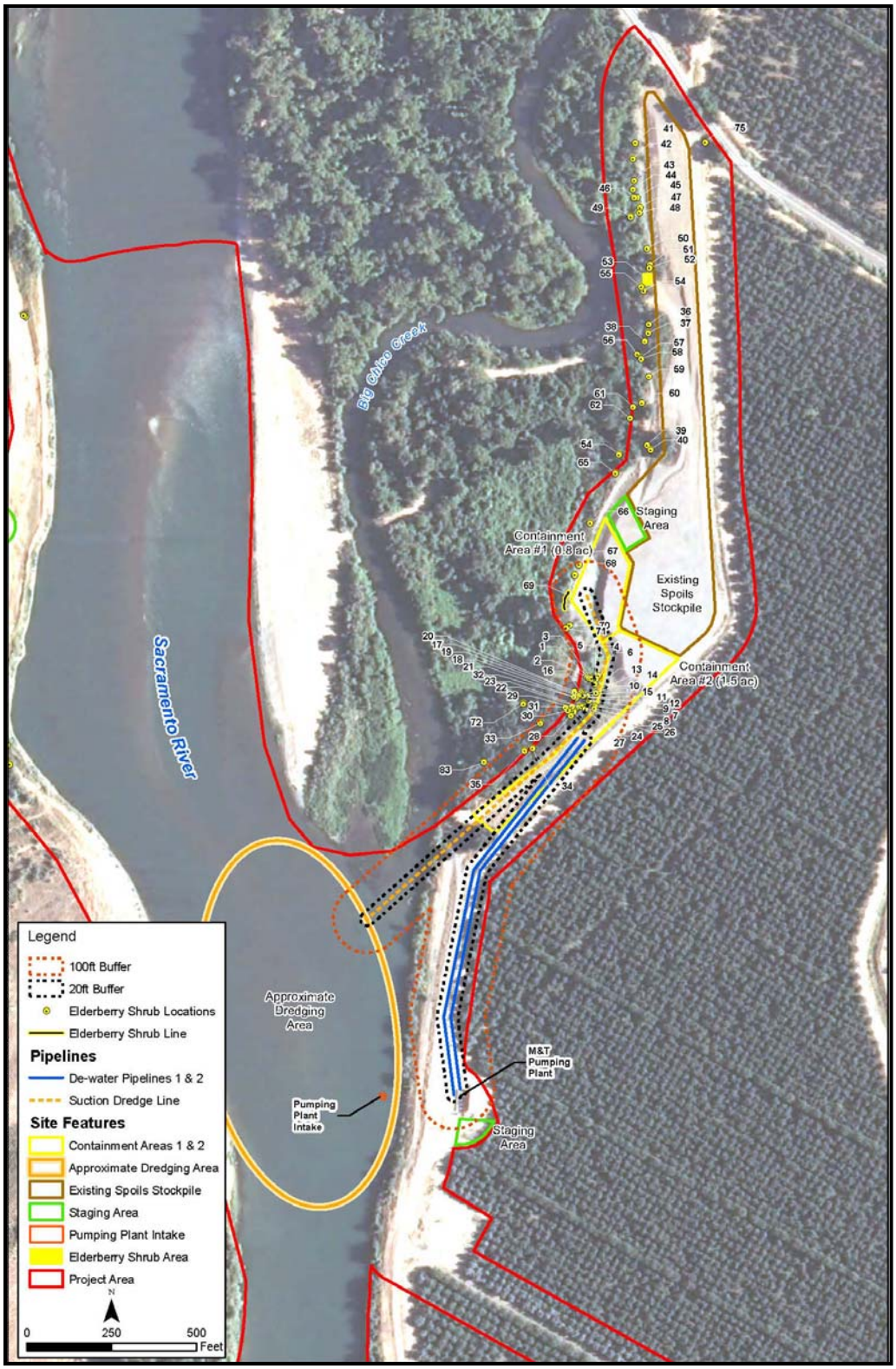

Figure 5-2. Location of Individual Elderberry Shrubs Identified During the 2012 Survey in Proximity to Key Project Features Associated with In-River Dredging and Spoils Disposal Under the Proposed Action.

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As shown on Figure 5-2, numerous elderberry shrubs in the Action Area are located within close proximity (1 to 100 feet) to access roads, and the shrubs potentially could be adversely affected by dust associated with construction traffic and inadvertent contact with construction equipment. Seventy-five (75) elderberry shrubs could potentially be affected by spoils deposition-related activities. It would not be possible for the pipeline routes to entirely avoid a 100-foot buffer area, and a total of 38 elderberry shrubs are present within 100 feet of the anticipated location of the suction dredge line and the dewatering pipeline (**Table 5-3**). Six elderberry shrubs are present within 20 feet of the suction dredge line. Typically, elderberry stems larger than 1.0 inch in diameter at ground level may be utilized by the beetle to complete its lifecycle. The 38 shrubs within 100 feet and the 6 shrubs within 20 feet of the pipelines have a combined total of 92 stems and 16 stems greater than 1.0 inch in diameter at ground level, respectively.

Table 5-3. Elderberry Shrubs Proximate to Key Project Features, Particularly the Suction Dredge Line and the Dewatering Pipeline, on the East Side of the Sacramento River.

Project Site	Total Number of Elderberry Shrubs	Number of Stems With VELB Exit Holes			Number of Stems Without VELB Exit Holes		
		Stem Diameter (inches)			Stem Diameter (inches)		
		≥1 & ≤3	>3 & <5	≥5	≥1 & ≤3	>3 & <5	≥5
Dredging and Spoils Disposal Area							
Within 20 feet of the Suction Dredge Line and the Dewatering Pipeline	6	0	0	0	14	2	0
Within 100 feet of the Suction Dredge Line and the Dewatering Pipeline	38	0	0	0	40	42	10
Total Within the Portion of the Action Area Located on the M&T Chico Ranch Property	75	1	5	5	53	64	24

[1] The dredging and spoils disposal area is located at the M&T Chico Ranch Property on the east side of the Sacramento River.

Although the potential exists for elderberry shrubs to be directly and indirectly affected by construction-related activities, the protective measures identified in the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999) would be implemented as part of the Proposed Action to minimize or avoid potential adverse effects to VELB and its host plant. Specifically, for elderberry shrubs within the Action Area, exclusionary fencing would be placed 100 feet from the shrub drip line where practicable. Where it is infeasible to conduct construction activities 100 feet from a shrub's drip line, the USFWS will be consulted and exclusionary fencing will be placed a minimum of 20 feet from the shrub drip line. In most cases, fencing will be placed at least 20 feet from the drip line of the shrub. In up to six cases, the suction dredge

line may be required to be located within 20 feet of a shrub. In these cases, fencing will be placed at the greatest distance possible from the shrubs.

Although the potential exists for elderberry shrubs to be directly and indirectly affected by construction-related activities, the protective measures identified in the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999) would be implemented as part of the Proposed Action to minimize or avoid potential adverse effects to VELB and its host plant. Specifically, for elderberry shrubs within the Action Area, exclusionary fencing would be placed 100 feet from the shrub drip line where practicable. Where it is infeasible to conduct construction activities 100 feet from a shrub's drip line, the USFWS will be consulted and exclusionary fencing will be placed a minimum of 20 feet from the shrub drip line. In most cases, fencing will be placed at least 20 feet from the drip line of the shrub. In up to six cases, the suction dredge line may be required to be located within 20 feet of a shrub. In these cases, fencing will be placed at the greatest distance possible from the shrubs.

Indirect effects to VELB could result from increased fugitive dust due to movement of vehicles and heavy equipment at the project site and on the access road to the existing spoils stockpile. Fugitive dust could reduce survivorship and productivity of the elderberry shrubs by decreasing photosynthetic output, reducing transpiration, which could affect the health of the shrub. This in turn could affect VELB. Dirt roadways and other areas of disturbed bare ground within 100 feet of elderberry shrubs will be watered at least twice a day to minimize dust emissions.

Elderberry plants must be transplanted if they cannot be avoided by the Proposed Action (USFWS 1999). Recognizing the need to provide a minimum setback of 20 feet from the drip line of each elderberry plant, it is anticipated that the pipeline routes could be adjusted during placement to avoid individual elderberry shrubs as much as possible. Although the area where the pipeline would be located is relatively narrow, it is anticipated that no elderberry shrubs would need to be removed as a result of construction activities. If, however, it did become necessary to transplant one or more individual elderberry shrubs within 20 feet of the suction dredge line because they would be directly impacted by construction activities, USFWS would first be contacted. Any subsequent actions would adhere to the USFWS (1999) guidance regarding transplanting elderberry plants and be conducted under the supervision of USFWS representatives.

In summary, in-river dredging and spoils disposal operations associated with the Proposed Action may adversely affect VELB because the potential exists for elderberry shrubs to be directly or indirectly affects by construction-related activities. However, potential adverse effects to elderberry shrubs would be avoided or reduced by implementing the protective measures described below.

Rock-toe and Tree Revetment Maintenance

Of the 440 elderberry shrubs recorded during the 2012 survey, 300 were located within riparian blue elderberry stands planted and maintained by the USFWS on the Capay Unit. As shown in

Figures 5-1a and 5-1b, the majority of the shrubs that would be affected by the Proposed Action are along the gravel access road that runs through the Capay Unit to the rock-toe and tree revetment and adjacent to the staging area near the revetment. Inadvertent contact with shrubs could occur while construction vehicles are entering or leaving the area. Within the portion of the Action Area that is proximate to the rock-toe and tree revetment along the Sacramento River, there are three elderberry shrubs within 100 feet of the revetment. Rock-toe and tree revetment maintenance associated with the Proposed Action has the potential to adversely affect VELB. However, potential adverse effects to elderberry shrubs would be avoided or reduced by implementing the protective measures described in the section below that describes the Environmental Commitments and Conservation Measures.

5.7.2.2 WESTERN YELLOW-BILLED CUCKOO

DIRECT AND INDIRECT EFFECTS

In-river Dredging and Spoils Disposal

Although suitable habitat exists on the Capay Unit, western yellow-billed cuckoos have not been detected and, thus, are not likely to be present at the revetment site location; therefore, dredging operations would not be expected to have an adverse effect on the western yellow-billed cuckoo nesting. Potential noise-related impacts on western yellow-billed cuckoos from dredging and spoils disposal, and construction vehicle access could include short-term disruption of foraging habitat use in the Action Area, as well as nest abandonment or early fledging in suitable habitat areas adjacent to the Action Area (e.g., riparian habitat along Big Chico Creek). Long-term habitat alteration is not anticipated because dense riparian habitat is not expected to be removed as a result of implementation of the Proposed Action.

As a precautionary measure, the environmental awareness training (see ***Environmental Commitment TR-2*** in Chapter 2) to be conducted prior to construction will include consideration of this species. Depending on the timing of when dredging (up to two dredge cycles) may become necessary, USFWS will be contacted to request updated species presence/absence information from the annual yellow-billed cuckoo survey effort along the Sacramento and Feather rivers, particularly if dredging operations would occur two or more years in the future. If nests or western yellow-billed cuckoos are observed by the monitoring biologist over the course of activities, then CDFW and USFWS will be contacted to determine the potential for adverse affects, and whether additional protective measures are necessary.

Rock-toe and Tree Revetment Maintenance

As previously discussed, yellow-billed cuckoo typically utilizes large areas of riparian vegetation for foraging and nesting activities. Except for an estimated 250 linear feet of riparian vegetation bordering the Sacramento River, riparian vegetation along the west bank of the Sacramento River in the Action Area was sparse prior to construction of the rock-toe and tree revetment in

2007. Since then, restoration efforts on about 600 acres of the Capay Unit have focused on restoring refuge agricultural lands to willow scrub, cottonwood, and mixed-riparian forests, some of which is anticipated to provide increased nesting and foraging habitat for the yellow-billed cuckoo. The future condition of the restored habitat on the Refuge is intended to be a multi-layered riparian forest that provides complex and diverse habitats to support a variety of wildlife, including western yellow-billed cuckoo (USFWS 2005).

Continued habitat succession has been identified as important in sustaining breeding populations (Laymon 1998). Persistence of the revetment and adjacent restored areas under the Proposed Action would allow existing riparian vegetation to continue to grow and mature. Although the existing volunteer woody vegetation established on the revetment since 2007 is not yet mature riparian forest, over time, this vegetation should become sufficiently large to potentially provide suitable nesting habitat (e.g., average nest site height of 14 feet in willow trees) as the riparian forest continues to develop.

If revetment maintenance becomes necessary, construction work necessary to maintain and/or repair the revetment according to the original design criteria is likely to represent an additional source of noise, though only temporarily. If cuckoos would be present, potential noise-related impacts on western yellow-billed cuckoos from ground disturbing activities associated with revetment maintenance and construction vehicle access could include short-term disruption of foraging habitat use in the Action Area, as well as nest abandonment or early fledging in suitable habitat areas adjacent to the Action Area. Long-term habitat alteration is not anticipated because dense riparian habitat is not expected to be removed as a result of implementation of the Proposed Action. Therefore, although construction activities could coincide with the period when western yellow-billed cuckoos are in California, no cuckoos have been detected at the revetment site location and, thus, maintenance work in this area would not be expected to adversely affect the species.

Depending on the timing of when dredging and revetment maintenance may become necessary, USFWS will be contacted to request updated species presence/absence information from the annual yellow-billed cuckoo survey effort along the Sacramento and Feather rivers, particularly if maintenance activities occur two or more years in the future. If nests or western yellow-billed cuckoos are observed by the monitoring biologist or the construction contractor over the course of activities, then CDFW and USFWS will be contacted to determine the potential for adverse affects, and whether additional protective measures are necessary.

Overall, the Proposed Action is not anticipated to adversely affect the western yellow-billed cuckoo or its habitat, nor would dredging operations and revetment maintenance substantially interfere with the movement of this species through the Action Area. Although there is a low likelihood of occurrence, implementation of the construction-related environmental commitments described in Chapter 2 will serve to protect any individual cuckoos that may be present in the immediate area. Therefore, the Proposed Action would not be expected to result in

adverse effects on western yellow-billed cuckoo and is not likely to contribute to the need to list this species in the future.

EFFECTS OF INTERRELATED AND INTERDEPENDENT ACTIONS

There are no interrelated or interdependent actions associated with the Proposed Action.

CUMULATIVE EFFECTS

Valley Elderberry Longhorn Beetle

Agricultural and urban development, including activities that affect vegetation that grows along existing irrigation channels and levees throughout much of the beetle's range, is likely to continue to have some effect on VELB and its habitat (77 FR60256).

To improve conditions caused by past habitat loss and fragmentation throughout the Central Valley, eight agencies and private organizations have completed 26 projects to enhance or restore 4,950 acres by planting elderberry (Talley et al. 2006a). Most of these elderberry-specific restoration efforts are located within already protected riparian vegetation (77 FR 60256). The largest effort to protect and restore VELB habitat has been conducted at the SRNWR. Long-term, beneficial effects would be expected from the ongoing implementation of the these restoration projects, as well as the SRNWR CCP because this planning effort is promoting greater protection of elderberry plants on the Capay Unit and in adjacent riparian corridors along the Sacramento River.

Climate change could affect VELB in other ways besides the amount and distribution of habitat (77 FR 60262). Changes in temperature and precipitation patterns may cause shifts in the timing of elderberry flowering relative to beetle emergence, or affect the relationship of the host plant species or beetle subspecies in other ways. Talley et al. (2006a) noted that the species (and variety) of elderberry varies with respect to drought tolerance and elevation. Therefore, it is possible that climate change could affect VELB. The magnitude of threat of climate change to the beetle in the future cannot be assessed further at this time due to taxonomic uncertainties within the host plant genus (*Sambucus*) and lack of genetic information about the two beetle subspecies (Talley et al. 2006a). Therefore, based on the best available scientific and commercial info at this time, and absent any confirming information, USFWS (77 FR 60262) concluded that climate change is not a significant factor affecting the persistence of VELB.

Western Yellow-billed Cuckoo

In general, western yellow-billed cuckoos continue to be cumulatively affected by habitat loss related to urbanization, flood control, pest management, and agricultural conversion (Reclamation 2008). The rate of agricultural conversion may have slowed significantly in the last decade as extensive riparian restoration has occurred within the Sacramento Valley (Reclamation 2008).

Since the passage of SB1086, which called for a management plan that would restore, manage and protect fisheries and riparian habitat along the Sacramento River, there have been many public acquisitions of land along its channel due to collaborative efforts between CDFW, USFWS, The Nature Conservancy and other interested parties (SRMAP 2010). When prioritizing land acquisitions, conservation agencies take into account target species (e.g., western yellow-billed cuckoo) or habitats, threats to these species and habitats, and current and future land uses (ERP, CALFED and CDFG 2011). Given these factors along with current hydrological factors and constraints, land acquisitions have been primarily concentrated on reaches between Red Bluff and Colusa. The 11,500 acres of floodplain forests, wetlands, grasslands, and aquatic habitats comprising the Sacramento River National Wildlife Refuge is presently managed by the USFWS (ERP, CALFED and CDFG 2011).

Pest management activities, primarily mosquito abatement activities, may serve to reduce food resources for cuckoos within the Sacramento Valley. Additionally, ongoing and future control of West Nile virus may require increased mosquito control activities, which may affect the species' prey base (Reclamation 2008).

As discussed above, climate change may be a stressor on yellow-billed cuckoos. Although information for western yellow-billed cuckoo is not available, eastern cuckoo declines have been linked to global climate patterns causing warmer winters, which reduce prey biomass the following summer (Anders and Post 2006).

ENVIRONMENTAL COMMITMENTS/CONSERVATION MEASURES

The Proposed Action has the potential to affect VELB through adverse effects to its host plant, the elderberry shrub. Avoidance and mitigation measures outlined in the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle, July 9, 1999* (USFWS 1999) would be followed in addition to any other terms and conditions issued by the USFWS. Generally, protective measures would be implemented as part of the Proposed Action until such time that the USFWS issues a Final Rule removing VELB from the Federal list of threatened and endangered species. However, because the Capay Unit of the SRNWR was established, in part, for VELB habitat restoration purposes, the protective measures identified below would likely remain in place on the Capay Unit regardless of a Final Ruling to remove VELB from listing under the ESA (K. Moroney, USFWS, 2013, pers. comm.).

- All elderberry shrubs that are located adjacent to construction areas, but can be avoided, will be protected through establishment of a fenced avoidance area. The USFWS will be consulted before any ground-disturbing activities within the 100-foot buffer area are considered. Orange barrier fencing will be placed 100 feet from the drip line of elderberry shrubs where practicable, and a minimum of 20 feet from the drip line of each elderberry shrub with one or more stems measuring one inch or greater in diameter at ground level where approved by USFWS. Construction personnel and/or activities will avoid fenced areas.
- Provide worker awareness training to contractors and work crews on the need to avoid damaging the elderberry plants and possible penalties for not complying with these requirements.
- Construction contractors will employ erosion and dust control measures[4] during all construction activities.
- No insecticides, herbicides, fertilizers, or other chemicals will be applied within 100 feet of elderberry plants with one or more stems measuring one inch or greater in diameter at ground level during construction activities. All drainage water during and following construction will be diverted away from shrubs with stems measuring one inch or greater at ground level.
- Place signs every 50 feet along the edge of the avoidance areas 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 would be clearly readable from a distance of 20 feet, and would be maintained for the duration of construction.
- Any damage occurring within areas within 100 feet of elderberry shrubs will be restored with native plant species.
- The construction contractor is required to provide a written description of how the core and buffer avoidance areas are to be restored and protected.
- Mowing of grasses and ground cover may occur from July through April to reduce fire hazard. No mowing should occur within five feet of elderberry plant stems. Mowing must be done in a manner that avoids damaging plants (e.g., stripping away bark through careless use of mowing/trimming equipment).

[4] For more information, please refer to the text in Chapter 2 and Chapter 3 describing Environmental Commitment WQ-2, which involves the preparation and implementation of an erosion control plan, and Environmental Commitment AQ-2, which involves the preparation and implementation of a dust control plan.

To the extent practicable, construction activities would occur outside of the peak nesting season to avoid potential impacts to migratory birds, including the western yellow-billed cuckoo. Project personnel will participate in an environmental awareness training program provided by a qualified biologist (see Appendix I) prior to initiation of construction activities at the project site.

Depending on the timing of when future dredging (up to two dredge cycles) and revetment maintenance may become necessary, CDFW and USFWS will be contacted to request updated species presence/absence information from the annual yellow-billed cuckoo survey effort along the Sacramento and Feather rivers. If nests or western yellow-billed cuckoos are observed by the monitoring biologist over the course of activities, then CDFW and USFWS will be contacted to determine the potential for adverse affects, and whether additional protective measures are necessary.

CONCLUSIONS AND DETERMINATION

Valley Elderberry Longhorn Beetle

In summary, in-river dredging and spoils disposal operations associated with the Proposed Action may adversely affect VELB because the potential exists for elderberry shrubs to be directly or indirectly affects by construction-related activities. However, potential adverse effects to elderberry shrubs would be avoided or reduced by implementing the protective measures described above.

Although the Proposed Action "*may affect, is likely to adversely affect*" VELB due to the limited potential for "take" of beetles that may be present in elderberry shrubs within the Action Area, the Proposed Action is "*not likely to jeopardize the continued existence*" of VELB.

In consideration of the current status of the species described in USFWS' proposed rule to delist VELB (77 FR 60238) and USFWS belief that VELB will continue to persist based on: (1) the increase in number of VELB occurrence records; (2) increase in number of locations where the VELB are found, including over a larger range than what was known at the time of listing; (3) past and ongoing riparian vegetation restoration; and (4) persistence of elderberry shrubs in restored areas and managed public lands, as well as the protective measures that would be implemented to protect elderberry shrubs in the Action Area, the Proposed Action is not expected *"…directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution"* of VELB."

Moreover, the Proposed Action would not result in *"destruction or adverse modification"* of critical habitat, nor will the Proposed Action result in *"a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery"* of VELB.

Western Yellow-billed Cuckoo

According to 50 CFR 402.10(a), a Federal agency "*…shall confer with the Service on any action which is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat.*" The Proposed Action will not jeopardize the continued existence of the proposed threatened western yellow-billed cuckoo because: (1) cuckoos are not likely to be present in the Action Area; (2) revetment maintenance, in-river dredging and spoils disposal operations associated with the Proposed Action would not result in direct mortality; and (3) the Proposed Action would not be expected to adversely affect western yellow-billed cuckoo nesting or foraging habitats. Additionally, potential adverse effects to cuckoos would be avoided or reduced by implementing the protective measures described above. However, in the event that the western yellow-billed cuckoo becomes listed prior to completion of the project, a provisional effect determination is provided below.

Overall, the Proposed Action may affect, but is not likely to adversely affect the western yellow-billed cuckoo. The Proposed Action also is not likely to contribute to listing the western yellow-billed cuckoo under the Federal ESA. In addition, because the definition of "take" under the State ESA applies only to individual members of a listed species, no "take" of western yellow-billed cuckoo would occur as a result of dredging or revetment maintenance.

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6.0 COMPLIANCE WITH ENVIRONMENTAL LAWS AND REGULATIONS

The following Federal and State laws have directed, limited or guided the NEPA and CEQA analyses and decision-making described in this Draft EA/IS.

6.1 REGULATORY SETTING

6.1.1 SECTION 404 OF THE CLEAN WATER ACT

As previously described, installation of bank stabilization structures that result in the placement of fill into waters of the United States generally are covered under Section 404 nationwide permits (potentially including Nationwide Permit 13 for bank stabilization), at the discretion of the USACE). Nationwide permits do not authorize activities that are likely to jeopardize the existence of a threatened or endangered species (listed or proposed for listing under the Federal ESA) or that may affect properties listed or eligible for listing in the National Register of Historic Places (56 FR 59134-59138, November 22, 1991). Besides conditions outlined under each nationwide permit, project-specific conditions may be required by the USACE as part of the Section 404 permit.

6.1.2 CENTRAL VALLEY FLOOD PROTECTION BOARD ENCROACHMENT PERMIT

Under California Water Code Sections 8534, 8608, 8609, and 8710-8723, the Central Valley Flood Protection Board (formerly the State Reclamation Board) is tasked with enforcing appropriate standards for the construction, maintenance and protection of adopted flood control plans. The adopted plan of flood control under the jurisdiction and authority of the Board includes the Sacramento and San Joaquin rivers and their tributaries, distributaries, and designated floodways. A Central Valley Flood Protection Board Encroachment Permit must be obtained prior to initiating any activity, including excavation and construction, removal or planting of landscaping, within floodways, levees, and 10 feet landward of the landside of levee toes. Additionally, activities located outside of the adopted plan of flood control but which may foreseeably interfere with the functioning or operation of the plan of flood control also is subject to a permit of the Board.

Because the original project to relocate the M&T Pumps Facility to the Sacramento River was constructed pursuant to a State Reclamation Board encroachment permit, the Central Valley Flood Protection Board and the CSLC issued letters authorizing the construction of the rock and brush revetment.

6.1.3 SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT

The National Historic Preservation Act of 1966, Section 106 (16 U.S. Code 470), requires Federal agencies to consider the effects of their actions, including approval, permitting, and

technical assistance on properties that are eligible for, or included in, the NRHP. Historical sites, objects, districts, and historic structures, and cultural landscapes that are eligible for listing on the NRHP are referred to as "historic properties." Section 106 also requires the Federal agency to afford the Advisory Council on Historic Preservation an opportunity to comment on the agency's efforts to consider historic properties. The implementing regulations for Section 106, found at 36 CFR 800, describe a process of inventory, evaluation, and consultation that satisfies the Federal agency's requirements. The criteria used for determining the eligibility of cultural resources are found at 36 CFR 60.4.

6.1.4 RIVERS AND HARBORS ACT

Under Section 10 of the Act, the building of any wharfs, piers, jetties, and other structures is prohibited without Congressional approval, and excavation or fill within navigable waters requires the approval of the Chief of Engineers. Service concerns include contaminated sediments associated with dredge or fill projects in navigable waters.

6.1.5 FEDERAL ENDANGERED SPECIES ACT

The USFWS (plants, wildlife, and resident fish) and NFMS (anadromous fish and marine fish and mammals) oversee the Federal ESA. Section 7 of the act mandates that all Federal agencies consult with USFWS and NMFS to ensure that the Federal agencies' actions do not jeopardize the continued existence of a listed species or destroy or adversely modify critical habitat for listed species. The USFWS (acting as NEPA lead agency) is required to consult with NMFS if it determines that the Proposed Action "may affect" a listed species within the jurisdiction of NMFS under ESA (e.g., listed anadromous fish species). This determination is made through preparation of a Biological Opinion (BO). The USFWS and NMFS will each subsequently provide a BO on wildlife species that are Federally listed or that are proposed for listing as threatened or endangered under their respective jurisdictions.

The ESA prohibits the "taking" of any wildlife species listed as threatened or endangered, including the destruction of habitat that would prevent species recovery. "Taking" is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct. Under Federal regulations, "take" is defined further to include habitat modification or degradation where it actually results, or is reasonably expected to result, in death or injury to wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Wildlife that are Federally listed as threatened are also protected from take, but protection of these species may be modified at the time of their listing.

Under Section 9 of the ESA, the take prohibition applies only to fish and wildlife species. However, Section 9 does prohibit the unlawful removal and reduction to possession, or malicious damage or destruction of, any endangered plant from Federal land. Section 9 prohibits acts to remove, cut, dig up, damage, or destroy an endangered plant in non-Federal areas in knowing violation of any State law or in the course of criminal trespass. Candidate species, Federal

species of concern, and species that are proposed or under petition for listing receive no protection under Section 9 of the ESA.

6.1.6 FISH AND WILDLIFE COORDINATION ACT

The Act of March 10, 1934, authorizes the Secretaries of Agriculture and Commerce to provide assistance to and cooperate with Federal and State agencies to protect, rear, stock, and increase the supply of game and fur-bearing animals, as well as to study the effects of domestic sewage, trade wastes, and other polluting substances on wildlife.

The Act also directs the Bureau of Fisheries (a predecessor agency to USFWS) to use impounded waters for fish-culture stations and migratory-bird resting and nesting areas and requires consultation with the Bureau of Fisheries prior to the construction of any new dams to provide for fish migration. In addition, this Act authorizes the preparation of plans to protect wildlife resources, the completion of wildlife surveys on public lands, and the acceptance by the Federal agencies of funds or lands for related purposes provided that land donations received the consent of the State in which they are located.

The amendments enacted in 1946 require consultation with the USFWS and the fish and wildlife agencies of States where the "*waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted… or otherwise controlled or modified*" by any agency under a Federal permit or license. Consultation is to be undertaken for the purpose of "preventing loss of and damage to wildlife resources."

6.1.7 NATIONAL WILDLIFE REFUGE SYSTEM IMPROVEMENT ACT

The Act's main components improve the National Wildlife Refuge System Administration Act of 1966 by amending it to include a unifying mission for the Refuge System, a new process for determining compatible uses of refuges, and a requirement for preparing comprehensive conservation plans. This Act states first and foremost that the mission of the National Wildlife Refuge System be focused singularly on wildlife conservation.

6.1.8 MIGRATORY BIRD TREATY ACT

The MBTA (16 USC 703) enacts the provisions of treaties between the United States, Great Britain, Mexico, Japan, and the Soviet Union and authorized the U.S. Secretary of the Interior to protect and regulate the taking of migratory birds. The MBTA sets seasons and bag limits for hunted species and protects migratory birds, their occupied nests, and their eggs (16 USC 703, 50 CFR 21, 50 CFR 10). Most actions that result in taking of, or the permanent or temporary possession of, a protected species constitute violations of the MBTA. The MBTA also prohibits destruction of occupied nests. The Migratory Bird Permit Memorandum dated April 15, 2003, clarifies that destruction of most unoccupied bird nests (without eggs or nestlings) is permissible under the MBTA; exceptions include nests of Federally threatened or endangered migratory birds, bald eagles, and golden eagles. USFWS is responsible for overseeing compliance with the MBTA.

6.1.9 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The Magnuson-Stevens Act of 1976 is the primary act governing Federal management of fisheries in Federal waters, from the three nautical-mile State territorial sea limit to outer limit of the U.S. Exclusive Economic Zone. It establishes exclusive U.S. management authority over all fishing within the Exclusive Economic Zone, all anadromous fish throughout their migratory range except when in a foreign nation's waters, and all fish on the continental shelf. The Magnuson-Stevens Act establishes eight Regional Fishery Management Councils responsible for the preparation of fishery management plans to achieve the optimum yield from U.S. fisheries in their regions. The Magnuson-Stevens Act also requires Federal agencies to consult with NMFS on actions that could damage EFH. EFH includes those habitats that support the different lifestages of each managed species. A single species may use many different habitats throughout its life to support breeding, spawning, nursery, feeding, and protection functions. EFH can consist of both the water column and the underlying surface (e.g. streambed) of a particular area. The Sacramento River is designated as EFH for Chinook salmon in the Action/Project Area.

6.1.10 CALIFORNIA ENDANGERED SPECIES ACT

CESA (Fish and Game Code, §2050 *et seq*.) is intended to conserve, protect, restore, and enhance species designated as endangered or threatened, and their habitat. Animal species designated as endangered or threatened under CESA are listed in California Code of Regulations, Title 14, §670.5. Plant species designated as endangered or threatened under CESA, or designated as a rare plant species under the California Native Plant Protection Act (Fish and Game Code §1900 *et seq*.), are listed in California Code of Regulations, Title 14, §670.2. CESA emphasizes that State agencies should not approve projects as proposed which would jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat essential to the continued existence of those species, if there are reasonable and prudent alternatives available consistent with conserving the species or its habitat that would prevent jeopardy (Fish and Game Code §2052.1).

Species designated as endangered or threatened under CESA, and species designated as candidates for listing or delisting under CESA, are subject to what is commonly known as CESA's "take" prohibition. "Take" is defined specifically in the Fish and Game Code to mean "hunt, pursue, catch, capture, or kill," or an attempt to do any such act, and violations of CESA's take prohibition are criminal misdemeanors under State law (Fish and Game Code §86 and §12000). Unlike the Federal ESA, CESA applies the take prohibitions to species under petition for listing (State candidates) in addition to listed species. Section 2081 of the Fish and Game Code expressly allows CDFW to authorize, by permit, the incidental take of endangered, threatened, and candidate species if all of the following conditions are met:

- The take is incidental to an otherwise lawful activity
- The impacts of the authorized take are minimized and fully mitigated
- Issuance of the permit will not jeopardize the continued existence of the species

- The permit is consistent with any regulations adopted in accordance with Sections 2112 and 2114 (legislature-funded recovery strategy pilot programs in the affected area)
- The applicant ensures that adequate funding is provided for implementing mitigation measures and monitoring compliance with these measures and their effectiveness

The incidental take of listed species is authorized by CDFW on a discretionary basis. Typically, mitigation measures, including species and habitat avoidance, minimization, restoration or enhancement, acquisition, and permanent protection of compensatory habitat, along with monitoring and management and funding assurances, are necessary to demonstrate that project impacts are fully mitigated. Full mitigation for take of listed species is determined on a project-specific basis, and a variety of combinations of mitigation actions can form the basis for a conclusion that the impacts of the taking caused by any particular project are fully mitigated as required by CESA. Generally, though, full mitigation can be achieved by offsetting the project's incidental take of individuals of the covered species, along with the other spatial, temporal, direct, indirect, and cumulative impacts, including habitat loss, that constitute "impacts of the taking" as that term is used in CESA, such that the covered species continues to survive and thrive after completion of the project and required mitigation.

CESA also provides that if a person obtains a Federal incidental take statement or incidental take permit under specified provisions of the ESA for species also listed under the CESA, no further authorization is necessary under CESA if the Federal permit satisfies all the requirements of CESA and the person follows specified procedures (Fish and Game Code §2080.1).

6.1.11 CALIFORNIA FISH AND GAME CODE

The Fish and Game Code states that the fish and wildlife resources of the State are held in trust for the people of the State by and through CDFW (Fish and Game Code §711.7(a)). Fish and Game Code Section 1802 states that CDFW has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species. All licenses, permits, tag reservations and other entitlements for the take of fish and game authorized by the Fish and Game Code are prepared and issued by CDFW (Fish and Game Code §1050(a)).

Fish and Game Code Section 1602 states that "*an entity may not substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake*" unless CDFW receives written notification regarding the activity and the entity pays the applicable fee. If CDFW determines that the activity may substantially adversely affect an existing fish or wildlife resource, CDFW issues an agreement to the entity that includes reasonable measures necessary to protect the resource. Activities that typically require a Lake or Streambed Alteration Agreement include, but are not limited to, excavation or placement of fill within a stream channel, vegetation clearing, installation and operation of structures that divert the flow of water, installation of culverts and bridge supports, cofferdams for construction dewatering, and bank reinforcement.

6.1.12 PUBLIC RESOURCES CODE SECTION 6301

Under the State of California sovereign interests, the CSLC has jurisdiction over the bed of the Sacramento River and material removed from the riverbed pursuant to California Public Resources Code Sections 600 et seq. and Title 2, division 3, Sections 1900 et seq. of the California Code of Regulations.

Both the 2001 and 2007 dry-land excavations, which involved heavy equipment accessing the excavation site from the shore along the east bank of the Sacramento River, did not require a State Lands Lease, as provided for in Section 6327 of the Public Resources Code (see Section 1.5.2 in Chapter 1). Since the previous dry-land excavations in 2001 and 2007, the sedimentation patterns in the Sacramento River have changed and future removal of the material is no longer feasible as a dry-land excavation. Because the Proposed Project would involve in-river dredging operations, it is anticipated that a dredging lease will be required from the CSLC pursuant to Section 6301 of the Public Resources Code:

> "*The commission has exclusive jurisdiction over all ungranted tidelands and submerged lands owned by the State, and of the beds of navigable rivers, streams, lakes, bays, estuaries, inlets, and straits, including tidelands and submerged lands or any interest there, whether within or beyond the boundaries of the State as established by law, which have been or may be acquired by the State (a) by quitclaim, cession, grant, contract, or otherwise from the United State or any agency thereof, or 9b) by any other means. All jurisdiction and authority remaining in the State as to tidelands and submerged lands as to which grants have been or may be made is vested in the commission.*
>
> *The commission shall exclusively administer and control all such lands, and may lease or otherwise dispose of such lands, as provided by law, upon such terms and for such consideration, if any, as are determined by it.*
>
> *The provisions of this section do not apply to land of the classes described in Section 6403, as added by Chapter 227 of the Statues of 1947."*

7.0 LIST OF PREPARERS

The names and area of participation of the lead and resource agency representatives who were primarily responsible for providing input to the Draft EA/IS are identified in **Table 7-1**. The names, qualifications, and area of participation of the persons who primarily responsible for preparing the Draft EA/IS, as well as those persons who provided substantive supporting information or analyses are included in **Table 7-2**.

Table 7-1. List of Agency Representatives Contributing to and Reviewing the Draft EA/IS.

Name	Area of Participation
California Department of Fish and Wildlife	**Lead Agency**
Joe Johnson	Agency representative; document review
Tracy McReynolds	Agency representative; document review
Jenny Marr	Agency representative; document review
United States Fish and Wildlife Service	**Lead Agency**
Dan Frisk	Agency representative; document review
Kelly Moroney	Agency representative; document review
Patricia Roberson	Agency representative; document review
Dan Welsh	Agency representative; document review
National Marine Fisheries Service	**Resource Agency**
Gretchen Umlauf	Agency representative; document review for ESA compliance purposes
M&T Chico Ranch/Llano Seco Rancho	**Project Proponent**
Les Heringer	Ranch manager; project description; document review
Ducks Unlimited	**Program/Grant Manager; Permitting Coordination**
Jim Well	Document review
Patrick Britton	Document review

Table 7-2. List of Persons Primarily Responsible for the Preparation of the Draft EA/IS.

Name	Participation
HDR Engineering, Inc.	
Paul Bratovich	Vice President/Principal Fisheries Biologist – Fisheries and aquatic resources, ESA consultation, guidance and document review, overall process participation
Dianne Simodynes	Senior Environmental Scientist/Project Manager – Project management, overall document preparation, document review, CEQA, NEPA and ESA compliance
Amanda Ransom	Environmental Planner – Recreation, cumulative effects, CEQA and NEPA compliance, general assistance related to document preparation
Morgan Neal	Environmental Scientist – Fisheries and aquatic resources, general assistance related to document preparation
Adrian Pitts	Senior Environmental Scientist – Terrestrial resources, general assistance related to document preparation
Michael Ernst	Environmental Engineer – Air quality emissions modeling
Brandon Jones	GIS Analyst – Maps and geographic data
Janna Huchet	Project Coordinator – Word processing, document formatting, compilation of literature cited, general assistance related to document preparation
Robertson-Bryan, Inc.	
Sara Reece	Botanical and sensitive species surveys
Corinne Munger	Botanical and sensitive species surveys
Janelle Nolan	Technical review of the botanical and sensitive species survey report
Tetra Tech, Inc.	
Bob Mussetter, Ph.D., P.E.	Engineering, hydrology and geomorphology technical assistance
Wagner & Bonsignore	
Emily MacDonald	Engineering, water supply technical assistance
Remy Moose Manley, LLP	
Jim Moose	Legal counsel

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