Chapter 7 Fluvial Geomorphology

7.1 Introduction

This chapter describes the environmental setting, methods of analysis, and impact analysis for fluvial geomorphology that would potentially be affected by the construction and operation of the Project. Fluvial geomorphology is a discipline that examines river processes (e.g., scour and deposition) and landforms (e.g., channel bed, channel banks, and floodplains), and the relationships between them. The study area for fluvial geomorphology consists of the local drainages associated with the Sites Reservoir (e.g., Funks, Stone Corral, and Hunters Creeks), as well as downstream waterbodies such as the Sacramento River and the Yolo Bypass. Engineered drainage canals (i.e., TC Canal, GCID Main Canal, and CBD) are also included in the study area. Other watercourses and flood storage facilities associated with northern California's water delivery and flood management infrastructure, such as the Trinity River, Feather River, American River, and San Luis Reservoir are not discussed below because, based on the various modeling results available for the Project, there would be no construction geomorphic impacts within these areas and operational geomorphic effects associated with the Project would have minimal or no impact on these watercourses and flood storage facilities.

Tables 7-1a and 7-1b summarize the CEQA determinations and NEPA conclusions for construction and operation impacts, respectively, between alternatives that are described in the impact analysis.

Table 7-1a. Summary of Construction Impacts and Mitigation Measures for Fluvial Geomorphology

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Impact FLV-1: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would result in a substantial increase or decrease in on- or off-site erosion or siltation			
No Project	NI/NE	-	NI/NE
Alternative 1	LTS/NE	-	LTS/NE
Alternative 2	LTS/NE	-	LTS/NE
Alternative 3	LTS/NE	-	LTS/NE
Impact FLV-2: Substantially alter natural river geomorphic processes (i.e., flow regime, sediment transport, and bank erosion) and existing river geomorphic characteristics (i.e., sinuosity, channel gradient, substrate composition, channel width and depth, and riparian vegetation)			
No Project	NI/NE	-	NI/NE
Alternative 1	LTS/NE	-	LTS/NE

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Alternative 2	LTS/NE	-	LTS/NE
Alternative 3	LTS/NE	-	LTS/NE
Impact FLV-3: Substantially alter the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel in Funks and Stone Corral Creeks downstream of Sites Reservoir			
No Project	NI/NE	-	NI/NE
Alternative 1	LTS/NE	-	LTS/NE
Alternative 2	LTS/NE	-	LTS/NE
Alternative 3	LTS/NE	-	LTS/NE
Impact FLV-4: Substantially alter geomorphic processes upstream of the dam sites			
No Project	NI/NE	-	NI/NE
Alternative 1	LTS/NE	-	LTS/NE
Alternative 2	LTS/NE	-	LTS/NE
Alternative 3	LTS/NE	-	LTS/NE

Notes:
NI = CEQA determination of no impact
LTS = CEQA determination of less-than-significant impact
LTSM = CEQA determination of less than significant with mitigation
SU = CEQA determination of significant and unavoidable
B = NEPA conclusion of beneficial effects
NE = NEPA conclusion of no effect or no adverse effect
AE = NEPA conclusion of adverse effect
SA = NEPA conclusion of substantial adverse effect

Table 7-1b. Summary of Operation Impacts and Mitigation Measures for Fluvial Geomorphology

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Impact FLV-1: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would result in a substantial increase or decrease in on- or off-site erosion or siltation			
No Project	NI/NE	-	NI/NE
Alternative 1	LTS/NE	-	LTS/NE
Alternative 2	LTS/NE	-	LTS/NE
Alternative 3	LTS/NE	-	LTS/NE
Impact FLV-2: Substantially alter natural river geomorphic processes (i.e., flow regime, sediment transport, and bank erosion) and existing river geomorphic characteristics (i.e., sinuosity, channel gradient, substrate composition, channel width and depth, and riparian vegetation)			
No Project	NI/NE	-	NI/NE
Alternative 1	LTS/NE	-	LTS/NE
Alternative 2	LTS/NE	-	LTS/NE
Alternative 3	LTS/NE	-	LTS/NE

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Impact FLV-3: Substantially alter the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel in Funks and Stone Corral Creeks downstream of the Sites Reservoir			
No Project	NI/NE	-	NI/NE
Alternative 1	LTS/NE	-	LTS/NE
Alternative 2	LTS/NE	-	LTS/NE
Alternative 3	LTS/NE	-	LTS/NE
Impact FLV-4: Substantially alter geomorphic processes upstream of the dam sites			
No Project	NI/NE	-	NI/NE
Alternative 1	LTS/NE	-	LTS/NE
Alternative 2	LTS/NE	-	LTS/NE
Alternative 3	LTS/NE	-	LTS/NE

Notes:
NI = CEQA determination of no impact
LTS = CEQA determination of less-than-significant impact
LTSM = CEQA determination of less than significant with mitigation
SU = CEQA determination of significant and unavoidable
B = NEPA conclusion of beneficial effects
NE = NEPA conclusion of no effect or no adverse effect
AE = NEPA conclusion of adverse effect
SA = NEPA conclusion of substantial adverse effect

7.2 Environmental Setting

This section describes the geomorphology of the watercourses in the study area from upstream to downstream. These watercourses consist of the local drainages in proximity to Antelope Valley and the inundation area, and downstream waterbodies such as the Sacramento River, CBD, Delta, and Yolo Bypass. Appendix 7A, *Fluvial Geomorphic Setting Information*, provides detailed information on the environmental setting for fluvial geomorphology of the waterbodies in the study area, including the reaches of the Sacramento River, the Delta, and the Yolo Bypass.

7.2.1. Drainages in Proximity to Antelope Valley

The drainages in proximity to Antelope Valley consist of creeks that are upstream of and within the valley, and the creeks that are downstream of the valley. Grapevine, Antelope, Funks, Stone Corral, and Hunters Creeks are upstream of and within Antelope Valley. Funks and Stone Corral Creeks exit Antelope Valley and their downstream reaches are in the Sacramento Valley. Figures 1-2 and 1-3 in Chapter 1, *Introduction*, identify the locations of these creeks. The geologic and topographic setting, and geomorphic characteristics associated with these drainages are discussed below.

7.2.1.1. Geologic and Topographic Setting

The Antelope Valley soils are in the Coast Ranges geomorphic province and have formed in place from weathered rock, colluvium, and alluvium (Soil Survey Staff 2020). Most of the soils in the Antelope Valley are clayey and have high expansion potential. The soils are shallow to very deep and have a slight to moderate water erosion hazard (Soil Survey Staff 2020). A stream-cut water gap on Funks Creek is in the Venado sandstone member of the Cortina Formation. The lower portion of the channel is in the Yolo member of the Cortina Formation. The stream-cut water gap on Stone Corral Creek is in the Boxer and Cortina Formations.

Antelope Valley is characterized as a gently sloping valley with some subtly rounded knolls, mainly in the vicinity of the saddle dams. It is drained primarily by easterly flowing Funks and Stone Corral Creeks, with some minor northeasterly flowing drainages in the northwestern part of the reservoir. Most of the inundation area is level or consists of gentle slopes (up to 3%), but the slopes in the vicinity of the Golden Gate and Sites Dams, saddle dams, and saddle dikes mostly range from 15% to 75% (AECOM 2020:8).

7.2.1.2. Drainage Geomorphic Characteristics

The study area contains multiple drainages that originate in the eastside foothills of the Coast Range, including Grapevine, Antelope, Funks, Stone Corral, and Hunters Creeks. Table 7-2 summarizes the characteristics of these drainages.

Table 7-2. Drainage Geomorphic Characteristics Summary

Creek Name	Location, Flow Direction, and Approximate Length	Water Regime	Planform	Primary Habitat Unit[a]	Channel Substrate[a]
Upstream of Antelope Valley					
Grapevine Creek	Creek flows north/northeast for 14.5 miles until confluence with Funks Creek.	Ephemeral	Slightly sinuous	Pool	Small cobble and gravel
Antelope Creek	Creek flows from Calvin Creek confluence through south Antelope Valley for 9.9 miles until joining Stone Corral Creek.	Ephemeral	Slightly sinuous	Flatwater	Silt and clay
Funks Creek	Headwater tributaries converge northwest of the reservoir footprint. Creek flows southeast for 3.7 miles until confluence with Grapevine Creek.[b]	Ephemeral to intermittent	Slightly sinuous	Flatwater	Gravel
Stone Corral Creek	Headwater tributaries converge along the Sites Lodoga Road; creek flows in southeast for 4.1 miles until confluence with Antelope Creek.	Ephemeral	Slightly sinuous	Flatwater	Bedrock

Creek Name	Location, Flow Direction, and Approximate Length	Water Regime	Planform	Primary Habitat Unit[a]	Channel Substrate[a]
Hunters Creek	Headwaters north of Antelope Valley flow east into Sacramento Valley. There are four forks of this creek. The north fork is the longest (9.0 miles) and drains into the TC Canal. The other three forks converge into the north fork.	Ephemeral	Slightly sinuous	–	–
Downstream of Antelope Valley					
Funks Creek	Creek flows 1.8 miles downstream of the proposed Golden Gate Dam to Funks Reservoir, then flows 3.8 miles to the GCID Main Canal, then 2.4 miles to I-5[c], after which it confluences with Stone Corral Creek, roughly 3.5 miles downstream and southeast of I-5.	Intermittent	N/A[d]	–	–
Stone Corral Creek	Creek flows 4.7 miles to the TC Canal, then roughly 3.0 miles to the GCID Main Canal, after which it continues 4.1 miles to I-5 then another 1.4 miles to its confluence with Funks Creek, and finally terminating in 5.6 miles at the CBD.	Intermittent	N/A[d]	–	–

Notes: a = Brown 2000
b = Distance between confluence and Golden Gate Dam is approximately 5.4 miles
c = Interstate 5
d = channel has been modified and largely straightened along the Sacramento Valley floor.
–- = no data

7.2.2. Other Valley Drainages

The other valley floor drainages in the study area that would be directly or indirectly affected by the Project are Walker Creek, Willow Creek, and Bird Creek.

Walker and Willow Creeks (where siphon replacements would occur) are valley streams, possibly intermittent, whose headwater-contributing channels originate in the foothills northwest of the GCID Main Canal. Similar to other valley floor channels in the study area, these creeks transition from more natural channels to highly disturbed and channelized drainages a few miles before flowing under Interstate 5 (I-5).

Bird Creek exits the Coast Range foothills and drains in an easterly direction into the CBD. Based on geographical similarities between Funks and Stone Corral Creeks (i.e., drainage area,

longitudinal position within the local drainage network, and observable geomorphic characteristics), Bird Creek is considered an intermittent stream. Approximately 0.25 mile west of I-5, Bird Creek transitions from more of a natural channel to a highly disturbed and channelized drainage that flows under I-5, extends through rice fields, and discharges into the CBD.

7.2.3. Sacramento River

The geomorphology of the Sacramento River varies through the region. The river transitions from a narrow and deep canyon environment (with a similarly narrow floodplain) in its upper reaches below Shasta Lake (i.e., the Keswick Dam to Red Bluff reach, further described below) to a meandering, shallower system with a broader alluvial floodplain in its lower reaches. The Sacramento River historically meandered across a wide floodplain. By geomorphic processes such as erosion and deposition, the river migrated across the deep alluvial soils from the Red Bluff area to about Chico Landing. At River Mile (RM) 190, the river has its confluence with Stony Creek (a western tributary). From this point downstream, high flows along the Sacramento River were historically divided between its mainstem and the adjacent flood basins (which were separated from the mainstem by natural levees).

The Sacramento Valley flood basins have been, and continue to be, primary influences on the hydrogeomorphic evolution of the Sacramento River and other watercourses in the study area. Most notably, these overflow areas cause the Sacramento River to get smaller downstream. In addition, suspended sediment that historically has been deposited in the flood basins has generated a thick, cohesive stratigraphic unit, which adds to the bank stability of the lower Sacramento River. The significance of these flood basin deposits increases downstream as the topographic lows become more pronounced between Chico and Verona (Water Engineering and Technology 1990:34–35). Because of these natural geomorphic processes, the riverbanks of the Sacramento River are generally higher than the surrounding floodplains. The stream power of flood flows in the mainstem Sacramento River has resulted in several distributary flood paths across the flat valley floor.

Today, both base flows and peak flows have been regulated to the extent that they limit natural geomorphic and ecosystem functions. Channel migration, meander cutoff and oxbow formation processes, and other smaller-scale geomorphic processes that operated in the past are limited by the presence of dams and levee construction.

7.2.3.1. Sedimentation

Under historical (i.e., unaltered) conditions, the Sacramento River lacked the capacity to carry the peak discharge events generated by winter season precipitation. Overbank flooding was commonplace. As flow velocity in the overbank areas was reduced, the sediment transport capacity was also lowered, thus allowing a large portion of the transported sediment to be deposited onto these overbank areas. The Sacramento River formed natural levees composed of the coarser substrate carried by the larger flows each year, while the finer material stayed in suspension longer and settled out into the flood basins.

Both the flow regime and the sediment transport and deposition regimes in the Sacramento River have been significantly altered from historical conditions due to anthropogenic modifications. Many of the river levees were originally intended to decrease channel width to promote higher flow velocities that would perpetuate scouring large amounts of hydraulic mining sediments to deepen the channel for navigation. The narrow channels contribute to the self-eroding phenomena of the levees (stream energy is essentially directed towards the banks), which necessitates the need for constant levee maintenance. To protect from bank erosion, many levees are armored with large angular boulders (i.e., rock slope protection or riprap).

7.2.3.2. Regional Geomorphic Description

For the purposes of this chapter, the Sacramento River is divided into the same valley reaches[1] used in Chapter 5, *Surface Water Resources* (Figure 7-1). The diversions and re-entry points associated with the Project are located between Keswick Reservoir and Verona. Accordingly, the highest potential for change to the geomorphic regime of the Sacramento River would occur in these reaches:

- Keswick Dam to Red Bluff reach (RM 302 to RM 246)
- Red Bluff to Chico Landing reach (RM 246 to RM 194)
- Chico Landing to Colusa reach (RM 194 to RM 143)
- Colusa to Verona reach (RM 143 to RM 79)

The Keswick Dam to Red Bluff reach includes flows upstream of the Project diversions[2]. The Red Bluff to Chico Landing reach and the Chico Landing to Colusa reach contain all of the diversions that would be implemented under the Project. The Colusa to Verona reach is located downstream of the diversions and the ensuing stream discharges that would be implemented under the Project.

The Sacramento River discharge would be located in the Colusa to Verona reach of the Sacramento River between RMs 100 and 101). This reach is mostly confined by levees but there are locations where the levees are set back to provide overflow across point bars of major meander bends (e.g., Tyndall Landing). The location of the Sacramento River discharge shows no evidence of historical meandering and average channel width has only increased about 4% between 1987 and 2005 upstream of the Feather River confluence.

7.2.4. Colusa Basin Drain

Landforms within the Colusa Basin include the levees along the west side of the Sacramento River and the large floodplains and flood basins on the valley floor. A low trough of relatively

[1] Regional geomorphic descriptions for the Keswick Dam to Red Bluff and Red Bluff to Chico Landing reaches of the Sacramento River are summarized mainly from Chapters 3 and 4 of the Hydraulics section of the *Sacramento River Conservation Area Forum Handbook* (California Resources Agency 2003).

[2] Fluvial geomorphic conditions in this reach are presented for information purposes only, as this reach would not be affected by the Project.

flat flood basins parallels the Sacramento River levees. The geomorphology of the Colusa Basin has been modified since via Euro-American settlement with the development of flood control facilities and water supply projects (H. T. Harvey & Associates et al. 2008:1). The CBD is the largest engineered drainage structure in the Colusa Basin. Eroded sediments from the adjacent agricultural areas are ultimately transported to the CBD, which has an outlet to the Sacramento River through the Knights Landing Ridge Cut and the Yolo Bypass.

7.2.4.1. Knights Landing Ridge Cut

The Knights Landing Ridge Cut conveys CBD drainage and flood flows into the Yolo Bypass several miles downstream of Fremont Weir. It is an entirely engineered drainage, approximately 8 miles long from its inception at the CBD to where it enters the Yolo Bypass. From the top of its surrounding levees, its width averages approximately 575 feet.

7.2.5. Delta and Yolo Bypass

The present geomorphic state of the Delta is a function of the intensity of water management in each of the tributary rivers, local farming practices, intra- and inter-Delta water transfers, and an extensive human-made levee system. Today, channel alignments are largely fixed by artificial levees and erosion control measures. Flooding, except when artificial levees break, no longer occurs on most islands and tracts. Instead, flow and sediment remain confined to the existing channel network. Upstream water diversions for municipalities and agriculture reduce the amount of flow entering the Delta and the amount of sediment transported to the Delta. In addition, conveyance of water within and out of the Delta alters flow directions and affects sedimentation and erosion rates and patterns. The levee system in the Delta restricts flow to a network of human-made and natural channels that reduce flood events and inhibit the accumulation of soils on the Delta islands.

7.2.5.1. Sediment Inputs

The Sacramento River Flood Control Project conveys released reservoir waters from various upstream sources and stormwater runoff through the Delta and into San Francisco Bay. These waters contain dissolved and undissolved solids, both of which are transported through the system. Undissolved solids (i.e., sediment) consist primarily of clay-, silt-, and sand-sized particles. Before construction of the flood control and conveyance system, the natural flow of freshwater runoff from the upstream mountainous regions transported significant quantities of silt and clay particles. Because of the wide expanse and flat terrain of the Delta area, these particles settled and formed the deposits of the Delta alluvial plain. During the wet season, when the volume of runoff water was much larger, the quantity of suspended and unsuspended solids was significant and included sands and gravels.

The natural processes described above continue in the present day but in a modified manner. Much of the naturally eroded and transported solid particles now settle out in instream water storage reservoirs. A percentage of the fine solids (e.g., silts and clays) are still transported during water releases that enter the system from waterways downstream of the reservoirs. These sediments enter the Delta channels, and rather than settling out in the alluvial plain (as occurred before the channels were constructed), they now remain within the leveed channels.

7.3 Methods of Analysis

The evaluation of physical environmental impacts on with fluvial geomorphology is both quantitative (using and interpreting modeling results) and qualitative (using information about local fluvial geomorphology to establish context and impact mechanisms). The following sections outline the processes used in the determination of impacts on fluvial geomorphology associated with construction and operation of the Project.

7.3.1. Construction

Construction impacts are evaluated qualitatively based on the physical characteristics of the locations where construction would occur, including slope and soil type. Where appropriate, the impact analysis is combined for Alternatives 1, 2, and 3 depending on the impact being evaluated or the associated Project components. The BMPs described in Appendix 2D, *Best Management Practices*, are incorporated into the analysis of potential construction impacts on fluvial geomorphology, including the erosion and sediment control measures under the description of the Stormwater Pollution Prevention Plan(s) (SWPPP) under Stormwater Construction General Permit coverage, and drainage evaluations, design, and implementation. These BMPs minimize alterations to existing drainage infrastructure and patterns where needed.

7.3.2. Operation

Operational impacts of Alternatives 1, 2, and 3 were evaluated quantitatively and qualitatively using the modeled results. The USRDOM model is a non-predictive model that simulates daily river flows in the Sacramento River basin based on the operations specified by the CALSIM II model for Alternatives 1, 2, and 3. The USRDOM model utilizes results from CALSIM II to evaluate the impacts of changing diversions, in-basin use, and Delta operations under projected conditions within current or future regulatory and operational regimes. The model integrates the downstream monthly operational decisions in CALSIM II with a simulation of the associated sub-monthly operational response at Shasta Lake depending on the inflows. This approach is particularly useful in verifying the CALSIM II simulated river conditions and the availability of excess flows to fill the Sites Reservoir under the capacity and operational constraints of the diversions at the Red Bluff and Hamilton City locations.

The USRDOM model description and results are included in Appendix 5C, *Upper Sacramento River Daily River Flow and Operations Modeling*. Detailed discussion of the CALSIM II model is provided in Appendix 5B, *Water Resources System Modeling*. The USRDOM modeled flood flows are compared for each alternative, as well as the No Action Alternative, at key diversion and return locations across the study area. The flood metrics evaluated are monthly average flows exceeded 10% of the time because this is the percent of time during which flows are relatively high and most of the geomorphic work would be performed on the Sacramento River system.

Geomorphic processes are spatially and temporally variable throughout a river system and determining the exact locations of expected geomorphic change is difficult without the aid of rigorous one-dimensional or two-dimensional hydraulic modeling that includes variables such as

changes in depth, velocity, and shear stress. Suspended sediment transport, bedload, and river meandering models were previously utilized in the 2017 Draft EIR/EIS for a 1.8-MAF reservoir with a Delevan intake/discharge location. The previous modeled results are valid for the scale at which impacts on fluvial geomorphology are being considered for Alternatives 1, 2, and 3. The previous modeling results are generally conservative (i.e., higher in volume) relative to the amount of diverted water (and sediment) being considered under Alternatives 1, 2, and 3. The previous modeling is summarized below and was applied and incorporated in the impact analysis under Impacts FLV-1 and FLV-2.

Results from a suspended sediment transport model and bedload analysis were reviewed and incorporated into the impact analysis (Appendix 7B, *Hydrodynamic Geomorphic Modeling Results*). A suspended sediment transport model evaluated the movement of sediment in the Sacramento River and estimated the amount of sediment that would be diverted under Alternatives 1, 2, and 3. The USRDOM model results for simulated daily flows were used in conjunction with actual U.S. Geological Survey gaging station sediment sampling results to develop a flow versus suspended sediment rating curve using the SRH-Meander model. The rating curve was then used to calculate the sediment transport in the Sacramento River and the amount of sediment entrained in the diversion under each alternative.

The bedload analysis investigated the sediment transport capacity of the Sacramento River from Keswick to Colusa Weir. The USRDOM model divided the Sacramento River into 15 reaches based on fluvial geomorphology and hydrology. The USRDOM model daily flows were used to develop flow duration curves. Bedload transport was calculated using several available equations in the SRH-Meander model, with one selected that best described the available observational data. The transport of sediment particles that were larger than 2 millimeters was calculated in tons per year for each reach. Using this approach, the aggrading and degrading reaches could be identified, as well as changes in streambed composition predicted over the 82-year simulation period.

The effects on natural river meandering, bank erosion, and deposition in the Sacramento River channel between Red Bluff and Colusa was modeled using the SRH-Meander model. Inputs to the model included USRDOM model daily flows, streambank erodibility, and channel hydraulic characteristics.

7.3.3. Thresholds of Significance

The evaluation criteria for the impact analysis are based on professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects. For the purposes of this analysis, an impact on fluvial geomorphology would be considered significant if the Project would:

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would result in substantial increase or decrease in on- or off-site erosion or siltation.

- Substantially alter natural river geomorphic processes (i.e., flow regime, sediment transport, and bank erosion) and existing river geomorphic characteristics (i.e., sinuosity, channel gradient, substrate composition, channel width and depth, and riparian vegetation).
- Substantially alter the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel in Funks and Stone Corral Creeks downstream of the Sites Reservoir.
- Substantially alter geomorphic processes upstream of the dam sites

7.4 Impact Analysis and Mitigation Measures

Impact FLV-1: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would result in a substantial increase or decrease in on- or off-site erosion or siltation

No Project

The No Project Alternative represents the continuation of the existing conditions within the study area. Current drainage patterns, as well as existing routine operations and maintenance activities would continue, and there would be no alterations to existing drainage patterns relative to existing conditions.

Significance Determination

The No Project Alternative would not result in substantial alterations to existing drainage patterns, through either the alteration of a stream or river or the addition of impervious surfaces, that would result in a substantial increase or decrease in on- or off-site erosion or siltation because no new facilities would be constructed and operated. There would be no impact.

Alternatives 1, 2, and 3

Construction

Temporary soil disturbance during construction in level to gently sloping areas (e.g., for pipeline installations, TRR East [Alternatives 1 and 3 only], existing road modifications, and siphon replacements on Walker and Willow Creeks) is expected to result in little or no erosion and sedimentation because of the lack of runoff energy (i.e., gradient) to entrain, transport, and deposit sediment. Drainage manipulations in areas with moderate to steep slopes (i.e., locations of the main dams, saddle dams, TRR West [Alternative 2 only], transition manifold, Huffmaster Road realignment, and South Road [Alternative 2 only]) would be more prone to accelerated erosion and sedimentation. Soil eroded within the reservoir's watershed and inundation area would ultimately be deposited and retained in the inundation area. Soil eroded from areas outside

the reservoir watershed and inundation area could reach outside receiving waters. BMPs would address potential increased erosion and siltation rates as a result of drainage pattern manipulation. The BMPs to Develop and Implement SWPPPs and Gain Coverage under Stormwater Construction General Permit would ensure that erosion and siltation rates would not be excessive. The BMPs would include erosion and sediment control measures and during-construction and post-construction runoff management measures. The erosion control measures would protect soils that have been exposed during excavation, filling, and stockpiling operations from eroding at rates greater than preconstruction conditions. The sediment control measures would capture sediment that was generated from exposed soils. The runoff management measures would reduce runoff rates and prevent concentrated runoff from causing scour, such as at culvert outfall points. System-wide, these measures would also ensure sediment would not be released into Sacramento River or the canals.

The Funks and TRR reservoirs and PGPs, administration and operation and maintenance buildings, Dunnigan Pipeline, Sacramento River discharge, and new roads, including the South Road (under Alternative 2 only) represent new facilities with the potential to alter existing drainage patterns and characteristics. The construction of these facilities would result in impervious surfaces or the facilities would be located in areas with characteristics that may lead to alterations of the existing drainage patterns (e.g., adjacent to existing receiving waterbodies, located in steeply sloped areas, or have moderately to highly erodible soils). Drainage infrastructure maintained by local landowners or local agencies would not be affected, and local surface runoff patterns would not be substantially altered because BMPs would identify design flows and incorporate measures to provide for drainage feature stability; incorporate appropriate relocation plans (for canals, ditches, wells, and other existing infrastructure); and incorporate other modifications to localized runoff amounts and/or patterns. Any necessary site features or procedures to remediate Project-induced drainage problems identified in the drainage evaluations would be installed before the Project was completed or as part of Alternatives 1, 2 or 3, depending on site-specific conditions.

Operation

Operation impacts were determined by evaluating suspended sediment increases and/or decreases. Decreases are important to identify for those aquatic organisms (e.g., delta smelt) that rely on suspended sediment and a certain level of turbidity within the study area. Suspended sediment transport modeling suggested that around 100,000–130,000 tons of sediment could be entrained annually by the TC Canal and GCID Main Canal diversions (as identified in the 2017 Draft EIR/EIS) compared to around 40,000–50,000 tons under existing conditions (see Table 2-6 of *Sediment Loads at Tehama-Colusa, Glenn-Colusa, and Delevan Diversions* in Appendix 7B). The entrained sediment load would represent less than or equal to 5% of Sacramento River sediment that otherwise could move downstream to the Delta, compared to around 3% under baseline conditions. Because water and sediment would both be diverted, the concentration of the sediment in the water would remain unchanged, so the turbidity of the water would be expected to remain the same as at the time the water was being diverted (i.e., principally in the winter/spring). The reduced (i.e., less than 5%) sediment load to the Delta under Alternatives 1,

2, and 3 may have relatively small effects on turbidity as a result of the reduction in sediment for resuspension at other times of the year because it is less than or equal to a 2% difference in the total suspended sediment output of the Sacramento River when compared to existing conditions. The importance of maintaining the existing sediment load of the Sacramento River is described in Chapter 11, *Aquatic Biological Resources*. Implementation of the sediment entrainment component of the Adaptive Management Plan developed for fish (described in detail in Appendix 2D) would inform whether adaptive management measures such as sediment reintroduction are warranted based on actual effects on turbidity under operation of Alternative 1, 2, or 3.

Most Project components (i.e., main dams and saddle dam construction, reservoir construction, Funks and TRR East and West and associated PGPs construction, Funks and TRR pipelines construction, TC Canal intake upgrades, CBD outlet upgrades, and GCID system upgrades) would create minimal new impervious surfaces with limited footprints. Under Alternatives 1 and 3, the amount of impervious surface would be approximately 260 acres. Alternative 2 would have slightly more impervious surfaces, approximately 325 acres. The South Road accounting for approximately 47 acres of impervious surfaces that are not included in Alternative 1 or 3. Project impervious surfaces would be designed to adequately drain water away under the BMP described for construction impacts.

Activities associated with the addition of two new pumps at RBPP would occur within its present footprint and would not result in changes to the footprint. There would be no new impervious footprints and thus a substantial reduction in the amount of natural soil surfaces available for infiltration of rainfall and runoff, thereby generating little, if any, additional runoff and associated erosion and siltation during storm events would not occur.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 1, 2, or 3 would not increase soil erosion and sedimentation rates as a result of alteration of existing drainage patterns. Where appropriate (i.e., depending on slope, soil type) the implementation of BMPs for erosion and sediment control would prevent increased soil erosion and sedimentation rates. Development and implementation of drainage evaluations for the Funks and TRR PGPs, administration and operation and maintenance buildings, Dunnigan Pipeline, Sacramento River discharge, road improvements, and new roads, including the South Road (under Alternative 2 only) would consider design flows, appropriate relocation plans, and other modifications to localized runoff amounts and/or patterns. This would reduce the potential for substantial alteration of existing drainage patterns, thereby not resulting in substantial erosion or siltation on- or off site as a result of construction.

Operation of Alternative 1, 2 or 3 would result in an increase in sediment entrainment. Implementation of the sediment entrainment component of the Adaptive Management Plan developed for fish would inform whether adaptive management measures such as sediment reintroduction are warranted based on estimated effects on turbidity. The addition of impervious surfaces would not substantially alter the existing drainage patterns of a site or area because of

the limited area of impervious surfaces and the ability of the surrounding open area to infiltrate precipitation.

Construction and operation of the Project would not substantially alter the existing drainage pattern of the site or area in a manner which would result in a substantial increase or decrease in on- or off-site erosion or siltation. This impact is considered less than significant.

NEPA Conclusion

Construction and operation effects for Alternative 1, 2, or 3 would be the same as those described above for CEQA. The construction and operation of Alternative 1, 2, or 3 would not have an adverse effect on the existing drainage patterns or changes in on- or off-site erosion or sedimentation.

Impact FLV-2: Substantially alter natural river geomorphic processes (i.e., flow regime, sediment transport, and bank erosion) and existing river geomorphic characteristics (i.e., sinuosity, channel gradient, substrate composition, channel width and depth, and riparian vegetation).

No Project

The No Project Alternative represents the continuation of the existing conditions in the study area. Current channel morphology conditions, as well as existing routine operations and maintenance activities would continue, and there would be no change in the geomorphic regimes.

Significance Determination

The No Project Alternative would not result in substantial alterations to natural river geomorphic processes and existing river geomorphic characteristics because no new facilities would be constructed and operated. There would be no impact.

Alternatives 1 and 3

This section addresses potential impacts associated with alteration of natural river geomorphic processes and existing Sacramento River geomorphic characteristics as a result of operation of Alternatives 1 and 3 at RBPP and GCID Main Canal at Hamilton City. Construction impacts associated with Impact FLV-2 are discussed under Impact FLV-1.

Operation

Based on the USRDOM modeled flood flows, the differences (primarily reductions) in monthly average flow exceeded 10% of the time between the No Action Alternative and Alternatives 1 and 3 at the four Sacramento River locations shown in Table 7-3. These values show an increase of less than 1% to a decrease of less than 5% when compared to No Action Alternative,

depending on the location (Table 7-4). These percentages are minor when considered in the context of the larger system.

Table 7-3. Percent Exceedance Values of USRDOM Modeled Monthly Average Flow for No Action Alternative and Alternatives 1, 2, and 3

Location	Location Relative to Project Elements	Capacity (cfs)	Month	Monthly Average Flow Exceeded 10% of the Time (cfs)				
				NAA	ALT 1A	ALT 1B	ALT 2	ALT 3
Sacramento River Flow at Bend Bridge	Between Shasta outflow and first diversion to Sites (Red Bluff)	98,000 (approx.)	Feb	40,506	40,526	40,461	40,509	40,461
Red Bluff Diversion	First diversion to Sites (serving TC Canal)	2,530	Jul	1,372	1,334	1,334	1,334	1,327
Sacramento River Flow below Red Bluff Diversion Dam	Between first diversion to Sites (Red Bluff) and second diversion to Sites (GCID)	260,000	Feb	41,165	39,155	39,091	41,146	39,091
Hamilton City Diversion	Second diversion to Sites (GCID)	3,000	Jun	2,696	2,689	2,678	2,670	2,663
Sacramento River near Wilkins Slough	Between second diversion to Sites (GCID) and Sites return (CBD)	30,000	Feb	26,450	26,211	26,473	26,424	26,401

Table notes:
The flood metrics are monthly average flows exceeded 10% of the time. This is the percent of time during which flows are relatively high and most of the geomorphic work would be performed on the system.
ALT = Alternative
CBD = Colusa Basin Drain
cfs = cubic feet per second
GCID = Glenn-Colusa Irrigation District
NAA = No Action Alternative

Table 7-4. Flow and Percent Change between the No Action Alternative and Alternatives 1, 2, and 3

Location	Month	Monthly Average Flow Compared to No Action Alternative (cfs change/percent change)			
		ALT 1A	ALT 1B	ALT 2	ALT 3
At Bend Bridge	Feb	+20 <1% increase	+45 <1% increase	+3 <1% increase	+45 <1% increase
Red Bluff Diversion	July	-38 <3% decrease	-38 <3% decrease	-38 <3% decrease	-45 <3% decrease
Below Red Bluff Diversion Dam	Feb	-2,010 5% decrease	-2,075 5% decrease	-20 <1% decrease	-2,074 5% decrease
Hamilton City Diversion	June	-7 <1% decrease	-18 <1% decrease	-26 <1% decrease	-33 <1% decrease
Near Wilkins Slough	Feb	-239 <1% decrease	+24 <1% increase	-26 <1% decrease	-48 <1% decrease

Table notes:
cfs = cubic feet per second

As computed from Table 7-3 and as shown in Table 7-4, the average (system-wide) decrease in monthly average flow between the No Action Alternative and Alternative 1A is approximately 2%; the average (system-wide) decrease in monthly average flow between the No Action Alternative and Alternative 1B is also approximately 2%; and the average (system-wide) decrease in monthly average flow between the No Action Alternative and Alternative 3 is less than 2%. As shown in Table 7-4, the monthly average flow would increase in two instances, where both instances represent a change of less than 1%. The biggest changes (decreases) would occur in the Sacramento River below the RBDD. This is because that diversion point is considered the primary point of diversion (under each Alternative 1 or 3).

A fundamental principle of fluvial geomorphology suggests that a decrease in the amount of flow generally causes a corresponding decrease in flow velocity that typically induces sediment deposition. There is potential for the creation of localized areas of sediment deposition under Alternatives 1 and 3. The relative amount of potential deposition would be extremely limited because Alternative 1 or 3 diversions would only occur under higher flow regimes in the Sacramento River. These high flows would maintain sediment transport. As such, implementation of the diversion rates and amounts under Alternatives 1 and 3 would not measurably alter the natural river geomorphic processes and existing river geomorphic characteristics.

Finally, sediment removal at the RBPP and the GCID Main Canal intake, and the TC Canal intake would occur during the regularly scheduled maintenance period for these intakes using the same practices currently employed. Therefore, maintenance activities at these locations are expected to result in minimal (if any) alterations to Sacramento River geomorphic regimes as compared to the existing conditions.

Bedload sediment balance of a river is an important consideration for potential impacts with regards to sediment transport and other related geomorphic processes. The bedload analysis for the 1.8-MAF reservoir suggested no significant effects on the distribution of annual flows (differences of no more than a few percentages) and therefore no significant alteration of the bedload sediment balance in the Sacramento River. Under existing conditions, most reaches in the Sacramento River are not experiencing measurable aggradation or degradation, except for the reach in the vicinity of Moulton Weir, which is experiencing aggradation. The modeled bedload analysis do not significantly affect the aggradation that would continue in this reach.

The river meandering, bank erosion, and deposition modeling concluded that there were no significant differences between the channel alignments between the existing conditions and the modeled alternatives. Meander tendency varied between alternatives. For example, the reach from Stony Creek to Moulton Weir was modeled to experience the most amount of active channel migration, and the reach from Moulton Weir to Colusa Weir was modeled to experience less channel migration (under all modeled alternatives).

CEQA Significance Determination and Mitigation Measures

The average (system-wide) decrease in monthly average flow between the No Action Alternative and operations under Alternative 1 or 3 is approximately 2% and diversions would only occur under higher flow regimes in the Sacramento River. Operational impacts on the geomorphic regime (including natural river geomorphic processes such as sediment transport and bank erosion) and existing river geomorphic characteristics (e.g., sinuosity, channel gradient, substrate composition, channel width and depth, and riparian vegetation) of the greater Sacramento River system are expected to be minimal. The overall volume of water available and the pattern of water diversion in the Sacramento River (and therefore the canals, Yolo Bypass, and the Delta) would generally be similar to the amount and pattern of water diversion under existing conditions. Therefore, operation of Alternative 1 or 3 would not substantially alter natural river geomorphic processes and existing geomorphic characteristics for the Sacramento River and downstream of the river and impacts would be less than significant.

NEPA Conclusion

Operation effects for Alternative 1 or 3 would be the same as those described above for CEQA and would not substantially alter natural river geomorphic processes and existing river geomorphic characteristics. As such, implementation of the diversion rates and amounts under Alternative 1 or 3 would have no adverse effect.

Alternative 2

Operation

Operational impacts under Impact FLV-2 for Alternative 2 would be similar but lesser in magnitude to those as described above for Alternatives 1 and 3. Based on the USRDOM modeled flood flows, the differences (primarily reductions) in monthly average flow exceeded 10% of the time between the No Action Alternative and Alternative 2 at the four Sacramento River locations shown in Table 7-3 are relatively minor and range from an increase of less than 1% to a decrease of less than 3% when compared to No Action Alternative, depending on the location (Table 7-4).

As computed from Table 7-3 and as shown in Table 7-4, the average (system-wide) decrease in monthly average flow between the No Action Alternative and Alternative 2 is less than 1%. Monthly average flow would increase in one instance, with a change of less than 1%.

Similar to Alternatives 1 and 3, the relative amount of potential deposition under Alternative 2 would be extremely limited because diversions would only occur under higher flow regimes in the Sacramento River. As such, implementation of the diversion rates and amounts under Alternative 2 would not substantially alter the natural river geomorphic processes and existing river geomorphic characteristics.

Sediment removal activities at the RBPP and the GCID Main Canal intake and the results from the bedload and river meandering, bank erosion, and deposition modeling would be the same as described for Alternatives 1 and 3 and would not result in substantial alterations to natural river geomorphic processes and existing river geomorphic characteristics.

The point at which the Sacramento River discharge joins the Sacramento River possibly represents an area where historical meandering may have occurred (California Resources Agency 2003:6-4). However, the Sacramento River discharge location does not have setback levees in the vicinity and a review of available aerial imagery (from 1985 to the present) shows no evidence of historical meandering in this reach. Furthermore, a study by Northwest Hydraulic Consultants (2010:4) concludes that the river channel in this general area is closely bordered by levees with extensive revetment, and lateral channel evolution is limited. Therefore, operation of the Sacramento River discharge at this location would not substantially alter natural river geomorphic processes and existing river geomorphic characteristics.

Installation of the Sacramento River discharge would result in the removal of riparian vegetation along a short length of the west bank and replacement with rock slope protection. The operation of this facility would therefore occur in an area where vegetation was present prior to construction activities; however, the vegetation removal would not measurably affect overall stream function and geomorphic regime under Alternative 2 because there is already a significant amount of existing rock slope protection on the banks of the river in the vicinity of the discharge.

CEQA Significance Determination and Mitigation Measures

The average (system-wide) decrease in monthly average flow between the No Action Alternative and Alternative 2 is less than 1% and diversions would only occur under higher flow regimes in the Sacramento River. Similar to Alternatives 1 and 3, operation of Alternative 2 would not substantially alter natural river geomorphic processes and existing geomorphic characteristics and impacts would be less than significant.

NEPA Conclusion

Operation effects for Alternative 2 would be the same as those described above for CEQA and would not substantially alter natural river geomorphic processes and existing river geomorphic characteristics. As such, implementation of the diversion rates and amounts under Alternative 2 would have no adverse effect.

Impact FLV-3: Substantially alter the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel in Funks and Stone Corral Creeks downstream of Sites Reservoir.

No Project

The No Project Alternative represents the continuation of the existing conditions within the study area. Current channel morphologic elements, as well as existing routing operations and maintenance activities would continue, and there would be no change in geomorphic attributes.

Significance Determination

The No Project Alternative would not substantially alter the amount of instream woody material, boulder, shaded riverine aquatic habitat, or spawning gravel in Funks and Stone Corral Creeks downstream of Sites Reservoir because there would be no construction and operation of new facilities to affect instream characteristics. There would be no impact.

Alternatives 1, 2, and 3

Construction

Construction would result in minimal impacts on the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel in Funks and Stone Corral Creeks because the Sites Dam and Golden Gate Dam would have relatively limited footprints within these channels (approximately 2 acres of temporary impacts on Funks Creek and Stone Corral Creek). Aerial imagery of the areas where the dams would be constructed was reviewed and the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel appears to be minimal.

Erosion and sedimentation impacts from construction (which could have direct or indirect effects on the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel in Funks and Stone Corral Creeks) associated with Impact FLV-3 are discussed under Impact FLV-1.

Operation

The reaches of Funks and Stone Corral Creeks likely to be most modified by the two main dams are the reaches from below the dams to where these creeks have been modified by historical water management practices. On Stone Corral Creek, the reach of interest is from the downstream face of the Sites Dam to just above the GCID Main Canal (7.7 miles); on Funks Creek, it is from the downstream face of Golden Gate Dam to the upper end of Funks Reservoir (1.8 miles). While these reaches have been modified by cattle grazing and minor diversions, they still have available fish habitat and both native and nonnative fish have been observed in each drainage. They also both experience much of their natural hydrograph and fluvial geomorphic processes.

Stone Corral Creek would receive bypass flows from the reservoir from an outlet on the Sites Dam and Funks Creek would receive augmented flow from the Funks pipelines to its reaches immediately upstream of Funks Reservoir. Bypass flows would range from 0 to 100 cfs, with larger pulse flows to emulate natural flood conditions, and lower flows in the drier months (e.g., summer).

The augmentation of flow in each drainage would support the existing geomorphic functions of each channel (e.g., gravel, SRA). The following geomorphic field studies would be required once access is obtained and before final designs for Sites and Golden Gate Dams are completed, per the description in Chapter 2:

- Characterization of flows, including assessing the base flow during the summer months.
- Characterization of habitats available (e.g., spawning, rearing, foraging, and sheltering habitats) at varying flow levels. Characterization of habitats would help to inform what habitats are available at what flow regimes.
- Conducting a fluvial geomorphologic study to characterize bedload and flow levels necessary for substrate mobilization. Substrate mobilization is a key component of channel maintenance and supporting habitat diversity.
- Surface Water Ambient Monitoring Program (SWAMP) technical study (i.e., bioassessment) that focuses on relationships between physical habitat, water quality, and benthic macroinvertebrates. A SWAMP bioassessment would document the baseline conditions with individual metrics (i.e., scores) for physical habitat (the Index of Physical Integrity [IPI]) and benthic macroinvertebrates (the California Stream Conditions Index [CSCI]). The Project Operations Plan would ensure that the IPI and CSCI scores do not decrease relative to baseline conditions.

The Authority would use information from these field studies, along with currently available information, to prepare an Operations Plan for Funks and Stone Corral Creeks. The Operations Plan would identify the approach for releases, including release schedule and volumes, a monitoring plan, and an adaptive management plan to maintain fish in good condition consistent with California Fish and Game Code Section 5937. For example, characterizing the bedload would allow a determination as to whether the Operations Plan would require gravel augmentation. The information would be integrated to focus on aquatic species of concern in the lower portions of the two creeks to concentrate on habitat maintenance needs. It is expected flow releases from the Sites Reservoir to these creeks would mimic the natural discharge of the associated creeks, and that releases would be low during Dry and Critically Dry Water Years. The flow releases would be determined to support focus species. Conversely, flow releases would be higher during Above Normal Water Years.

Under Alternatives 1, 2 and 3, Sites Reservoir dams would be designed and constructed pursuant to criteria designed to prevent failure. The designs would incorporate multiple lines of defense or design redundancy as required to meet design standards reducing the potential for dam failure (Chapter 5, *Surface Water Resources* and Chapter 12, *Geology and Soils*). Furthermore,

Alternatives 1, 2, and 3 would include the design and operation of facilities to meet criteria and requirements for emergency reservoir drawdown in the unlikely and rare event of an emergency. During an emergency release event, Saddle Dams 3 and 5 (Alternatives 1 and 3 only) and Saddle Dam 8B, the I/O Works, and Sites Dam would operate simultaneously to release water. In addition, the TRR East would have an emergency outlet into Funks Creek. In the unlikely and rare event of an emergency release, it is likely that overbank flooding (and localized deposition) would occur on the upper banks and floodplain surfaces of every channel receiving emergency release water, while the main channels would experience channel bed scour.

CEQA Significance Determination and Mitigation Measures

Construction impacts on the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel in Funks and Stone Corral Creeks would be less than significant as the Sites Dam and Golden Gate Dam would have relatively limited footprints within these channels. In addition, and as described under Impact FLV-1, the impact of increased soil erosion and sedimentation rates as a result of alteration of existing drainage patterns would be less than significant for Project elements under Alternative 1, 2, or 3 because erosion and sediment control measures would minimize and reduce erosion in accordance with the BMPs. These measures would also serve to ensure that there would be minimal to no substantial alteration of the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel in smaller creeks.

Operation of Alternative 1, 2, or 3, would provide bypass flows to Stone Corral and Funks Creeks. These flows would be refined through studies required under Project Commitments. These flows would support geomorphic processes in these channels by maintaining channel-forming flows and maintaining geomorphic processes (e.g. mobilization of bedload and erosion of stream banks) that support the fish assemblage and other aquatic species below the dams. The Sites Reservoir would meet design criteria to greatly reduce the potential of emergency releases that would likely create localized deposition and scour. Impacts would be less than significant.

NEPA Conclusion

Construction and operation effects for Alternative 1, 2, or 3 would be the same as those described above for CEQA and would not substantially alter the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel in Funks and Stone Corral Creeks downstream of the reservoir. Construction and operation would have no adverse effect.

Impact FLV-4: Substantially alter geomorphic processes upstream of the dam sites

No Project

The No Project Alternative represents the continuation of the existing conditions within the study area. Antelope Valley and the ephemeral drainages within and extending upslope of the valley would remain intact and not be inundated. There would be no change in geomorphic attributes relative to existing conditions.

Significance Determination

The No Project Alternative would not result in a substantial alteration in the amount of ephemeral stream habitat and associated geomorphic processes upstream of Sites Reservoir. There would be no inundation within the existing Antelope Valley drainage network and no changes would occur to the existing geomorphic attributes because no new facilities would be constructed and operated. There would be no impact.

Alternatives 1, 2, and 3

This section addresses potential impacts associated with alteration of existing ephemeral stream habitat and associated geomorphic processes in the smaller creeks within and upslope of Antelope Valley.

Construction and Operation

Under Alternative 1 or 3 approximately 24.3 miles[3] of primarily marginal ephemeral channel habitat that experiences sediment transport, scour, and deposition based on the volume and duration of precipitation would be inundated. Under Alternative 2 approximately 24.1 miles[4] of primarily marginal ephemeral channel habitat would be inundated. This habitat is marginal because the streams are ephemeral, have abundant algae at low flow, have minimal and sporadic shrub or tree riparian vegetation, and have been degraded by cattle trampling. The current geomorphic processes would cease to function (e.g., sediment transport, scour, and deposition) as riverine geomorphic processes would be replaced with lacustrine/reservoir processes (e.g., limited transport and movement and sediment migrating to depressions within the inundation area). Over time, it is likely the channel segments in the Antelope Valley that would not be inundated would adjust to a new base level, albeit a temporally fluctuating one (i.e., the water surface of the Sites Reservoir) via adjustments to their channel beds upstream of the new water surface. Deposition of materials in short stretches of the downstream reaches of these channels would increase due to changes in base level. These channels appear to be relatively static (non-dynamic) fluvial systems. Impacts would be expected to be relatively small, although the magnitude of such changes is uncertain and difficult to quantify or qualify given the lack of predictive capability regarding fluvial geomorphic processes once the reservoir was inundated.

Habitats associated with these ephemeral channels are described in Chapter 9, *Vegetation and Wetland Resources*; Chapter 10, *Wildlife Resources*; and Chapter 11, *Aquatic Biological Resources*.

[3] This number only includes the named streams within the Antelope Valley. There are also various unnamed tributaries to the named channels.

[4] This number only includes the named streams within the Antelope Valley. There are also various unnamed tributaries to the named channels.

CEQA Significance Determination and Mitigation Measures

The current riverine geomorphic processes within the inundated area would be replaced with lacustrine/reservoir processes. The non-inundated portions of the ephemeral channel network would adjust to a new geomorphic equilibrium, although the magnitude of such changes is uncertain and difficult to quantify or qualify. No significant erosion or deposition is expected under the operation of the Sites Reservoir and substantial alteration of geomorphic processes upstream of the dam sites is not expected. Construction and operation impacts would be less than significant.

NEPA Conclusion

Construction and operation effects would be the same as those described above for CEQA. Sites Reservoir construction and operation would have no adverse effect on the alteration of geomorphic processes upstream of the main dam sites.

7.5 References

7.5.1. Printed References

AECOM. 2020. *Geology and Seismicity Technical Memorandum*. August 18. Sites Program Management Team.

Brown, C.J. 2000. *North of the Delta Offstream Storage Investigation, Progress Report, Appendix D: Fish Survey Summary*. September. Prepared for the California Department of Fish and Game with the assistance of Waiman Yip, California Department of Water Resources.

California Resources Agency. 2003. SB 1086, Sacramento River Conservation Area Forum Handbook. September. Prepared for The Resources Agency, State of California by the Sacramento River Advisory Council under Senate Bill 1086, authored by Senator Jim Nielsen.

H. T. Harvey & Associates, G. Mathias Kondolf, Geomorph, and Blankinship & Associates. 2008. *Colusa Basin Watershed Assessment*. December. Prepared for Colusa County Resource Conservation District.

Northwest Hydraulic Consultants. 2010. *Comprehensive Geomorphic and Sedimentation Analyses of Lower Sacramento River for Flood Management, Erosion Mitigation and Habitat Enhancement Design*. Proceedings from the 2nd Joint Federal Interagency Conference, June 27–July 1, 2010, Las Vegas, NV.

Soil Survey Staff. 2020. Web Soil Survey. Natural Resources Conservation Service, United States Department of Agriculture. Available:

https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm. Accessed: October 21, 2020.

Water Engineering & Technology. 1990. *Geomorphic Analysis and Bank Protection Alternatives Report for Sacramento River (RM 78–194) and Feather River (RM 0–28)*. May. Fort Collins, CO. Prepared for U.S. Army Corps of Engineers, Sacramento District, Sacramento, CA.

Chapter 8 Groundwater Resources

8.1 Introduction

This chapter describes the environmental setting, methods of analysis, and impact analysis for groundwater resources (including groundwater quality) that would potentially be affected by the construction and operation of the Project. Groundwater resources are defined as groundwater aquifer systems, including groundwater infrastructure (i.e., existing groundwater wells and their distribution facilities in the vicinity of the Project). The study area for groundwater resources consists of the groundwater basins and subbasins that could be directly affected by construction and operation of Project facilities. Offsite commercial facilities (including quarries) for aggregate and other materials are not included in the study area and impact analysis because they are existing, permitted facilities. Tables 8-1a and 8-1b summarize the CEQA determinations and NEPA conclusions for construction and operation impacts, respectively, between alternatives.

Table 8-1a. Summary of Construction Impacts between Alternatives

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Impact GW-1: Violation of water quality standards or waste discharge requirements or otherwise substantial degradation of groundwater quality			
No Project	NI NE	-	NI NE
Alternative 1	LTS NE	-	NI NE
Alternative 2	LTS NE	-	NI NE
Alternative 3	LTS NE	-	NI NE
Impact GW-2: Substantial decrease in groundwater supplies or substantial interference with groundwater recharge			
No Project	NI NE	-	NI NE
Alternative 1	LTS NE	-	LTS NE
Alternative 2	LTS NE	-	LTS NE
Alternative 3	LTS NE	-	LTS NE

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Impact GW-3: Conflict with or obstruct implementation of a sustainable groundwater management plan			
No Project	NI NE	-	NI NE
Alternative 1	LTS NE	-	LTS NE
Alternative 2	LTS NE	-	LTS NE
Alternative 3	LTS NE	-	LTS NE

Notes:
NI = CEQA determination of no impact
LTS = CEQA determination of less-than-significant impact
LTSM = CEQA determination of less than significant with mitigation
SU = CEQA determination of significant and unavoidable
B = NEPA conclusion of beneficial effects
NE = NEPA conclusion of no effect or no adverse effect
AE = NEPA conclusion of adverse effect
SA = NEPA conclusion of substantial adverse effect

Table 8-1b. Summary of Operation Impacts between Alternatives

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Impact GW-1: Violation of water quality standards or waste discharge requirements or otherwise substantial degradation of groundwater quality			
No Project	NI NE	-	NI NE
Alternative 1	LTS B	-	LTS B
Alternative 2	LTS B	-	LTS B
Alternative 3	LTS B	-	LTS B
Impact GW-2: Substantial decrease in groundwater supplies or substantial interference with groundwater recharge			
No Project	NI NE	-	NI NE
Alternative 1	LTS B	-	LTS B
Alternative 2	LTS B	-	LTS B

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Alternative 3	LTS B	-	LTS B
Impact GW-3: Conflict with or obstruct implementation of a sustainable groundwater management plan			
No Project	NI NE	-	NI NE
Alternative 1	LTS NE	-	LTS NE
Alternative 2	LTS NE	-	LTS NE
Alternative 3	LTS NE	-	LTS NE

Notes:
NI = CEQA determination of no impact
LTS = CEQA determination of less-than-significant impact
LTSM = CEQA determination of less than significant with mitigation
SU = CEQA determination of significant and unavoidable
B = NEPA conclusion of beneficial effects
NE = NEPA conclusion of no effect or no adverse effect
AE = NEPA conclusion of adverse effect
SA = NEPA conclusion of substantial adverse effect

8.2 Environmental Setting

This section summarizes the existing conditions for groundwater resources in the study area which consists of the Funks Creek and Antelope Creek groundwater basins, and the Red Bluff, Colusa, and Yolo Subbasins of the Sacramento Valley Groundwater Basin (Figure 8-1). Table 8-2 shows the alternative component/facility and corresponding groundwater basin or subbasin, regulatory agency, depth to basin aquifer, and total annual groundwater use. A detailed description of the existing conditions in the study area is provided in Appendix 8A, *Groundwater Resources Basin Setting*.

Table 8-2. Summary of Groundwater Resources in the Study Area

Alternative Component/Facility	Groundwater Basin or Subbasin	Regulating Agency	Groundwater Basin Depth[a] (feet bgs)	2018 Total Pumped Groundwater Use[b] (AF)	Local Groundwater Infrastructure and Use [c,d]				Groundwater Quality [c,e]	
					Well Type	Well Depth (feet bgs)	Depth to Shallow Groundwater (feet bgs)	Yield (gpm)	Specific Conductance (µS/cm)	Primary MCL Exceedances
Sites Reservoir and adjacent roads Recreation Areas	Funks Creek and Antelope Creek Basins	Glenn and Colusa Counties	100	1,038	15 Domestic 15 Stock	100 to 201	1 to 30	0 to 60	680 to 2,190	Arsenic
RBPP and TC Canal Diversion	Red Bluff Subbasin	Groundwater Sustainable Agency of Tehama County	200	76,153	32 Domestic 9 Irrigation 5 Production 3 Public Use	45 to 600	55	20 to 2,080	158 to 707	None
TRR East and West, TRR East and West Pipelines	Colusa Subbasin	Colusa Groundwater and Glenn Groundwater Authorities	200	553,700	17 Domestic 3 Irrigation	70 to 400	4 to 20	70 to 200	444 to 1,104	None
Funks Reservoir and Transition Manifold	Colusa Subbasin	Colusa Groundwater and Glenn Groundwater Authorities	200	553,700	20 Domestic 2 Stock 3 Industrial	22 to 440	15 to 207	3 to 75	–	–
SD1,2,3-Z3 Quarry 2, GG-Z3 Quarry 2, and Sites-Z3 Quarry	Colusa Subbasin	Colusa Groundwater and Glenn Groundwater Authorities	200	553,700	10 Domestic 2 Industrial	28 to 300	–	2 to 50	–	None
CBD Outlet, Sacramento River Discharge, Dunnigan Pipeline	Yolo Subbasin	Yolo Subbasin Groundwater Agency	20 to 420	327,195	20 Domestic 65 Irrigation 1 Stock 2 Industrial 2 Public Use	51 to 1,000	20 to 293	4 to 5,467	361 to 781	Total Dissolved Solids Nitrates

Table Notes:
a = California Department of Water Resources 2020a
b = California Department of Water Resources 2019
c = based on a 1-mile radius from Alternative Component/Facility
d = California Department of Water Resources 2020b
e = California Water Boards 2020
f = No data
AF = acre-feet
bgs = below ground surface
gpm = gallons per minute
MCL = Maximum Contaminant Level
µS/cm = microsiemens per centimeter

8.3 Methods of Analysis

Data, published reports, and modeling results, and best professional judgement were used to identify and evaluate the potential impacts on groundwater resources from Project implementation. The groundwater quality impact analysis focuses on Project construction and operation activities which could substantially degrade groundwater quality. The impact analysis also considers potential violations of groundwater quality standards and evaluates wastewater discharge effects that may occur from Project construction and operations. The BMPs described in Appendix 2D, *Best Management Practices,* are incorporated into the analysis of potential Project construction and operation impacts on groundwater resources. BMPs in the Project Stormwater Pollution Prevention Plan (SWPPP), would entail discharging groundwater onto suitable land where it would infiltrate back into the water table; testing groundwater if contamination is suspected; and treating or settling groundwater prior to land or surface water discharge to reduce sedimentation. Project facilities would comply with applicable design standards and building codes. Impacts associated with accidental spills and releases of hazardous materials, which could affect groundwater quality, are discussed in Chapter 27, *Public Health and Environmental Hazards*.

8.3.1. Construction

Construction activities, such as dewatering and groundwater use, would potentially affect groundwater resources. Dewatering would occur during excavation for Sites Reservoir, quarrying, GCID system upgrades, road construction and improvements, pipeline and transition manifold installation, and Funks Reservoir dredging. Groundwater would be required for uses such as moisture conditioning of fill materials, batching concrete, grouting, and dust suppression for haul roads, stockpiles, disposal areas, quarries, and borrow areas. The potential impacts of construction-related dewatering on groundwater resources are evaluated qualitatively based on the number and location of wells that may be affected by construction activities. The potential impacts of groundwater use during Project construction were evaluated qualitatively and quantitatively. Groundwater use for construction was assumed to be up to 100,000 gallons per day for 365 days a year. This assumption provides a conservative evaluation of construction impacts on groundwater in the study area because actual use is likely to be less than this total volume.

8.3.2. Operation

Operations would potentially affect groundwater resources by altering groundwater quality, groundwater recharge, groundwater/surface water interaction, and groundwater flow direction and volume. The potential impacts on groundwater resources from operation of the Project were analyzed using publicly available data, modeling results, and operation practices (Appendix 8B, *Groundwater Modeling*).

Potential variations in groundwater flow direction were evaluated to determine if Project operations would result in the migration of lower quality groundwater into areas of higher quality

groundwater. Existing groundwater quality conditions were compared to existing surface water quality to determine infiltration effects from Project conveyance systems and reservoirs.

Surface water and groundwater systems are connected within the Sacramento Valley Groundwater Basin and are highly variable spatially and temporally. In general, the Sacramento and Feather Rivers act as drains and are recharged by groundwater throughout most of the year, except for areas of depressed groundwater elevations attributable to groundwater pumping (inducing leakage from the rivers) and localized recharge to the groundwater system. Project operations would change current surface water management and could affect groundwater/surface water interaction.

A CalSim II surface water routing model and Central Valley Hydrologic Model (CVHM) were used to determine potential impacts on groundwater resources from Project operations. The CalSim II model determined how much water would need to be diverted to fill and maintain Sites Reservoir assuming a reservoir capacity of 1.8 MAF. This CalSim II simulation was then used as input to the CVHM groundwater model to ascertain changes to groundwater/surface water interaction at the TC Canal and GCID Main Canal diversions from operations over the life of the Project. The CVHM model utilized historical groundwater conditions from April 1961 through September 2003 for the simulation. The CVHM model results presented changes in groundwater levels at 4.2 years, 24.8 years, and 39.2 years near the points of diversion as well as roughly 12 miles downgradient. Changes to surface and groundwater exchange at the TC Canal and GCID Main Canal diversions over the life of the Project (from start of operations to 40 years later) were also simulated and included in model results (Appendix 8B, *Groundwater Modeling*).

Though modeled Project operations were based on a 1.8-MAF reservoir capacity, groundwater modeling results used to evaluate effects on groundwater resources are valid. First, the incremental groundwater effects associated with the Project operations as simulated for the 1.8-MAF reservoir model run are unlikely to be greatly affected by changes in hydrological baseline conditions. Second, the models used represent a beyond-worst-case condition for evaluating effects on groundwater/surface water interaction because Alternatives 1, 2, and 3 have smaller reservoir sizes and would require less water supply (1.8 MAF as compared to 1.5 or 1.3 MAF).

A $SACFEM_{2013}$ model was used to determine the potential impacts of long-term reservoir seepage on groundwater levels near Sites Reservoir. The model assumed a reservoir capacity of 1.8 MAF with an associated seepage rate of 2,150 gallons per minute, and that the reservoir was filled to the maximum capacity over the life of the Project. The analysis compared groundwater levels from the modeled 1.8-MAF reservoir capacity seepage against baseline conditions over 17 years (Water Year 1970 to Water Year 1985; Figure 10A-1 in Appendix 8B). This modeled reservoir size and seepage rate would be greater than those conditions under Alternatives 1, 2, and 3 since these alternatives would have reservoir capacity of 1.5 MAF or 1.3 MAF. Therefore, the model represents a beyond-worst-case condition for evaluating seepage effects on groundwater levels near Sites Reservoir from Project operations.

The $SACFEM_{2013}$ model was also used to assess the potential impacts on groundwater recharge within the TRR East complex from seepage. TRR East and West would be constructed using a liner system to prevent seepage; the liner may reduce surface water infiltration and could affect groundwater recharge in the area. The model determined average hydrological conditions using Water Year 2005 that were utilized to estimate existing deep percolation from precipitation within TRR East (Sites Project Authority and Bureau of Reclamation 2017). Impacts to groundwater recharge from the TRR West liner were qualitatively analyzed using the Water Year 2005 annual precipitation to determine possible changes at the local and landscape scale.

8.3.2.1. Implementation of the Sustainable Groundwater Management Act

Project construction, operation, and maintenance may affect the implementation of the Sustainable Groundwater Management Act (SGMA) by conflicting or impeding with local Groundwater Sustainability Plans (GSPs). Counties which have medium or high priority groundwater basins, as designated under the SGMA, are required to draft a GSP with the goal of having a sustainable groundwater aquifer within 20 years after plan adoption and implementation (further details regarding SGMA are contained in Appendix 4A, *Regulatory Requirements*). The Colusa and Yolo Subbasins have been designated as high priority and are regulated by the Colusa Groundwater Authority (CGA), Glenn Groundwater Authority, and the Yolo County Flood Control and Water Conservation District (FCWCD) while Red Bluff Basin is designated as a medium priority subbasin and regulated by Groundwater Sustainable Agency of Tehama County. These county agencies are currently drafting their GSPs that would be submitted to the California Department of Water Resources for review by January 2022. At the time of preparation of this RDEIR/SDEIS, these GSPs were in the initial study and planning phases, and the potential Project effects on individual GSPs could not be evaluated. Therefore, this analysis compares the Project effects on the overarching SGMA goals, as well as current county Groundwater Management Plans (GWMPs) and Basin Management Objectives (BMOs), which would be superseded by adopted GSPs. The GWMPs and BMOs reviewed include:

- Coordinated Assembly Bill 3030 Groundwater Management Plan (Antone et al. 2012)
- BMO for Groundwater Surface Elevations in Glenn County, California (Glenn County Water Advisory Committee 2001)
- BMO Method of Groundwater Basin Management (Dudley 2000)
- Colusa Basin Watershed Management Plan (Fahey 2012)
- Groundwater Management Plan (Yolo County Flood Control and Water Conservation District 2006)

8.3.3. Thresholds of Significance

An impact on groundwater resources (including groundwater quality) would be considered significant if the Project would:

- Violate any water quality standards or waste discharge requirements or otherwise substantially degrade groundwater quality.

- Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the Project may impede sustainable groundwater management of the basin.
- Conflict with or obstruct implementation of a sustainable groundwater management plan.

8.4 Impact Analysis and Mitigation Measures

Impact GW-1: Violation of water quality standards or waste discharge requirements or otherwise substantial degradation of groundwater quality.

No Project

Existing conditions and the future No Project Alternative were assumed to be similar given the rural nature of the study area and limited potential for growth and development in Glenn and Colusa counties over the life of the Project. As a result, it is anticipated that the No Project Alternative would not entail material changes in groundwater conditions as compared to existing conditions.

Under the No Project Alternative, the operations of the existing TC Canal, RBPP, and GCID Main Canal would continue. These facilities have not been shown to degrade or otherwise adversely affect groundwater within the Sacramento Valley Groundwater Basin. In addition, there is no known water quality contamination in the study area.

Significance Determination

The No Project Alternative would not result in a violation of water quality standards or waste discharge requirements or otherwise substantial degradation of water quality because no new facilities would be constructed and operated. There would be no impact.

Alternatives 1, 2, and 3

Many of the Project facilities are included in Alternatives 1, 2, and 3. These facilities would involve the same types of construction methods and operation activities and would largely result in the same potential construction and operation impacts related to groundwater quality. The potential construction and operation impacts discussed below pertain to all Project alternatives unless otherwise stated.

Construction

The footprint of Alternatives 1 and 3 would differ from that of Alternative 2; but construction means and methods would be the same between these alternatives, resulting in the same effects related to groundwater quality.

Dewatering

Temporary dewatering would be required during construction for a variety of activities (e.g., during quarrying, installation of the Dunnigan Pipeline). Dewatering would not change the permeability of the ground surface where construction activities would occur. Therefore, dewatering would not affect groundwater quality during construction.

Temporary dewatering would be required for construction of the two TRR East or TRR West pipelines and two Funks pipelines leading to the I/O tunnel. In addition, dewatering would be required for the tunnel between the main reservoir and extension reservoir of TRR West. Pipes used to transport water during construction of the TRR East or West may be buried several feet below ground at heavily trafficked intersections and require temporary dewatering. There is one groundwater well within 1 mile of these facilities with a Primary Maximum Containment Level exceedance for arsenic and there is a low probability of arsenic affecting groundwater quality in the study area (California Water Boards 2020). An onsite water treatment facility, including a settling basin, would be located near the I/O Works. Treated water would then be used for dust suppression or discharged into Funks Creek. Groundwater discharged to surface waterbodies would comply with RWQCB Order No. 5-00-175. Groundwater encountered in other areas during dewatering would be stored onsite in bermed areas or Baker tanks as needed. Potential contamination of groundwater from dewatering would be avoided through the implementation of BMPs. Based on the lack of extensive, documented groundwater contamination near the TRR East and West pipelines, I/O Works, and Funks PGP, as well as the use of BMPs, dewatering during construction of these facilities would not result in a violation of water quality standards or waste discharge requirements or otherwise substantial degrade groundwater quality.

Funks Reservoir dredged to design capacity. Groundwater quality would not be adversely affected due to reduced seepage and percolation from the drained reservoir because this is a temporary activity and soil permeability is low in the area.

Abandoned Wells or Septic Systems

There are approximately 26 wells, 10 existing plugged natural gas wells, and numerous septic systems located in the Sites Reservoir inundation area. There are approximately 20 groundwater wells and one plugged dry natural gas well within a 1-mile radius of the TRR East and West, and their associated pipelines. Because natural gas wells are dry and previously plugged, there would be no effect on groundwater quality. Other water wells, septic systems, test wells, or boreholes may also be along or adjacent to other Project facilities. There has been no reported groundwater contamination as a result of septic systems in the study area (Appendix 27A, *Environmental Records Search*). All well types, boreholes, and septic systems would be located, identified, and decommissioned before or during construction to avoid possible groundwater contamination in accordance with the BMPs. The decommissioning requirements described in the BMPs would reduce the potential for contamination of groundwater to occur because the well boreholes would be filled with impermeable materials to preventing cross-contamination in accordance with county groundwater authority requirements. With the implementation of well-decommissioning BMPs and on the basis of a lack of reported contamination from septic systems, groundwater

quality would not be degraded or result in a violation of groundwater quality standards due to abandoned wells or septic systems in the study area.

Concrete Batch Plants and Onsite Water Treatment Plants

Three concrete batch plants that would be used to construct the I/O Works, main dams and saddle dams, diversions, and emergency release structures and would require groundwater use during operations. Due to the variable water quality in the Antelope Creek and Funks Creek Basins, groundwater would be treated at onsite water treatment plants prior to use for mixing concrete. The treatment would improve the groundwater quality, and the water used for concrete production would not be discharged back into the environment. Therefore, groundwater treated at the onsite water treatment plants and used for concrete mixing would not violate water quality standards or otherwise degrade groundwater quality during construction.

Operation

Reservoirs

Despite the grouting of the underlying rock formations, some water would leak from the inundation area and potentially affect groundwater quality in nearby areas. Alternative 2 would have a slightly less potential for this to occur when compared to Alternatives 1 and 3 because it has a smaller inundation area. Surface water from the Sacramento River, which would be used to fill the Sites Reservoir, has an electrical conductivity (EC) averaging 130 microsiemens per centimeter (µS/cm). Though this salinity could increase due to evapoconcentration, local creek discharges, and Salt Pond seeps it should remain well below the current EC for groundwater quality of 680 to 2,190 µS/cm in the Sites Reservoir footprint. The weight of the reservoir could force additional percolation of surface water into the reservoir soils, resulting in higher quality surface water seeping into the reservoir floor and the shallow groundwater layer. This surface water would then alter the shallow groundwater chemistry in and immediately adjacent to the reservoir by reducing salinity.

Because Alternatives 1 and 3 have a larger surface water capacity than Alternative 2, these alternatives would allow potentially more fresh water in and adjacent to the Sites Reservoir. Alternatives 1 and 3 would result in more water weight on the reservoir floor than Alternative 2, which would cause more groundwater percolation and greater changes, or improvements, to shallow groundwater quality. The model results show minor changes to the extent of groundwater flow, which would result in minimal groundwater freshening that would be primarily contained along the eastern margin of the Sites Reservoir.

The TRR East and West would both be constructed with an ultraviolet-resistant polyvinylchloride or high-density polyethylene liner to minimize seepage over the reservoir footprint. Therefore, there would be no to very minimal interaction between the existing groundwater table and reservoir surface water resulting in a low likelihood that groundwater

quality would be degraded or that water quality standards would be violated due to seepage in the TRR East or TRR West complex.

Salt Pond

A saline seep is present approximately 4 miles north of the community of Sites near the Salt Lake Fault. The saline seep, Salt Pond, is within the inundation area. Based on the geology and topography of the inundation area, surface water would percolate into the shallow aquifer under the reservoir floor, formed from alluvial deposits, and then flow to the west. Due to saline density the saline seep would stay near the bottom of the reservoir floor where it would mix with fresh water close to the Golden Gate Dam. Mixing with surface water would increase during periods of inflow from the bottom outlet of the I/O tower. Based on modeling (assumed a maximum 1.8-MAF reservoir capacity during the wettest simulated Water Year), groundwater elevation would increase along the western margin of the reservoir but would not result in any difference in the discharge area when compared to existing conditions. Some fresh water would dilute the saline water column within or near the Salt Pond, improving water quality somewhat within that column as compared to the baseline. Groundwater would move laterally and be discharged in the same area as existing conditions (Appendix 8B, *Groundwater Modeling*). As mentioned above, groundwater near Sites Reservoir has higher salinity than reservoir surface water and as such the inundation area would not result in increasing salinity or decreasing groundwater quality.

Wastewater Collection or Disposal Systems

An onsite wastewater disposal system, which would include a septic tank or other alternative system, would be installed at the administration building. The septic system would be sited and designed to avoid harmful contamination. The onsite wastewater disposal system at the Funks PGP maintenance and storage building would not result in a violation of wastewater discharge requirements or otherwise substantial degrade groundwater quality.

Vault toilets would be installed at all the recreation areas. These vault toilets would not include a leach field and would not dispose of wastewater on site. This wastewater would be pumped and transported offsite for treatment at a licensed facility and so would not result in a detrimental effect to groundwater resources or a violation of waste discharge requirements.

Recreation Areas

During operation of recreation areas, increased vehicle traffic and use of the recreation areas by recreationists could introduce contaminants (e.g., fuels, oils, and herbicides) which could enter the environment and subsequently compromise groundwater quality. Potential contamination of groundwater from hazardous materials via this route would be low due to the depth of the groundwater aquifer within the basin (100 feet below ground surface [bgs]). Therefore, increased vehicle traffic or use of recreation areas would not degrade groundwater quality or result in a violation of water quality standards.

CEQA Significance Determination and Mitigation Measures

Groundwater degradation from contaminates during dewatering would be unlikely due to depth to the groundwater aquifer within the study area. Abandoned wells would be decommissioned as described in the BMPs. There are no documented reports of contamination from septic tanks. An onsite water treatment facility would be utilized during dewatering for the I/O Works. Three onsite water treatment plants would be operated alongside concrete batch plants. These treatment plants would improve groundwater prior to use in mixing concrete. Groundwater quality standards would be met through implementation of SWPPP BMPs. Groundwater which could be discharged to surface waterbodies would be compliant with RWQCB Order No. 5-00-175. There would be a less-than-significant impact on groundwater quality or violation of water quality standards during construction for Alternative 1, 2, or 3.

Sacramento River fresh water would alter the shallow groundwater chemistry in and immediately adjacent to the reservoir by reducing salinity, resulting in a less-than-significant impact from Alternative 1, 2, or 3. Alternative 1 or 3 would have a greater impact as compared to Alternative 2 because these two alternatives have larger reservoir capacities. Because TRR East and TRR West would both have a liner to prevent groundwater/surface water interaction, they would have a less-than-significant impact on groundwater quality from Alternatives 1, 2, and 3.

Due to saline density of the Salt Pond, saline water would stay near the bottom of the reservoir floor where it would mix with fresh water close to the Golden Gate Dam. This fresh water would dilute the saline water column, improving water quality. Therefore, Alternatives 1, 2, and 3 would have a less-than-significant impact on groundwater quality when compared to existing conditions.

Administration building wastewater disposal systems would not contaminate groundwater and would be in compliance with county regulations. Wastewater from vault toilets in recreation areas would be pumped and treated offsite at a licensed facility. Hazardous materials from increased traffic and use of recreation areas would be unlikely to reach the basin aquifer. Therefore, operation of these facilities under Alternative 1, 2, or 3 would not result in wastewater discharge violation and would have a less-than-significant impact on groundwater quality.

NEPA Conclusion

Construction and operation effects under Alternatives 1, 2, and 3 would be the same as those described above for CEQA. The effects of construction would not be adverse and the effects of operation would be beneficial.

Impact GW-2: Substantial decrease in groundwater supplies or substantial interference with groundwater recharge that would impede sustainable groundwater management of the basin.

No Project

Under the No Project Alternative, the operations of the existing TC Canal, RBPP, and GCID Main Canal would continue. These facilities have been shown to act as a source of groundwater recharge within the Sacramento Valley Groundwater Basin that would continue under the No Project Alternative.

Significance Determination

The No Project Alternative would not result in a substantial decrease in groundwater supplies or substantial interference with groundwater recharge that would impede sustainable groundwater management of the groundwater basins and subbasins because no new facilities would be constructed and operated. There would be no impact.

Alternatives 1, 2, and 3

The footprint of Alternatives 1 and 3 would differ from that of Alternative 2, but construction means and methods would be the same between these alternatives, resulting in the same effects related to groundwater elevation or flow direction. The construction impacts discussed below pertain to Alternatives 1, 2, and 3 unless otherwise stated.

Construction

Groundwater Use

The average volume of construction water required for the Sites Reservoir complex, including adjacent roads and recreation areas, is estimated to be 750,000 to 1,000,000 gallons per day and would be supplied from existing groundwater wells over a period of 4 years. This required daily construction use within the reservoir would be less than 15% of the 2018 groundwater pumped for total groundwater use within Antelope and Funks Creek Basins (Table 8-2). Over time, the water used during construction would be replaced. Groundwater recharge would come from the surface water in the inundation area infiltrating into the floor of the reservoir; surface water infiltration from runoff in nearby creeks such as Grapevine Creek, Funks Creek, and Antelope Creek; and from precipitation. Therefore, use of groundwater for the construction of the Sites

Reservoir complex would not result in a substantial decrease in groundwater supplies or substantial interference with groundwater recharge in these basins.

Construction of the Dunnigan Pipeline would require 20,000 to 30,000 gallons of water per day from existing wells or dewatering efforts. The required daily construction use would be less than 1% of the 2018 groundwater pumped for total groundwater use within the Yolo County Subbasin (Table 8-2). The use of groundwater for the construction of the Dunnigan Pipeline would not result in a substantial decrease in groundwater supplies or substantial interference with groundwater recharge in this subbasin. Water used for pipeline compression and dust control during construction of conveyance facilities would be supplied from the GCID Main Canal and would not affect groundwater.

Dewatering and Redirected Surface Water

Temporary dewatering would be required during construction and could affect the surrounding groundwater levels. Dewatering practices would include BMP measures discussed in GW-1.

Some of the GCID Main Canal would be dewatered during siphon improvements. This construction would occur during the regularly scheduled annual maintenance period for the canal and would not adversely affect groundwater flow directions or quality. Construction of the new GCID Main Canal head gate would not require temporary dewatering (Appendix 2C, *Construction Means, Methods, and Assumptions*). The GCID Main Canal system upgrades would have no impact on groundwater supplies or recharge when compared to existing conditions.

The flow of Stone Corral and Funks Creeks would be temporarily redirected and reduced during construction of the main dams. The redirection of creek flows and stormwater management may result in a minor reduction of groundwater recharge (due to potentially altering the volume infiltration of surface water and potentially changing groundwater flow directions), but not at a rate that would affect surface water infiltration into groundwater aquifers or significantly change the existing deep percolation.

Dredging Funks Reservoir would require dewatering that would result in a short-term reduction in groundwater levels and recharge in the nearby area. There are 25 wells located within 1 mile of Funks Reservoir with depths between 22 to 440 feet bgs and depths to water between 15 to 207 feet bgs. Temporary dewatering during construction would not affect these wells because the average well depth and total depth to water would be able to compensate for any reduction in nearby groundwater levels. Dewatering required to dredge Funks Reservoir would not result in a substantial decrease in groundwater levels or substantial interference with groundwater recharge.

Construction of TRR East and West, TRR East and West pipelines, pipelines to convey water during TRR East and West construction, the transition manifold, and Dunnigan Pipeline, as well as quarrying associated with dam construction, may require dewatering. Under Alternatives 1 and 3, construction of the TRR East embankment, TRR East PGP, and the TRR East electrical substation would require excavation between 40 to 50 feet bgs. Under Alternative 2, TRR West

would be excavated to a depth between 20 to 60 feet bgs, with a maximum depth of 120 feet near the TRR West PGP on the western side of the reservoir. TRR West PGP and electrical substation would also require excavation between 40 to 50 feet bgs. Under all three alternatives, the pipelines and transition manifold would be installed approximately 6 feet bgs.

Three quarries located to the east of Sites Reservoir and two within the inundation area would be excavated to access aggregate material for dam construction. Quarries can disrupt the existing movement of surface water/groundwater exchange by interrupting the natural water recharge. In addition, groundwater flow can also be disrupted as quarry dewatering lowers the water table and changes groundwater flow direction (Green et al. 2003:216, Ekmekci 1990:4). After construction, quarries outside the inundation area would be decommissioned and graded to have positive drainage to quarry bottoms and so would act as a recharge area upon construction completion.

BMPs require groundwater encountered during any excavation be stored onsite in bermed areas or Baker tanks before being discharged onto suitable land where it would infiltrate back into the water table. Encountered groundwater may also be utilized for dust suppression or moisture conditioning of embankment fill materials. Temporary dewatering during construction would not affect local groundwater wells (Table 8-2) because the average well depth and total depth to water would compensate for any localized reduction in groundwater levels. Alternative 2 would require more dewatering over a larger area during installation of the Dunnigan Pipeline compared to Alternatives 1 and 3 (10 miles versus 4 miles). Based on the typical depth to groundwater for local infrastructure wells along the Dunnigan Pipeline alignment and the temporary nature of dewatering, the installation of the pipeline would not result in a substantial decrease in groundwater supplies or substantial interference with groundwater recharge.

Operation

Project operation would differ under Alternatives 1, 2, and 3; but the differences in water deliveries would largely have the same effects on groundwater resources under all Alternatives. Therefore, the operation impacts discussed below pertain to Alternatives 1, 2, and 3 unless otherwise stated.

Sacramento River Diversion, Conveyance to Regulating Reservoirs, and Conveyance to Sacramento River

The timing and magnitude of changes at the two points of diversion on the Sacramento River vary between the alternatives but generally include periods of increased diversion flow during winter months to fill or maintain Sites Reservoir.

Model-simulated Sacramento River groundwater elevations were almost identical to baseline conditions. The largest decrease in groundwater elevation near the RBPP and GCID Main Canal head gate was 2.5 feet, with average annual volumetric differences in groundwater exchange 12 miles downgradient in the TC Canal and GCID Main Canal of 0.22% and 2.3%, respectively (Appendix 8B, *Groundwater Modeling*; Figure 10A-10). Because diversions required to operate

the Sites Reservoir under Alternatives 1, 2, and 3 would be less than those needed for a 1.8-MAF reservoir capacity, the effects on groundwater elevation and groundwater/surface water interaction would be minimal. In addition, diversions would occur during high-flow events when excess surface water is available and would have minimal interference with groundwater recharge.

Alternative 2 would have the least effect on groundwater levels, as well as groundwater/surface water interaction, because it would require the least water to fill and maintain the Sites Reservoir (1.3 MAF as compared to 1.5 MAF under Alternatives 1 and 3). Alternative 3 would affect groundwater level and groundwater/surface water interaction the most due to increased filling and releases during operation.

Model-simulated groundwater/surface water interaction downstream of diversions indicated that the largest change in groundwater recharge was up to 3 cubic feet per second 10 miles downstream from the RBPP 20 years from the start of operations. After this spike, groundwater recharge matched existing conditions along the 12 miles of the TC Canal over the life of the Project (approximately 40 years). Groundwater recharge 12 miles downgradient from the GCID Main Canal head gate remained largely the same as existing conditions over the 40 years simulated (Appendix 8B; Figure 10A-11). Because water diversions required to operate the Sites Reservoir under Alternatives 1, 2, and 3 would be less than that needed for the 1.8-MAF reservoir capacity, the effects on groundwater recharge for these alternatives would be less than was modeled. Therefore, Project-related diversions would not substantially interfere with groundwater recharge.

Alternative 2 would have the least effect on groundwater recharge because it would involve the lowest volume of water to fill and maintain Sites Reservoir (1.3 MAF as compared to 1.5 MAF under Alternatives 1 and 3). Alternative 3 would have the greatest effect on groundwater recharge due to increased exchanges during operation.

Pipeline operation could affect the surrounding groundwater levels due to pipeline seepage along the I/O tunnels, TRR East and TRR West pipelines, Funks pipelines, and Dunnigan Pipeline. The I/O tunnels would be constructed using pre-excavation grouting to reduce groundwater flow into the tunnels. These two tunnels would be lined with concrete to prevent seepage between the transition manifold and the I/O tower and would not change groundwater levels or flow direction. Construction of these tunnels would not result in a substantial decrease in groundwater supplies or substantial interference with groundwater recharge.

The TRR East and TRR West pipelines, Funks pipelines, and Dunnigan Pipeline would be constructed using a large diameter welded steel pipe to prevent or minimize seepage between the perspective pipeline inlets and outlets (Rude pers. comm.). There would be no change in groundwater levels or flow direction associated with these pipelines and their installation would not result in a substantial increase in groundwater supplies or substantial interference with groundwater recharge. Based on the length of Dunnigan Pipeline under Alternative 2, there is a greater possibility for increases in groundwater levels compared to Alternative 1 or 3.

Reservoirs

A portion of the water retained in the Sites Reservoir under operating conditions would infiltrate into the subsurface materials, acting as new sources of recharge to the underlying groundwater system (as described above in Impact GW-1). In the nearby Colusa Subbasin, additional groundwater recharge would be beneficial during dry periods when groundwater levels are generally low but could adversely affect adjacent land uses in the study area that are susceptible to seepage in wetter years when groundwater levels are generally higher. Modeling showed that simulated groundwater levels would begin to increase as compared to baseline levels. In most years, the reservoir seepage inflow to groundwater would provide a benefit in terms of additional shallow groundwater. During critical drought years, groundwater levels were projected to be between 30 to 20 feet higher along the western margin of the Colusa Subbasin immediately adjacent to Site Reservoir, with the highest groundwater elevation modeled near Funks Creek. This increase was reduced to a 5-foot gain or less just 4 miles to the east near TRR East (Appendix 8B, *Groundwater Modeling*; Figure 10-3A). During Extremely Wet Water Years, groundwater levels were modeled to be from 1 to 25 feet higher along the western margin of the Colusa Subbasin immediately adjacent to Site Reservoir with the highest groundwater elevation modeled near Funks Creek (Appendix 8B; Figure 10-3B). Similar to the Critically Dry Water Years, the 2017 model simulation showed that expanded areas of higher groundwater elevations would be limited. Extremely Wet Water Years did result in additional discharge to streams and/or low-lying areas as compared to Normal or Dry Water Years. Finally, simulated hydrographs indicated even during Wet Water Years, groundwater levels were still forecast to be approximately 10 feet bgs near Funks Creek with little chance of flooding orchard land, though still higher than existing conditions (Appendix 8B; Figure 10-8B). Changes to nearby groundwater levels from Sites Reservoir seepage under Alternatives 1, 2, and 3 would be less than those modeled for the 1.8-MAF capacity but would still result in changes to groundwater levels and recharge as compared to existing conditions. Under Alternatives 1, 2, and 3 groundwater levels along the western margin of the Colusa Subbasin, especially near Funks Creek during Extremely Wet Water Years, may increase in the local shallow groundwater aquifer. Alternatives 1 and 3 would have a greater recharge potential in that aquifer when compared to Alternative 2 because they have a larger reservoir capacity (1.5 MAF as compared to 1.3 MAF). In addition, Alternative 1 would have a greater recharge potential in the shallow groundwater aquifer as compared to Alternative 3 because more water would be consistently stored in the reservoir during Alternative 1 operations (Alternative 3 operations would have a more reservoir fluctuation). Operation of Sites Reservoir would increase shallow groundwater levels abutting the inundation area, resulting in a slight increase in groundwater supplies and recharge when compared to existing conditions.

Conversion of irrigated agriculture to the lined TRR East would result in temporary lowering of groundwater levels in the proximity of TRR East due to the reduction in deep percolation from precipitation and seepage from irrigation canals. The estimated deep percolation from precipitation alone over the TRR East footprint, under average hydrologic conditions (Water Year 2005), was estimated at approximately 225 AF per year. This represents less than 0.1% of the average deep percolation within the Colusa Subbasin (400,700 AF per year) based on the

average hydrologic conditions included in the 2017 model (Sites Project Authority and Bureau of Reclamation 2017). In addition, there is no irrigated agriculture in the TRR West footprint and it is on flat lands or sloping foothills. Natural groundwater recharge is primarily driven from precipitation events, approximately19.36 inches near Colusa (Water Year 2005). This precipitation represents a lower volume and less constant rate of water than seepage from irrigation canals near the TRR East footprint. The relative magnitude of the loss of groundwater recharge for TRR East and TRR West would be minimal compared to conditions in the subbasin, and operation of TRR East or TRR West would not result in a substantial decrease in groundwater supplies or substantial interference with groundwater recharge.

Recreation Areas and Roads

Under Alternatives 1, 2, and 3, the Project would add 46 miles of paved and unpaved roads. Alternative 2 would involve an additional 30 miles of paved roads for the realigned portion of Huffmaster Road and new South Road. These new roads could slightly diminish groundwater recharge but not to an extent that would affect existing uses of nearby wells because the increase of hard surface areas is negligible when compared to the surrounding permeable area. In addition, these roads would not be located in a high groundwater recharge area (The Nature Conservancy 2020).

Groundwater would not be used as a potable water source in the recreation areas. Therefore, operation activities associated with the recreation areas would result in similar groundwater conditions as the existing baseline.

Stone Corral Creek and Funks Creek

Flows would be maintained downstream of the dams and the creeks would continue to infiltrate as they currently do because releases would be made from the reservoir to these creeks.

CEQA Significance Determination and Mitigation Measures

Total required groundwater use for construction of Sites Reservoir and Dunnigan Pipeline over the life of the Project would be between 1% to 15% of the total annual groundwater use within the basin or subbasin and would result in a less-than-significant reduction in groundwater supply.

Based on the average well depth and total depth to water of local well infrastructure, nearby wells would be able to compensate for reductions in groundwater levels associated with dewatering during construction. Water diverted from Stone and Funks Creeks during construction would remain in the same watershed, resulting in minimal to no change in deep percolation or recharge within the basin. In addition, changes in groundwater levels or recharge would be minimized through use of BMPs (see Impact GW-1). Alternative 1, 2, or 3 would result in a less-than-significant impact on groundwater levels and recharge in the study area.

Pipeline operation could affect the surrounding groundwater levels due to seepage under Alternative 1, 2, or 3. Based on the length of the Dunnigan Pipeline under Alternative 2, there is a greater chance for increases to groundwater levels as compared to Alternative 1 or 3. All

pipelines would be constructed using materials to effectively prevent or minimize pipeline seepage, resulting in a less-than-significant impact on groundwater levels.

All diversions would primarily take place during high flows when excess surface water would be available. In addition, modeling has shown little to no effects on existing groundwater recharge due to diversions. Effects on groundwater recharge would be the greatest under Alternative 3, then Alternative 1, and the lowest under Alternative 2. Based on high-flow conditions and modeling, diversions would have a less-than-significant impact on groundwater recharge or supplies under Alternative 1, 2, or 3.

Inundation in previously unsaturated areas would result in higher groundwater in the shallow aquifer along the western margins of the Colusa Subbasin (in the immediate vicinity of the Sites Reservoir). Groundwater levels and recharge potential would increase the most under Alternative 1, which would consistently store the most surface water. Alternative 2 would result in the lowest change in potential recharge or groundwater levels when compared to existing conditions. Increased shallow groundwater levels and recharge would be limited and not result in inundation to local orchards. Therefore, Alternative 1, 2, or 3 would have a less-than-significant impact on groundwater recharge and supply.

Reduced infiltration from the TRR East, TRR West, roads, and recreation areas would not be considered a significant change when compared the surrounding landscape and so Alternative 1, 2, or 3 would have a less-than-significant impact on groundwater recharge.

Discharges would continue to be made to Stone Corral Creek and Funks Creek under operating conditions; therefore, operation of Alternative 1, 2, or 3 would have less-than-significant impacts on groundwater recharge through these creeks.

NEPA Conclusion

Construction and operation effects on groundwater supplies and groundwater recharge under Alternative 1, 2, or 3 would be the same as described above for CEQA. The construction effects would not be adverse, and the operation effects would be beneficial. Surface water from Sites Reservoir has the potential to improve nearby shallow groundwater aquifer levels.

Impact GW-3: Conflict with or obstruct implementation of a sustainable groundwater management plan.

No Project

Under the No Project Alternative, the operations of the existing TC Canal, RBPP, and GCID Main Canal would continue. The operations of these facilities do not conflict with or obstruct the implementation of a sustainable groundwater management plan (e.g., county GSP).

Significance Determination

The No Project Alternative would not conflict with or obstruct the implementation of a sustainable groundwater management plan. There would be no impact.

Alternatives 1, 2, and 3

Current county GWMPs and BMOs would be superseded by GSPs adopted by local groundwater authorities. These GSPs would be developed at the basin and subbasin levels and would contain measures to facilitate the achievement of the overall goals of the SGMA. This section discusses likely GSP measures that may be affected by the implementation of Alternative 1, 2 or 3. Construction and operation would similarly affect possible GSP measures, and the potential construction and operation impacts discussed below pertain to all Project alternatives unless otherwise stated.

Construction

Construction activities would result in no to less-than-significant impacts on groundwater resources throughout the study area (see Impacts GW-1 and GW-2) during the 6-year construction period. Construction would not conflict with or impede GSPs developed by county groundwater authorities.

Operation

Operation could affect GSPs through changing the surface water management practice in the Sacramento Valley Groundwater Basin by increased diversions from the Sacramento River and storage of up to 1.5 MAF at Sites Reservoir. Under Alternatives 1 and 2, water would be released from Sites Reservoir for use by storage partners during Dry to Critically Dry Water Years. Releases under Alternative 3 are likely to be more frequent. Operations are unlikely to affect groundwater levels, flows, or water quality (see Impacts GW-1 and GW-2) so they would not impede or conflict with the overarching SGMA goals. Project facilities would not impede the installation or use of groundwater monitoring wells, which is a likely GSP measure.

Alternative 1, 2, or 3 would increase diversions from the Sacramento River. Because GSPs are in the initial stages of development, the surface water requirements for MAR areas are unknown. Project facilities are largely not in areas identified as excellent recharge areas by the CGA and operation would not conflict with current or future MAR projects (The Nature Conservancy 2020). Diversions would be highest under Alternative 3, then Alternative 1, with Alternative 2 having the lowest diversions from the Sacramento River. Diversions would not significantly reduce recharge or groundwater levels (Impact GW-2) and would therefore not impede likely GSP measures for sustainable groundwater levels.

Operation would improve water supply and reliability by creating additional surface water storage to be used by SWP and CVP contractors. This increased water storage aligns with existing county GWMPs and BMOs and likely goals in future GSPs. Alternatives 1 and 3 would

provide more surface water storage than Alternative 2. Under Alternative 3, the reservoir exchanges would increase and Sites Reservoir would typically be below full capacity. The operation under Alternative 3 would also result in less seepage as compared to Alternative 1, reducing the beneficial effects on nearby groundwater levels.

Alternative 1, 2, or 3 would provide a more reliable surface water supply for agricultural use, lowering dependency on groundwater pumping for crop irrigation in the Sacramento Valley and the San Joaquin Valley. For example, under Alternatives 1, 2, and 3, Colusa County could release up to 10 TAF per year directly to the TC Canal which would then count towards groundwater replenishment (Appendix 8B, *Groundwater Modeling*). Surface water use could increase deep percolation that would subsequently increase groundwater storage and improve groundwater quality because surface water has been shown to have better water quality than groundwater, especially in the San Joaquin Valley. This increase in groundwater storage could also reduce land subsidence and disconnections from surface water. The increased surface water use for agriculture would also decrease dependency on micro-irrigation systems which rely on groundwater pumping and have been shown to result in little to no groundwater recharge and a buildup of salt in the upper layers of the soil profile, both due to lack of deep percolation (Fahey 2012). All surface water use would be downstream from Sites Reservoir and this benefit would not be applicable to the Groundwater Sustainable Agency of Tehama County GSP.

CEQA Significance Determination and Mitigation Measures

Construction and operation under Alternative 1, 2, or 3 would not conflict with or obstruct implementation of GSPs. Construction and operation would not result in a violation of water quality standards or waste discharge requirements or otherwise substantial degradation of groundwater quality (Impact GW-1). There would be no substantial decrease in groundwater supplies or interference with groundwater recharge (Impact GW-2). Operation would improve surface water reliability and increase its use, which would reduce groundwater pumping in the Sacramento Valley Groundwater Basin and San Joaquin Valley. Alternative 1, 2, or 3 would have a less-than-significant impact on GSP implementation.

NEPA Conclusion

Construction and operation effects under Alternative 1, 2, or 3 would be the same as described above for CEQA. The construction and operation of Alterative 1, 2, or 3 would have beneficial to not adverse effects on GSP implementation.

8.5 References

8.5.1. Printed References

Antone, G., Madea, L., Bethurem, N., Brown J., Fullton, A., Lawrence S., Staton K., Spangler D., Ehorn B., McManus D., Hull R., 2012. *Coordinated AB 3030 Groundwater*

Management Plan 2012. Prepared for Tehama County Flood Control & Water Conservation District Board of Directors.

California Department of Water Resources. 2020a. *California's Groundwater*. Bulletin 118-03. Antelope Creek and Funks Creek Basins; Colusa, Red Bluff and Yolo Subbasins. Available: https://water.ca.gov/Programs/Groundwater-Management/Bulletin-118. Accessed: January 21, 2021.

California Department of Water Resources. 2020b. *Well Completion Reports Map Application*. Colusa, Red Bluff and Yolo Subbasins. https://dwr.maps.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37. Accessed: January 21, 2021.

California Department of Water Resources. 2019. *Sustainable Groundwater Management Act (SGMA) Basin Prioritization Data*. Colusa, Red Bluff, and Yolo subbasins. Available: https://data.cnra.ca.gov/dataset/sgma-basin-prioritization. Accessed: January 13, 2021.

California Water Boards. 2020. *Groundwater Ambient Monitoring and Assessment Program (GAMA)*. Groundwater Information System. Colusa, Red Bluff and Yolo Subbasins. Available: https://gamagroundwater.waterboards.ca.gov/gama/gamamap/public/. Accessed: January 29, 2021.

Dudley, T. 2000. *Basin Management Objective (BMO) Method of Groundwater Basin Management*. Version 1.02.

Ekmekci, M. 1990. Impact of Quarries on Karst groundwater Systems. Proceedings of the Antalya Symposium and Field Seminar, October 1990.

Fahey, M. 2012. *Colusa Basin Watershed Management Plan*. December 2012. Prepared by the Colusa County Resource Conservation District.

Glenn County Water Advisory Committee. 2001. *Basin Management Objective (BMO) For Groundwater Surface Elevations in Glenn County, California*. August 21, 2001. Prepared for the Glenn County Board of Supervisors.

Green, J., Pavlish, J., Leete, J., and Alexander, Jr., E. 2003. Quarrying Impacts on Groundwater Flow Paths. Sinkholes and the Engineering and Environmental Impacts of Karst: pp. 216-222. Proceedings of the Ninth Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst, held in Huntsville, Alabama, September 6-10, 2003.

Sites Project Authority and Bureau of Reclamation. 2017. *Sites Reservoir Project Draft EIR/EIS, Chapter 10, Groundwater Resources*. Available: https://3hm5en24txyp2e4cxyxaklbs-wpengine.netdna-ssl.com/wp-content/uploads/2018/03/10-GW_Res_SitesDraftEIR-EIS_August2017.pdf. Accessed: January 8, 2021.

The Nature Conservancy. 2020. *Colusa Multi-Benefit Groundwater Recharge: Project Area*. Prepared for Colusa Groundwater Authority. August 21, 2020

Yolo County Flood Control and Water Conservation District. 2006. *Groundwater Management Plan*. Final. June 2006.

8.5.2. Personal Communications

Rude, Pete. Civil Engineer and Principal Project Manager. Jacobs, Redding, CA. February 8, 2021—Email to Lyna Black, Project Manager/Environmental Planner, Jacobs, Redding, CA.

Chapter 9 Vegetation and Wetland Resources

9.1 Introduction

This chapter describes the environmental setting, methods of analysis, and impact analysis for vegetation and wetland resources that would potentially be affected by the construction and operation of the Project. Vegetation and wetland resources are defined as natural communities, wetlands and non-wetland waters of the United States and of the State, special-status plant species, and invasive plant species.

The study area for vegetation and wetland resources consists of areas of disturbance under Alternatives 1, 2, and 3 plus a 300-foot-wide buffer. The offsite borrow areas that would be aggregate sources for dam construction are not included in the study area for vegetation and wetland resources because the offsite borrow areas are existing active locations. Therefore, obtaining aggregate from these offsite locations during Project construction would not result in additional impacts on vegetation and wetland resources.

Tables 9-1a and 9-1b summarize the CEQA determinations and NEPA conclusions for construction and operation impacts, respectively, between alternatives.

Table 9-1a. Summary of Construction Impacts and Mitigation Measures for Vegetation and Wetland Resources

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Impact VEG-1: Substantial adverse effect (i.e., loss or removal), either directly or through habitat modifications, on plant species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service			
No Project	NI NE	-	NI NE

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Alternative 1	S SA	**Mitigation Measure VEG-1.1:** Conduct Appropriately Timed Surveys for Special-Status Plant Species Prior to Construction Activities **Mitigation Measure VEG-1.2:** Establish Activity Exclusion Zones Around Special-Status Plants in Temporary Impact Areas and Compensate for Permanent Impacts on Special-Status Plants	LTSM NE
Alternative 2	S SA	Same as Alternative 1	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE
Impact VEG-2: Substantial adverse effect (i.e., loss or removal) on any riparian habitat or other sensitive natural community			
No Project	NI NE	-	NI NE
Alternative 1	S SA	**Mitigation Measure VEG-2.1**: Conduct Surveys for Sensitive Natural Communities and Oak Woodlands in the Project Area Prior to Construction Activities **Mitigation Measure VEG-2.2:** Avoid and Compensate for Adverse Effects on Sensitive Natural Communities	SU SA
Alternative 2	S SA	Same as Alternative 1	SU SA
Alternative 3	S SA	Same as Alternative 1	SU SA
Impact VEG-3: Substantial adverse effect (i.e., loss or removal) on state or federally protected wetlands			

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
No Project	NI NE	-	NI NE
Alternative 1	S SA	**Mitigation Measure VEG-3.1:** Avoid and Minimize Disturbance of Wetlands and Non-Wetland Waters During Construction Activities **Mitigation Measure VEG-3.2**: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Wetlands **Mitigation Measure VEG-3.3:** Compensate for Temporary and Permanent Impacts on State- or Federally Protected Non-Wetland Waters	LTSM NE
Alternative 2	S SA	Same as Alternative 1	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE
Impact VEG-4: Conflict with any local policies or ordinances protecting vegetation resources (including wetlands and non-wetland waters), such as a tree preservation policy or ordinance			
No Project	NI NE	-	NI NE
Alternative 1	S SA	**Mitigation Measure VEG-2.1**: Conduct Surveys for Sensitive Natural Communities and Oak Woodlands in the Project Area Prior to Construction Activities **Mitigation Measure VEG-4-1:** Avoid and Minimize Potential Adverse Effects on Oak Woodlands During Construction **Mitigation Measure VEG-4-2** Compensate for Adverse Effects on Oak Woodlands	SU SA
Alternative 2	S SA	Same as Alternative 1	SU SA
Alternative 3	S SA	Same as Alternative 1	SU SA
Impact VEG-5: Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan			
No Project	NI NE	-	NI NE

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Alternative 1	S SA	**Mitigation Measure VEG-2.1**: Conduct Surveys for Sensitive Natural Communities and Oak Woodlands in the Project Area Prior to Construction Activities **Mitigation Measure VEG-2.2:** Avoid and Compensate for Adverse Effects on Sensitive Natural Communities **Mitigation Measure VEG-3.1:** Avoid and Minimize Disturbance of Wetlands and Non-Wetland Waters During Construction Activities **Mitigation Measure VEG-3.2**: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Wetlands **Mitigation Measure VEG-3.3:** Compensate for Temporary and Permanent Impacts on State- or Federally Protected Non-Wetland Waters **Mitigation Measure VEG-4-1:** Avoid and Minimize Potential Adverse Effects on Oak Woodlands **Mitigation Measure VEG-4.2** Compensate for Adverse Effects on Oak Woodlands	LTSM NE
Alternative 2	S SA	Same as Alternative 1	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE
Impact VEG-6: Introduction or increased spread of invasive plant species			
No Project	NI NE	-	NI NE
Alternative 1	LTS NE	-	LTS NE
Alternative 2	LTS NE	-	LTS NE
Alternative 3	LTS NE	-	LTS NE

Notes:
NI = CEQA determination of no impact
LTS = CEQA determination of less-than-significant impact
S = CEQA determination of significant impact
LTSM = CEQA determination of less than significant with mitigation

SU = CEQA determination of significant and unavoidable
B = NEPA conclusion of beneficial effects
NE = NEPA conclusion of no effect or no adverse effect
AE = NEPA conclusion of adverse effect
SA = NEPA conclusion of substantial adverse effect

Table 9-1b. Summary of Operations Impacts and Mitigation Measures for Vegetation and Wetland Resources

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Impact VEG-1: Substantial adverse effect (i.e., loss or removal), either directly or through habitat modifications, on plant species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service			
No Project	NI NE	-	NI NE
Alternative 1	S SA	**Mitigation Measure VEG-1.3:** Establish Activity Exclusion Zones Around Special-Status Plants Prior to Vegetation Maintenance Activities	LTSM NE
Alternative 2	S SA	Same as Alternative 1	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE
Impact VEG-2: Substantial adverse effect (i.e., loss or removal) on any riparian habitat or other sensitive natural community			
No Project	NI NE	-	NI NE
Alternative 1	S SA	**Mitigation Measure VEG-2.3:** Establish Activity Exclusion Zones Around Sensitive Natural Communities Prior to Vegetation Maintenance Activities	LTSM NE
Alternative 2	S SA	Same as Alternative 1	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE
Impact VEG-3: Substantial adverse effect (i.e., loss or removal) on state or federally protected wetlands			
No Project	NI NE	-	NI NE
Alternative 1	S SA	**Mitigation Measure VEG-3.4:** Establish Activity Exclusion Zones Around Wetlands and Non-Wetland Waters in Vegetation Maintenance Areas	LTSM NE

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Alternative 2	S SA	Same as Alternative 1	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE
Impact VEG-4: Conflict with any local policies or ordinances protecting vegetation resources (including wetlands and non-wetland waters), such as a tree preservation policy or ordinance			
No Project	NI NE	-	NI NE
Alternative 1	S SA	**Mitigation Measure VEG-4.3:** Establish Activity Exclusion Zones Around Blue Oak Woodlands in Vegetation Maintenance Areas	LTSM NE
Alternative 2	S SA	Same as Alternative 1	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE
Impact VEG-5: Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan			
No Project	NI NE	-	NI NE
Alternative 1	NI NE	-	NI NE
Alternative 2	NI NE	-	NI NE
Alternative 3	NI NE	-	NI NE
Impact VEG-6: Introduction or increased spread of invasive plant species			
No Project	NI NE	-	NI NE
Alternative 1	LTS NE	-	LTS NE
Alternative 2	LTS NE	-	LTS NE
Alternative 3	LTS NE	-	LTS NE

Notes:
NI = CEQA determination of no impact
LTS = CEQA determination of less-than-significant impact
S = CEQA determination of significant impact
LTSM = CEQA determination of less than significant with mitigation
SU = CEQA determination of significant and unavoidable
B = NEPA conclusion of beneficial effects

NE = NEPA conclusion of no effect or no adverse effect
AE = NEPA conclusion of adverse effect
SA = NEPA conclusion of substantial adverse effect

9.2 Environmental Setting

This section describes the environmental setting for the vegetation and wetland resources in the study area. The environmental setting is composed of the physical setting, vegetation and wetland resource types, sensitive natural communities, wetlands and non-wetland waters, special-status plant species, and invasive plant species.

Appendix 9A, *Special-Status Species*, provides the species lists used to determine the special-status plant species with the potential to occur in the study area, special-status plant table, and species accounts. Appendix 9B, *Vegetation and Wetland Methods and Information*, contains the methods and sources of information for identifying the land cover types in the study area, as well as descriptions of vegetation communities (including sensitive natural communities), wetlands, non-wetland waters, unvegetated land cover types, and invasive plants.

9.3 Physical Setting

The physical setting for the study area is composed of its geography, topography, hydrology, soils, and climate. The geographic subdivisions of California that encompass the study area are the Inner North Coast Ranges District of the Northwestern California Region and the Sacramento Valley Subregion of the Great Central Valley Region, which are both in the California Floristic Province (Baldwin et al. 2012). The study area occurs in the Coast Range foothills surrounding the Antelope Valley and in a long swath of the northwestern Sacramento Valley. The topography of the study area varies from west to east. The west side of the study area is characterized by low rolling foothills and elevations range from approximately 400 to 800 feet above mean sea level (msl) in the hills surrounding Antelope Valley to 200 feet above msl in the Funks Reservoir area. From the Funks Reservoir, the valley gently slopes to the study area's lowest point, which is approximately 30 feet above msl at the eastern edge of the study area, along the Sacramento River south of Dunnigan.

Streams in the central and eastern parts of the study area include Stone Corral Creek and its tributary Funks Creek, which cross Antelope Valley and drain to the Sacramento Valley. Antelope Creek extends north through Antelope Valley and drains to Stone Corral Creek. Wilson Creek and Grapevine Creek are in the western part of the study area. Wilson Creek, which follows the northern half of the South Road alignment, is tributary to Squaw Creek and the East Park Reservoir, which is west of and outside the study area. Grapevine Creek follows the southern half of the South Road alignment. The downstream section of Stone Corral Creek and most of Antelope Creek are supported by groundwater and remain inundated or saturated throughout the year, while the other named streams flow primarily during the winter and spring,

with some reaches becoming dry during the summer and fall. Streams in the study area support riparian woodland and wetlands. Numerous unnamed intermittent and ephemeral streams also drain the study area, and many are tributary to the named streams. Canals in the study area that carry flows to and from reservoirs include the GCID Main Canal and the TC Canal. Numerous agricultural ditches supply water to orchards, rice fields, row crops, and vineyards in the study area. Additional discussion of creek hydrology in the study area is provided in Chapter 5, *Surface Water Resources.*

The soils in the eastern portion of the study area were formed in flood basins and terraces (Natural Resources Conservation Service 2020a). Most of the soils that formed in the flood basins have been levelled for rice production and are subject to flood control improvements (Natural Resources Conservation Service 2006:16). They are generally clayey, and some have a high sodium content (Natural Resources Conservation Service 2020a). Soils in the western portion of the study area, including Antelope Valley, are on gentle to very steep slopes. Most of the soils are clayey (Natural Resources Conservation Service 2020a). Serpentine soils, which occur intermittently in the Coast Ranges, are upslope from the lower elevations and outside the study area. Chapter 12, *Geology and Soils,* provides additional information on soils in the project construction area.

The climate in the study area is characterized by hot, dry summers and cool, relatively wet winters, depending on the water year type. Data from two weather stations, one north (Stony Gorge Reservoir, California) and one east (Colusa 2 SSW, California) of the study area, were reviewed for temperature and precipitation averages (Natural Resources Conservation Service 2020a, 2020b). The average high temperatures range from between 95.2°F and 94°F in July to between 55.2°F and 55.6°F in January, and the average low temperatures range from between 32.4°F and 36.6°F in December to between 59.1°F and 60.3°F in July. The average annual precipitation is from 16.37 to 22.51 inches, with precipitation falling mostly as rain with less than 1 inch of snow, primarily between October and May (Natural Resources Conservation Service 2020b, 2020c).

9.3.1 Vegetation and Wetland Resource Types in the Study Area

The study area and vicinity are predominantly vegetated by natural and agricultural vegetation. Property access restrictions precluded field investigations of vegetation and wetland resources in the study area since the preparation of the 2017 Draft EIR/EIS. The information on the types and extent of vegetation and wetland resources in the study area presented in this RDEIR/SDEIS is primarily based on the results of previous surveys of parts of the study area conducted between 1998 and 2003 (California Department of Water Resources 2000a, California Department of Water Resources 2000b, Sites Project Authority and U.S. Bureau of Reclamation 2017) and on the interpretation of recent high-resolution aerial imagery of the entire study area.

The study area contains 28 mapped land cover types that are shown in Figure 9B-1 and are listed in Table 9B-1, which also provides acreage estimates for each type (Appendix 9B). All land cover type acreages are preliminary, particularly for the wetland and non-wetland water types,

which are subject to change pending field review and verification by the U.S. Army Corps of Engineers (USACE) and State Water Resources Control Board (State Water Board).

The most abundant plant community in the study area is annual grassland, with areas of oak savanna and blue oak woodlands becoming more common as elevations increase from east to west and eventually transitioning to chamise and foothill pine in the westernmost part of the study area. Riparian woodland and wetlands are present along most of the major creeks including Antelope Creek, Funks Creek, Grapevine Creek, and Stone Corral Creek. Open water types in the survey area include Funks Reservoir, GCID Main Canal, TC Canal, Salt Pond, and small ponds. Seasonal wetlands are located in grasslands and topographic lows where clay soils are present. To the east, agricultural areas containing rice and orchards are the most abundant land cover type.

9.3.2 Sensitive Natural Communities

Sensitive natural communities are habitats that are considered sensitive because of their high species diversity, high productivity, unusual nature, limited distribution, or declining status. Local, state, and federal agencies consider these habitats important and generally require compensation for loss of sensitive communities. The California Natural Diversity Database (CNDDB) contains a current list of rare natural communities throughout the state (California Department of Fish and Wildlife 2020). U.S. Fish and Wildlife Service (USFWS) considers certain habitats, such as riparian and wetland communities, important to wildlife. The USACE and U.S. Environmental Protection Agency consider stream habitats important for water quality and wildlife. The acreages and rarity ranks for the sensitive natural communities identified in the study area are shown in Tables 9B-1 and 9B-2, respectively (Appendix 9B).

One sensitive natural community, upland riparian, is mapped in the study area. Upland riparian in the study area may be classified as either Fremont cottonwood forest (S3), Goodding's willow – red willow riparian woodland and forest (S3), and/or California rose briar patches (G3 S3). This riparian community may also function as shaded riverine aquatic (SRA) cover for fish species, as described in detail in Chapter 11, *Aquatic Biological Resources*, for Impact FISH-1 under "Loss of Riparian Vegetation (Including SRA Cover) and Increased Water Temperature."

Three other common upland vegetation types are also identified as having the potential to contain sensitive natural communities: (1) annual grassland with potential for California brome–blue wildrye prairie (G3 S3), gum plant patches (G2, G3 S2, S3), needlegrass–melic grass grassland (G3 S3), and white-tip clover swales (G3? S3?); (2) foothill pine with potential for foothill pine-herbaceous association (Provisional Alliance); and (3) oak savanna with potential for valley oak woodland and forest (G3 S3).

9.3.3 Wetlands and Non-Wetland Waters

Wetlands and non-wetland waters in the study area are subject to regulation as waters of the United States and waters of the state that fall in the jurisdictions of the USACE and the State Water Board, respectively. The wetland and non-wetland water resources regulated by these agencies may vary because of differences in federal and state laws and regulations. The

regulations relating to wetlands and non-wetland waters are described in Chapter 4, *Regulatory and Environmental Compliance: Project Permits, Approvals, and Consultation Requirements*.

Wetland types identified in the study area that are subject to federal and/or state regulations include forested wetland, freshwater marsh, managed wetland, scrub-shrub wetland, and seasonal wetland. The forested wetland and scrub-shrub wetland types are riparian habitats that may also function as SRA cover for fish species, as described for Impact FISH-1 in Chapter 11, *Aquatic Biological Resources*.

Non-wetland waters identified in the study area that are subject to federal and/or state regulations include canal, ditch, pond, reservoir, ephemeral stream, intermittent stream, and perennial stream. The acreages of wetlands and non-wetland waters presented are preliminary, as the aquatic resources delineation has not been completed with onsite surveys or jurisdictional review by the USACE and State Water Board.

9.3.4 Special-Status Plant Species

For the purpose of this RDEIR/SDEIS, special-status plant species are defined as those in one or more of the following categories.

- Species listed or proposed for listing as threatened or endangered under Endangered Species Act (ESA) (50 Code of Federal Regulations 17.12, and various notices in the Federal Register [FR]).
- Species that are candidates for possible future listing as threatened or endangered under ESA (85 FR 73164, November 16, 2020).
- Species listed or proposed for listing by the State of California as threatened or endangered under CESA (14 California Code of Regulations 670.5).
- Plants listed as rare under the California Native Plant Protection Act (California Fish and Game Code 1900 et seq.).
- Plants with a California Rare Plant Rank (CRPR) of 1 or 2, which are plants considered by CDFW and CNPS to be “rare, threatened, or endangered in California” (California Native Plant Society 2020).
- Plants with a CRPR of 3 or 4, which are plants identified by CDFW and CNPS about which more information is needed to determine their status, and plants of limited distribution and may be included as special-status species on the basis of local significance or recent biological information.

Table 9A-1 (Appendix 9A) lists the 42 special-status plant species that occur in or within 5 miles of the study area. Please refer to Table 9A-1 for the scientific names of the special-status species. The special-status species were identified based on the CNDDB records query (California Department of Fish and Wildlife 2021), California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants (2020) search, the USFWS species list (U.S. Fish and Wildlife Service 2021), and review of species distribution and habitat requirements data.

Surveys for special-status plant species were conducted between 1998 and 2003 in parts of the study area (California Department of Water Resources 2000a; Sites Project Authority and U.S. Bureau of Reclamation 2017), but not all parts of the study area were included in these surveys and more recent surveys have not been performed. Therefore, all species identified as present in the study area vicinity were evaluated for their potential to occur in the study area itself, based on the known range of each species and their habitat associations, as well as the previous survey data. The following sections focus on the two federally and/or state listed species with potential to occur in the study area. Twenty-eight of the non-listed species are not known to be present in the study area and have low or no potential to occur in the study area. These 28 species are not addressed further. The other 12 non-listed, special-status plant species have moderate to high potential to occur in the study area.

9.3.4.1 Keck's Checkerbloom

Keck's checkerbloom (also referred to as Keck's checkermallow) is listed as endangered under ESA (65 FR 7764, February 16, 2000); it is not listed under CESA. The species was thought to be restricted to three sites in Fresno and Tulare Counties at the time of its listing, and critical habitat for the species is located in those counties (68 FR 12875–12880, March 18, 2003). Subsequent taxonomic studies have concluded that the species also occurs in the southern Inner North Coast Ranges in Colusa, Napa, Solano, and Yolo Counties (Hill 2015). There are 50 occurrences, five of which are within 5 miles of the study area. Keck's checkerbloom grows in grasslands and on grassy slopes in blue oak woodland, generally on clay soils, and sometimes on soils derived from serpentinite. Grasslands, blue oak woodland, and oak savanna in the study area are potential habitat for this species.

Botanical surveys of the Sites Reservoir project area were conducted prior to Keck's checkerbloom being listed and before it was recognized to occur in northern California. Consequently, these surveys identified all checkerbloom plants in the area as fringed checkerbloom (*Sidalcea diploscypha*) (California Department of Water Resources 2000a), a common species that is similar in appearance to Keck's checkerbloom, so that any potential occurrences of Keck's checkerbloom in the survey area were not mapped.

A species habitat model developed for Keck's checkerbloom can be used to predict locations of suitable habitat in the study area. The model presently considers annual grassland, blue oak woodland, and oak savanna communities where the soil map unit Cibo-Ayar-Altamont also occurs. This map unit includes soils with high clay content that represent potentially suitable microhabitat for Keck's checkerbloom.

9.3.4.2 Palmate-Bracted Bird's Beak

Palmate-bracted bird's-beak is federally listed as endangered (51 FR 23769, July 1, 1986). It is also state listed as endangered. This species was listed under the name *Cordylanthus palmatus* but is now known as *Chloropyron palmatum.* No critical habitat has been designated for this species. The species is known from 25 occurrences, eight of which are extirpated (i.e., destroyed) or possibly extirpated. These occurrences are present at widely separated locations in the Central Valley, ranging from Glenn County to Fresno County. Three occurrences are present within 5

miles of the study area. Habitat for the species is iodine bush scrub and alkaline meadow. Palmate-bracted bird's-beak was not found in the study area (California Department of Water Resources 2000a), and there is potential for this species to occur in alkali seasonal wetlands in the current study area. A species habitat model developed for palmate-bracted bird's-beak can be used to predict where suitable habitat is present in the study area. The model considers seasonal wetlands and intermittent streams where Capay soils are present. Capay soils are generally alkaline.

9.3.5 Invasive Plant Species

The California Invasive Plant Council defines invasive species as plants that are not native to an environment, and once introduced, establish, quickly reproduce and spread, and cause harm to the environment, economy, or human health. Table 9B-5 (Appendix 9B) lists species of invasive plant species that have been observed in the study area or are documented from Glenn or Colusa Counties and occur in land cover types similar to those in the study area (California Invasive Plant Council 2021, CalFlora 2021). Please refer to that table for the scientific names of invasive plant species. Thirty-two of these species were identified in the study area during botanical resource surveys conducted between 1998 and 2003 (California Department of Water Resources 2000a; Sites Project Authority and U.S. Bureau of Reclamation 2017). Nearly all plant communities in the study area support invasive plant species, although some have more extensive invasive plant infestations than others. Annual grassland in the inundation area supports invasive grass species such as ripgut and other bromes, hedgehog dogtail, and medusahead, as well as invasive forbs, such as yellow star-thistle, which is widespread (Sites Project Authority and U.S. Bureau of Reclamation 2017). Italian thistle, bull thistle, and other nonnative thistles are common in the grassland understory of oak woodland at the edges of the Sites Reservoir inundation area. Ruderal areas by roads in grassland understory of blue oak woodlands can become infested with milk thistle, olive, California bur-clover, cutleaf geranium, and invasive thistles and mustards. Edges of agricultural fields, ranches or homesteads, and roadsides through agricultural areas are also vulnerable to infestations of many invasive species. Wetlands in the study area may support hyssop loosestrife and Himalayan blackberry. Upland riparian habitat may support tree-of-heaven, giant reed, and tree tobacco.

9.4 Methods of Analysis

The methods for analysis of impacts on vegetation and wetland resources are organized into direct and indirect impacts. Direct impacts are those effects that would be directly caused by Project construction and operation even if it took time for the resulting effect to develop (e.g., filling of the reservoir over a 20-year period). Indirect impacts are those that would occur either later in time or at a distance from the area where direct impacts would occur but are reasonably foreseeable, such as erosion and alteration of existing hydrology. Direct and indirect impacts may be either permanent or temporary. Impacts on vegetation and wetland resources are generally considered temporary where they would be restored to preconstruction conditions within 1 year. The study area and land cover mapping area for vegetation and wetland resources includes a 300-foot-wide buffer outside of the temporary and permanent impact areas. The buffer

area was assessed for potential temporary and indirect impacts on vegetation and wetland resources.

9.4.1 Construction

Direct permanent impacts on natural communities, wetlands, and non-wetland waters were assessed using the estimated amount of land cover that would be converted by Project construction. Construction impacts include both construction of new facilities and filling of the reservoir. Temporary impacts on natural communities, wetlands, and non-wetland waters were calculated using the estimated amount of land cover that would be temporarily disturbed during Project construction but would be restored to pre-Project conditions within 1 year of disturbance. Temporarily affected areas that would ultimately be inundated by the Sites Reservoir were included in the permanent impact area to avoid double counting acreages, and because these areas would ultimately be permanently affected. The impact analysis assumed that the conditions on parcels of land surrounding the reservoir would be maintained similar to existing conditions (e.g., as grazing lands). In addition, temporary impacts on special-status plants from ground disturbance, even if followed by restoration, would constitute a permanent impact, unless the particular species benefits from disturbance.

Impacts on vegetation and wetland resources were calculated using geographic information system (GIS) software. The Project footprint and associated temporary impact areas were overlaid on the land cover mapping data to quantify the permanent and temporary impacts associated with the construction of the Project facilities.

Impacts on occurrences of special-status plants known to occur in the study area were based on previous survey results and CNDDB occurrence data. Special-status plant species identified as having moderate to high potential to occur in the study area were included in the impact analysis. The full extent of impacts on special-status plants is currently unknown because recent botanical surveys for special-status plants have not been conducted throughout the study area. The extent of impacts cannot be calculated based on the current available data; therefore, the impact assessment is qualitative.

The following assumptions and alternative details regarding specific Project components were applied to the impact analysis:

- Construction of the TC Canal diversion pumps would not affect any areas of natural communities, wetlands, or non-wetland waters because construction would occur within the existing facility footprint. This area is not considered further in this analysis.
- Temporary impacts from the use of coffer dams in Stone Corral and Funks Creeks during dam construction are included in the impacts shown in Tables 9-2b and 9-4b.
- Impacts from construction of TRR East are included in the impacts shown in Tables 9-2a and 9-2b for Alternatives 1 and 3. Impacts from construction of TRR West are included in the impacts shown in Tables 9-4a and 9-4b for Alternative 2.

- Impacts in the north-south transmission line and the east-west transmission line would be primarily temporary for installation of new high-voltage electrical transmission lines to power the regulating reservoirs. Only one of the two alignments described in Chapter 2 would be constructed. Small areas for new transmission line towers would be required in the alignment, but specific locations are currently unknown. The maximum permanent impact from the towers would total less than 0.01 acre and is largely within annual grassland, therefore the potential permanent impact on special-status plants, sensitive natural communities, wetlands, and non-wetland waters would be much less than 0.01 acre. The entire area of the transmission line alignments is included in the temporary impacts shown in Tables 9-2b and 9-4b. Final Project design for placement of the new towers within the transmission line alignments would avoid special-status plants, sensitive natural communities, wetlands, and non-wetland waters to the extent feasible.
- Quarries located outside the inundation area would be regraded and allowed to revegetate at the bottoms, but they would not return to pre-Project conditions.
- Offsite borrow areas would be in existing commercial facilities and would not impact land cover.
- The inundation area would replace natural communities, wetlands, and non-wetland waters with open water. Alternative 1 or 3 would permanently flood a larger area than Alternative 2.
- The footprints for the Peninsula Hills, Stone Corral Creek, and day-use boat ramp/parking recreation areas represent the total area that could be used for recreation activities. Only part of each footprint would experience a permanent loss of vegetation for the construction of camp sites, picnic areas, hiking trails, potable water source, utility connections, and kiosk (at Peninsula Hills and Stone Corral Creek Recreation Areas), and toilets.
- New road construction would result in permanent loss of existing vegetation in the entire construction disturbance area, and improvements to existing roads would affect only the area to the edges of the right-of-way. The exact locations of the realigned Huffmaster Road, new Comm Road South, and new South Road are not yet finalized. Therefore, corridors have been used to identify potential direct and indirect impacts. For example, on the South Road a 400-foot-wide conceptual road alignment plus a 300-foot-wide buffer has been identified to allow for design flexibility. Because the final South Road corridor is unknown, the entire corridor was assumed to be permanently affected for the purposes of the impact analysis. Within the corridors, the actual permanent impact area would be only the footprint of roads and shoulders with additional temporarily affected areas for construction staging and equipment movement.

The following BMPs, which are described in Appendix 2D, *Best Management Practices*, are incorporated into the analysis of potential construction and operations impact on vegetation and wetland resources.

- Salvage, Stockpile, and Replace Topsoil and Prepare a Topsoil Storage and Handling Plan – requires evaluation of topsoil for salvaging suitability and storage and handling plans when topsoil cannot be used without stockpiling.
- Develop and Implement Stormwater Pollution Prevention Plan(s) (SWPPP) and Gain Coverage under Stormwater Construction General Permit (Storm Water and Non-Storm Water) – requires development and use of erosion control measures, sediment control measures, construction materials management measures, waste management measures, non-stormwater control measures, and post-construction stormwater management measures.
- Develop and Implement Spill Prevention and Hazardous Materials Management/Accidental Spill Prevention, Containment, and Countermeasure Plans (SPCCPs) and Response Measures – requires site-specific plans with measures to minimize effects from spills of hazardous or petroleum substances during construction and operation/maintenance.
- Worker Environmental Awareness Program (WEAP) – requires training of all construction crews and contractors on protection and avoidance of biological, cultural, archaeological, paleontological, and other sensitive resources.
- Construction Best Management Practices and Monitoring for Fish, Wildlife, and Plant Species Habitats, and Natural Communities – requires a construction monitoring plan for sensitive biological resources and in-water construction activities, use of exclusion fencing around sensitive biological resources, and measures for construction personnel to protect wildlife.
- Control of Invasive Plant Species during Construction and Operation – requires identification of invasive plant infestations, measures for handling removed invasive plants during construction, and control of invasive aquatic plants during operation of Sites Reservoir.

9.4.2 Operation

Because operation of the Project would not involve additional earth-moving or substantial disturbance of new areas beyond those that would be disturbed during construction, acreage impacts due to operation were not assessed. The operation phase would include primarily changes in water diversions to Sites Reservoir, energy generation and use, and routine tasks to maintain the facilities after construction according to operations and maintenance plans to be developed. Maintenance would include vegetation control and grazing around all facilities, recreation areas, and a 100-foot buffer around the facilities. These activities would affect undeveloped land where sensitive natural communities, wetlands and non-wetland waters, or special-status plants could occur. Public use of recreation areas could affect areas that support special-status plants, sensitive natural communities, or wetlands and non-wetland waters, impacts that could result during operation of recreation areas were considered.

9.4.3 Thresholds of Significance

An impact on vegetation resources (including wetlands and non-wetland waters) would be considered significant if the Project would:

- Have a substantial adverse effect, either directly or through habitat modifications, on any plant 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 state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.
- Conflict with any local policies or ordinances protecting vegetation resources, such as a tree preservation policy or ordinance.
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.
- Introduce or increase the spread of invasive plant species.

9.5 Impact Analysis and Mitigation Measures

Impact VEG-1: Substantial adverse effect (i.e., loss or removal), either directly or through habitat modifications, of plant species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service

No Project

The No Project Alternative would not construct or operate any new facilities. Special-status plants occur in the study area. Because the No Project Alternative would not construct or operate new facilities, there would be no temporary impacts on special-status plants from temporary construction staging or other disturbance or permanent impacts from placement of facilities that would remove special-status plants.

Significance Determination

Under the No Project Alternative, no new facilities would be constructed or operated, and there would be no temporary or permanent impacts due to the Project. The No Project Alternative would have no impact on special-status plants.

Alternatives 1 and 3

The extent of permanent and temporary impacts, quantified as described above in Section 9.3, *Methods of Analysis*, of Alternatives 1 and 3 is shown in Tables 9-2a and 9-2b. All land cover type acreages are preliminary, particularly for the wetland and non-wetland water types, which are subject to change pending field review and verification by the USACE and State Water Board.

Table 9-2a. Alternatives 1 and 3 Acreages of Permanent Impacts on Special-Status Plant Habitats, Sensitive Natural Communities, and Wetland and Non-Wetland Water Types in Project Component Areas

Project Components	Annual Grassland[1]	Blue Oak Woodland	Canal	Chamise Chaparral	Ditch	Foothill Pine[1]	Forested Wetland	Freshwater Marsh	Managed Wetland	Mixed Chaparral	Oak Savanna[1]	Pond	Reservoir	Scrub-Shrub Wetland	Seasonal Wetland	Perennial Stream	Intermittent Stream	Ephemeral Stream	Upland Riparian[1]
Sacramento River Diversion and Conveyance to Regulating Reservoirs	0	0	<1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Regulating Reservoirs and Conveyance Complex	6	0	2	0	1	0	0	<1	0	0	0	0	<1	<1	1	<1	<1	<1	0
Sites Reservoir Inundation Area	11,271	159	<1	<1	<1	0	2	38	0	0	282	36	0	6	256	23	164	22	46
Inlet/Outlet Works	23	0	0	0	0	0	0	0	0	0	2	0	0	0	<1	0	<1	<1	<1
Dams and Dikes	154	5	0	0	0	0	<1	1	0	0	4	<1	0	<1	11	1	3	1	2
Quarries and	409	0	0	0	0	0	0	<1	0	0	17	0	0	<1	2	0	4	2	0

Project Components	Annual Grassland[1]	Blue Oak Woodland	Canal	Chamise Chaparral	Ditch	Foothill Pine[1]	Forested Wetland	Freshwater Marsh	Managed Wetland	Mixed Chaparral	Oak Savanna[1]	Pond	Reservoir	Scrub-Shrub Wetland	Seasonal Wetland	Perennial Stream	Intermittent Stream	Ephemeral Stream	Upland Riparian[1]
Rock Processing Facilities																			
Conveyance to Sacramento River	0	0	<1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		<1
Roads	772	97	<1	0	<1	0	3	2	0	1	122	2	0	2	60	<1	10	<1	5
Recreation Areas	460	79	0	0	0	0	0	0	0	0	239	<1	0	<1	<1	0	1	2	4
Alternatives 1 and 3 Total Permanent Impacts	13,095	340	2	<1	2	0	6	42	0	1	666	39	<1	8	329	25	182	27	57

[1] Sensitive natural community or may contain areas that are sensitive natural communities. In annual grassland, there is potential for California brome – blue wildrye prairie, gum plant patches, needlegrass – melic grass grassland, and white-tip clover swales. In foothill pine, there is potential for foothill pine-herbaceous. In oak savanna, there is potential for valley oak woodland and forest.

Table 9-2b. Alternatives 1 and 3 Acreages of Temporary Impacts on Special-Status Plant Habitats, Sensitive Natural Communities, and Wetland and Non-Wetland Water Types in Project Component Areas

Project Components	Annual Grassland[1]	Blue Oak Woodland	Canal	Chamise Chaparral	Ditch	Foothill Pine[1]	Forested Wetland	Freshwater Marsh	Managed Wetland	Mixed Chaparral	Oak Savanna[1]	Pond	Reservoir	Scrub-Shrub Wetland	Seasonal Wetland	Perennial Stream	Intermittent Stream	Ephemeral Stream	Upland Riparian[1]
Sacramento River Diversion and Conveyance to Regulating Reservoirs	0	0	<1	0	<1	0	1	0	0	0	0	0	0	1	0	0	0	0	<1
Regulating Reservoirs and Conveyance Complex	580	0	8	0	<1	0	<1	13	0	0	0	3	223	<1	15	<1	3	1	2
Inlet/Outlet Works	7	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Dams and Dikes	42	2	0	0	0	0	<1	<1	0	0	<1	<1	0	0	2	0	0	<1	<1
Quarries and Rock Processing Facilities	155	0	0	0	0	0	0	1	0	0	1	1	0	<1	19	0	6	<1	0
Conveyance	0	0	<1	0	<1	0	0	0	6	0	0	0	0	0	0	0	3	0	2

Project Components	Annual Grassland[1]	Blue Oak Woodland	Canal	Chamise Chaparral	Ditch	Foothill Pine[1]	Forested Wetland	Freshwater Marsh	Managed Wetland	Mixed Chaparral	Oak Savanna[1]	Pond	Reservoir	Scrub-Shrub Wetland	Seasonal Wetland	Perennial Stream	Intermittent Stream	Ephemeral Stream	Upland Riparian[1]
to Sacramento River																			
Roads	144	21	0	1	0	0	1	<1	0	0	16	0	0	1	0	0	2	1	2
Recreation Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternatives 1 and 3 Total Temporary Impacts	928	23	8	1	1	0	2	14	6	0	19	4	223	2	36	<1	14	2	6

[1] Sensitive natural community or may contain areas that are sensitive natural communities. In annual grassland, there is potential for California brome – blue wildrye prairie, gum plant patches, needlegrass – melic grass grassland, and white-tip clover swales. In foothill pine, there is potential for foothill pine-herbaceous. In oak savanna, there is potential for valley oak woodland and forest.

Construction

Construction of Alternative 1 or 3 would result in direct permanent loss of occupied habitat for bent-flowered fiddleneck and red-flowered bird's-foot trefoil in annual grassland, blue oak woodland, and oak savanna, and of occupied habitat for brittlescale and San Joaquin spearscale in alkali seasonal wetlands. Construction of Alternative 1 or 3 could also result in an undetermined loss of potential habitat for the special-status plants that were assessed as having a moderate to high probability of occurring in the study area (Table 9A-1 lists the special-status species, including their scientific names, and their habitat requirements): Bolander's horkelia, California alkali grass, Colusa layia, deep-scarred cryptantha, Keck's checkerbloom, Konocti manzanita, and Tracy's eriastrum. Potential habitats for these species include annual grassland, blue oak woodland, oak savanna, chamise, mixed chaparral, and seasonal wetland. For federally listed species (Keck's checkerbloom and palmate-bracted bird's-beak), habitat models have been used to identify impacts on suitable species habitat in the study area. Table 9-3 below shows the acreages of direct permanent and temporary impacts on the two modeled plant species. Tables 9-2a and 9-2b show the acreages of direct permanent and temporary impacts on habitats for other special-status plant species in each component area under Alternatives 1 and 3.

Table 9-3. Acreages of Permanent and Temporary Impacts on Modeled Special-Status Plant Species Habitat in the Study Area

	Alternative 1 and 3		Alternative 2	
	Permanent Impacts	**Temporary Impacts**	**Permanent Impacts**	**Temporary Impacts**
Keck's checkerbloom	10,094	700	9,735	682
Palmate-bracted bird's-beak	217	8	214	7

Preconstruction and construction measure BMPs are part of Alternatives 1 and 3 and would limit direct impacts on special-status plants. Construction workers would be trained on the importance of avoiding special-status species and require fencing of sensitive habitats and any occupied special-status plant habitats where avoidance is feasible. The BMPs would also restrict off-road driving in the construction area, where avoided special-status plants could be damaged or destroyed. BMPs for controlling invasive species by removing, bagging, and disposing at a waste facility would reduce the potential for the spread of invasive plant species into occupied special-status plant habitats. The BMPs would also limit indirect impacts on special-status plants by implementing a SWPPP that would protect habitats outside of the construction area from erosion and sedimentation.

These BMPs would not prevent the permanent loss of or degradation of habitat quality for special-status plants in the footprint for Alternatives 1 and 3. Under Alternative 1 or 3, construction of facilities would result in the loss and habitat modification for the four species

known to occur in the affected area (bent-flowered fiddleneck, brittlescale, red-flowered bird's-foot trefoil, and San Joaquin spearscale) through direct removal and habitat quality degradation, which could include disturbance of the seed bank and changes to soil structure and mycorrhizal (symbiotic fungal) systems. Permanent impacts on the species' habitats would result from earth moving and vegetation removal for construction of facilities associated with the regulating reservoirs and conveyance complex, Sites Reservoir and related facilities, recreation areas, and new roads, including Comm Road South and the realigned Huffmaster Road. These permanent impacts would include both the facility footprints and the temporary construction areas where earth-moving would occur. These facilities would result in the permanent loss of occupied special-status plant habitats, including annual grassland, blue oak woodland, oak savanna, and alkaline seasonal wetland in the construction footprint. Alternative 1 or 3 could also result in the direct permanent loss of occupied habitat for seven other special-status species with potential to occur in the construction footprint, including the two federally listed, modeled species, Keck's checkerbloom and palmate-bracted bird's-beak.

Under Alternative 1 or 3, construction activities would also result in the temporary disturbance of special-status plant habitat during construction and reduced habitat quality in the interim between the completion of construction and the establishment of habitat restoration plantings. Temporary impacts on potential special-status plant habitat would occur during construction activities for most facilities, except those associated with the Sacramento River diversion and conveyance to regulating reservoirs. Temporary impacts would result from equipment movement that does not affect living plants or disrupt the soil surface (e.g., driving over dead annual plants). Construction would result in temporary impacts on annual grassland, blue oak woodland, oak savanna, and seasonal wetland. There would be no temporary impacts on special-status plant habitat from the construction of the Sacramento River diversion and conveyance to regulating reservoirs because those facilities already exist and construction activities would be located within existing footprints.

Potential indirect impacts on special-status plants from the construction of Alternative 1 or 3 from changes in the hydrology of special-status plant habitat outside the construction area due to erosion and sedimentation from earth moving during construction would be avoided by implementation of BMPs and the SWPPP.

Operation

Operation of the Sites Reservoir under Alternatives 1 and 3 would not result in additional impacts on special-status plant species beyond those described for construction, including ongoing recreational activities in the three recreation areas after construction and impacts on occupied special-status plant habitat from maintenance activities after construction. Additional operation-phase impacts could occur in undeveloped parts of the recreation areas due to visitor use of spaces outside of the constructed facility. The permanent footprint of these recreation areas is currently at a conceptual design stage, and the actual location of facilities is not yet known. Impacts shown in Table 9-2a include a substantially larger area than would ultimately be part of the recreation area footprints, and much of the designated recreation areas would remain

undeveloped. Because the construction impact acreage assessed for the recreation areas includes all habitat in the recreation area boundaries, therefore, there would be no additional impact on occupied special-status plant habitat in the recreation areas due to operation.

Maintenance of Alternative 1 or 3 facilities could require access that is adjacent to occupied special-status plant habitat. Although 15-foot-wide maintenance roads would be constructed to provide access to the main dams, saddle dams and dikes, I/O Works, and Funks PGP, there is potential for maintenance equipment to cause erosion of or sedimentation into adjacent habitats in the buffer areas and adversely affect vegetation cover and occupied special-status plant habitat quality. The SWPPP would contain erosion and sedimentation control measures that would be required as part of maintenance activities to prevent erosion and sedimentation off site, and these effects would be avoided. Vegetation maintenance activities for land around facilities that involve grading, tilling, disking, or controlled burns could affect special-status plants or occupied special-status habitats if they are present in the vegetation maintenance areas.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 1 or 3 would result in significant impacts on special-status plant species by reducing the number of occurrences of special-status plants and lowering the quality of occupied habitat for bent-flowered fiddleneck, brittlescale, red-flowered bird's-foot trefoil, and San Joaquin spearscale. Construction could also affect potential habitat for additional special-status plant species, including the federally listed Keck's checkerbloom and palmate-bracted bird's-beak. Indirect impacts under Alternative 1 or 3 due to erosion and sedimentation in occupied special-status plant habitats located outside of the construction area would be avoided with implementation of applicable BMPs (e.g., implementation of a SWPPP). The occurrences of special-status plants in the construction footprint are significant because their loss could substantially decrease genetic diversity for the species, particularly the red-flowered bird's-foot trefoil, which is known from only eight locations. While measures would be implemented before and during construction to avoid and minimize impacts on special-status plants, Alternative 1 or 3 would still result in the loss and habitat quality degradation of their habitats. Additionally, the construction footprint has not been completely surveyed for special-status plants, and there is potential for additional species or locations of the known special-status plant species to occur in the footprint and be subject to construction-related impacts. The direct and permanent losses of special-status plants would be a significant impact. Implementation of Mitigation Measures VEG-1.1 and VEG-1.2 would reduce the level of impact to less than significant because all locations of special-status plants in and within 300 feet of the Project footprint would be identified and mapped, and the acquisition and permanent protection of occupied habitat for each affected species at identified ratios would ensure some of the populations of these species would survive in perpetuity.

Operation impacts on special-status plants from erosion and sedimentation would be avoided and applicable BMPs (e.g., implementation of a SWPPP) would be implemented. Operation impacts on special-status plants from vegetation maintenance could result in losses of special-status plants, and this would be a significant impact. Implementation of Mitigation Measure

VEG-1.3 would reduce the level of impact to less than significant because all locations of special-status plants in the vegetation maintenance areas would be identified, fenced, and avoided.

Mitigation Measure VEG-1.1: Conduct Appropriately Timed Surveys for Special-Status Plant Species Prior to Construction Activities

The Authority will employ qualified botanists to conduct special-status plant surveys of the Project footprint, including all permanent and temporary construction impact areas and a 250-foot-wide buffer area to encompass areas where indirect effects may occur. The surveys will be conducted in accordance with *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (California Department of Fish and Wildlife 2021), or the most current protocols. Surveys will occur during the season that special-status plant species would be evident and identifiable, which generally is during their blooming period. The surveys will be conducted no more than 3 years prior to the start of ground-disturbing activities. The results of the surveys will be submitted in a report to CDFW and/or USFWS for review no less than 1 year prior to the start of ground-disturbing activities.

The survey report will include the location and description of all work areas and the location and description of all occupied habitat for special-status plant species. The report will also identify locations where effective avoidance measures could be implemented. In areas where no special-status plant species are present, no further mitigation will be required.

Mitigation Measure VEG-1.2: Establish Activity Exclusion Zones Around Special-Status Plants in Temporary Impact Areas and Compensate for Permanent Impacts on Special-Status Plant Species

Where surveys determine that a special-status plant species is present in or adjacent to an area where temporary ground-disturbing activities would take place, the Authority will avoid Project impacts on the species through the establishment of activity exclusion zones, in which no ground-disturbing activities will take place, including construction staging or other temporary work areas. Activity exclusion zones for special-status plant species will be established around each occupied habitat site, the boundaries of which will be clearly marked with construction exclusion fencing or its equivalent. The establishment of activity exclusion zones will not be required if no construction-related disturbances will occur within 250 feet of the occupied habitat. The size of activity exclusion zones may be reduced through consultation with a qualified biologist and with concurrence from CDFW or, for any federally listed species, from USFWS based on site-specific conditions.

Prior to any activities that would result in permanent impacts on special-status plants, the Authority will acquire and permanently protect compensation habitat for each affected species at a minimum 2:1 ratio (2 acres restored or created for every 1 acre filled), but the

final compensation ratios will be based on site-specific information and determined through coordination with state and/or federal agencies (CDFW, USFWS) during permit processing. Compensation habitat will consist of existing off-site occupied habitat acquired in-fee, through conservation easements, or from a certified conservation bank. The Authority will monitor compensation habitat annually to verify that the habitat suitability is maintained. The Authority will prepare and implement an operations and management plan for each compensation habitat, with funding provided through an endowment. The plan will include requirements to monitor the habitat and determine and implement appropriate management measures to maintain the habitat. The Authority will submit annual monitoring reports to CDFW or, for any federally listed species, to USFWS for review and determination that the Project remains in compliance with the mitigation requirements.

Mitigation Measure VEG-1.3: Establish Activity Exclusion Zones Around Special-Status Plants Prior to Vegetation Maintenance

A qualified botanist employed by the Authority will conduct special-status plant surveys of vegetation maintenance areas in annual grassland, chaparral, oak woodland and savanna, and wetlands at a minimum of every 3 years. If any special-status plants are found in or within 50 feet of the vegetation maintenance areas, the Authority will fence and avoid the plants that could be affected by surface-disturbing maintenance activities.

NEPA Conclusion

The construction and operation effects under Alternative 1 or 3 would be the same as those described above for CEQA. Construction of Alternative 1 or 3 would result in a substantial adverse effect on special-status plant species, but through implementation of BMPs and the Mitigation Measures VEG-1.1 and VEG-1.2 construction effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 could result in a substantial adverse effect on special-status plant species, but through implementation of BMPs and Mitigation Measure VEG-1.3 operation effects would be reduced to no adverse effect.

Alternative 2

The extent of Alternative 2 permanent and temporary impacts, quantified as described above in Section 9.3, *Methods of Analysis,* is shown in Tables 9-4a and 9-4b. All land cover type acreages are preliminary, particularly for the wetland and non-wetland water types, which are subject to change pending field review and verification by the USACE and State Water Board.

Table 9-4a. Alternative 2 Acreages of Permanent Impacts on Special-Status Plant Habitats, Sensitive Natural Communities, and Wetland and Non-Wetland Water Types in Project Component Areas

Project Components	Annual Grassland[1]	Blue Oak Woodland	Canal	Chamise Chaparral	Ditch	Foothill Pine[1]	Forested Wetland	Freshwater Marsh	Managed Wetland	Mixed Chaparral	Oak Savanna[1]	Pond	Reservoir	Scrub-Shrub Wetland	Seasonal Wetland	Perennial Stream	Intermittent Stream	Ephemeral Stream	Upland Riparian[1]
Sacramento River Diversion and Conveyance to Regulating Reservoirs	0	0	<1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
Regulating Reservoirs and Conveyance Complex	181	0	3	0	<1	0	<1	4	0	0	0	0	<1	<1	2	<1	<1	<1	<1
Sites Reservoir Inundation Area	10,648	108	0	0	<1	0	3	38	0	0	209	36	0	9	251	22	160	16	42
Inlet/Outlet Works	24	0	0	0	0	0	0	0	0	0	2	0	0	0	<1	0	<1	<1	<1
Dams and Dikes	83	5	0	0	0	0	<1	<1	0	0	5	0	0	<1	8	1	3	<1	2
Quarries and Rock	437	0	0	0	0	0	0	0	0	0	17	2	0	0	2	0	4	2	0

Processing Facilities																		
Conveyance to Sacramento River	0	0	<1	0	<1	0	0	0	0	0	0	0	0	0	0	<1	0	0	<1
Roads	832	131	1	141	<1	86	1	1	0	8	117	5	0	<1	61	<1	21	4	44
Recreation Areas	450	53	0	0	0	0	0	0	0	0	213	<1	0	<1	0	0	1	2	3
Alternative 2 Total Permanent Impacts	12,655	297	4	141	<1	86	4	43	0	8	563	43	<1	9	323	23	189	24	92

[1] Sensitive natural community or may contain areas that are sensitive natural communities. In annual grassland, there is potential for California brome – blue wildrye prairie, gum plant patches, needlegrass – melic grass grassland, and white-tip clover swales. In foothill pine, there is potential for foothill pine-herbaceous. In oak savanna, there is potential for valley oak woodland and forest.

Table 9-4b. Alternative 2 Acreages of Temporary Impacts on Special-Status Plant Habitats, Sensitive Natural Communities, and Wetland and Non-Wetland Water Types in Project Component Areas

Project Components	Annual Grassland[1]	Blue Oak Woodland	Canal	Chamise Chaparral	Ditch	Foothill Pine[1]	Forested Wetland	Freshwater Marsh	Managed Wetland	Mixed Chaparral	Oak Savanna[1]	Pond	Reservoir	Scrub-Shrub Wetland	Seasonal Wetland	Perennial Stream	Intermittent Stream	Ephemeral Stream	Upland Riparian[1]
Sacramento River Diversion	0	0	<1	0	<1	0	1	0	0	0	0	0	0	1	0	0	0	0	<1

Project Components	Annual Grassland[1]	Blue Oak Woodland	Canal	Chamise Chaparral	Ditch	Foothill Pine[1]	Forested Wetland	Freshwater Marsh	Managed Wetland	Mixed Chaparral	Oak Savanna[1]	Pond	Reservoir	Scrub-Shrub Wetland	Seasonal Wetland	Perennial Stream	Intermittent Stream	Ephemeral Stream	Upland Riparian[1]
and Conveyance to Regulating Reservoirs																			
Regulating Reservoirs and Conveyance Complex	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1
Sites Reservoir Inundation Area	550	0	3	0	<1	0	<1	9	0	0	0	3	223	<1	15	<1	3	1	0
Inlet/Outlet Works	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	<1
Dams and Dikes	34	2	0	0	0	0	<1	<1	0	0	2	<1	0	<1	2	0	<1	<1	0
Quarries and Rock Processing Facilities	98	0	0	1	0	0	<1	<1	0	0	1	<1	0	0	<1	0	1	0	2
Conveyance to Sacramento	0	0	2	0	5	0	0	0	6	0	0	0	0	0	0	0	3	0	2

Project Components	Annual Grassland[1]	Blue Oak Woodland	Canal	Chamise Chaparral	Ditch	Foothill Pine[1]	Forested Wetland	Freshwater Marsh	Managed Wetland	Mixed Chaparral	Oak Savanna[1]	Pond	Reservoir	Scrub-Shrub Wetland	Seasonal Wetland	Perennial Stream	Intermittent Stream	Ephemeral Stream	Upland Riparian[1]
River																			
Roads	226	21	0	0	0	0	<1	1	0	0	16	1	0	<1	17	0	7	1	0
Recreation Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Alternative 2 Total Temporary Impacts	908	23	5	1	5	0	2	10	6	0	20	4	223	2	34	<1	14	2	<1

[1] Sensitive natural community or may contain areas that are sensitive natural communities. In annual grassland, there is potential for California brome – blue wildrye prairie, gum plant patches, needlegrass – melic grass grassland, and white-tip clover swales. In foothill pine, there is potential for foothill pine-herbaceous. In oak savanna, there is potential for valley oak woodland and forest.

Construction

Construction of Alternative 2 would result in direct permanent and temporary impacts and indirect impacts on special-status plant species. Table 9-3 shows the acreages of direct permanent and temporary impacts on the two modeled plant species. Tables 9-4a and 9-4b show the acreages of direct permanent and temporary impacts on each habitat type under Alternative 2. Overall, less acreage would be affected under Alternative 2 as compared to Alternative 1 or 3 but impacts on several habitats would be greater—chamise chaparral, foothill pine, mixed chaparral, pond, shrub-scrub wetland, intermittent stream, and upland riparian. The BMPs for Alternatives 1 and 3 would also apply to Alternative 2. While these preconstruction and construction measures are part of Alternative 2, their implementation would not prevent the permanent and direct loss or habitat quality degradation for special-status plant species in the Alternative 2 footprint.

Construction of Alternative 2 would result in the loss of special-status plant species through direct removal and habitat degradation. The Alternative 2 footprint contains adobe lily, as well as the four special-status plant species discussed for Alternatives 1 and 3. Permanent impacts on special-status plant species would result from construction of the same components as described for Alternatives 1 and 3 with two differences. First, additional permanent impacts from construction of the new South Road under Alternative 2 would result in the loss of annual grassland, chamise, mixed chaparral, blue oak woodland, oak savanna, and seasonal wetland. Second, permanent impacts on special-status plant habitats would be reduced due to the decreased reservoir size and inundation area. Under Alternative 2, temporary and indirect impacts would occur at the same facilities as those as described for Alternatives 1 and 3.

Operation

As described for Alternatives 1 and 3, there would be no additional impact from operation of the recreation areas on special-status plant species under Alternative 2, as the recreation areas would be the same between Alternatives 1, 2, and 3. Impacts of vegetation maintenance would also be the same between Alternatives 1, 2, and 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in similar impacts to Alternatives 1 and 3 except that construction of the South Road would result in greater loss of annual grassland, chamise, mixed chaparral, blue oak woodland, oak savanna, and seasonal wetland, and the smaller reservoir would result in somewhat smaller loss of special-status plant habitats. As with Alternatives 1 and 3, implementation of Mitigation Measures VEG-1.1 and VEG-1.2 would reduce the level of impact to less than significant. Operation impacts on special-status plants would be the same as Alternatives 1 and 3. There would be no impact in the recreation areas, but there would be potential impacts in vegetation maintenance areas. As with Alternatives 1 and 3, implementation of Mitigation Measure VEG-1.3 would reduce the level of impact from vegetation maintenance to less than significant.

NEPA Conclusion

The construction effects under Alternative 2 would be the same as those described above for CEQA. Construction of Alternative 2 would result in a substantial adverse effect on special-status plant species, but through implementation of BMPs and the Mitigation Measure VEG-1.1 and VEG-1.2 construction effects would be reduced to no adverse effect. Operation of Alternative 2 could result in a substantial adverse effect on special-status plant species. Through implementation of BMPs and Mitigation Measure VEG-1.3, operation effects would be reduced to no adverse effect.

Impact VEG-2: Substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service

No Project

The No Project Alternative would not construct or operate any new facilities, and there would be no temporary impacts on sensitive natural communities from temporary construction staging or other disturbance and no permanent impacts from placement of facilities in sensitive natural communities.

Significance Determination

Under the No Project Alternative, no new facilities would be constructed or operated, and there would be no temporary or permanent impacts due to the Project. The No Project Alternative would have no impact on state or federally protected sensitive natural communities.

Alternatives 1 and 3

Construction

Construction of Alternative 1 or 3 would result in direct permanent and temporary impacts on sensitive natural communities. Tables 9-2a and 9-2b show the acreages of permanent and temporary impacts on the sensitive natural community types in each component area under Alternatives 1 and 3. Indirect impacts due to construction of Alternative 1 or 3 could occur due to changes in hydrology of sensitive natural communities outside the construction area due to erosion and sedimentation during construction.

BMPs are incorporated into Alternatives 1 and 3 to avoid and minimize permanent and temporary impacts on sensitive natural communities. These BMPs would limit direct impacts on sensitive natural communities because they would train construction workers on the importance of preserving sensitive natural communities outside of the construction footprint and require fencing of sensitive natural communities where avoidance is feasible. The BMPs would also restrict off-road driving in the construction area, where avoided sensitive natural communities could be damaged or destroyed. BMPs for controlling

invasive species by removing, bagging, and disposing at a waste facility would reduce the potential for the spread of invasive plant species into sensitive natural communities. The BMPs would also limit indirect impacts on sensitive natural communities by implementing a SWPPP that would protect habitats outside of the construction area from erosion and sedimentation. Preconstruction and construction measures are part of Alternatives 1 and 3. The measures would not prevent the permanent loss or habitat quality degradation of sensitive natural communities in the footprint for Alternatives 1 and 3.

Sensitive natural community types include upland riparian habitat, sensitive natural communities in annual grasslands, and sensitive natural communities in oak savanna. All these sensitive natural community types would experience similar types of permanent, direct impacts associated with construction, including earth moving, vegetation removal, filling, and hydrological interruption. Construction activities would also result in the temporary disturbance of these sensitive natural community types during construction and reduced habitat quality in the interim between the completion of construction and the establishment of habitat restoration plantings. The impacts on riparian habitat that is also a component of SRA cover for fish are described for Impact FISH-1 in Chapter 11.

There would be no permanent or temporary impacts associated with the following sensitive communities and facilities because of the lack of the sensitive community in the area of the facility:

- no permanent impacts on upland riparian habitat from the construction of the Sacramento River diversion and conveyance to regulating reservoirs or the regulating reservoirs and conveyance complex
- no permanent or temporary impacts on annual grassland from the construction of the Sacramento River diversion or conveyance to the Sacramento River
- no permanent or temporary impacts on oak savanna from the construction of the Sacramento River diversion and conveyance to regulating reservoirs, regulating reservoirs and conveyance complex, conveyance to Sacramento River, or Comm Road South
- no temporary impact on upland riparian habitat, annual grassland, or oak savanna from the construction of new roads or recreation areas

Operation

Operation of the Sites Reservoir under Alternative 1 or 3 would not result in additional impacts beyond those described for construction, including ongoing recreational activities in the three recreation areas after construction and impacts on sensitive natural communities from maintenance activities after construction. Additional operation-phase impacts could occur in undeveloped parts of the recreation areas due to visitor use of spaces outside of the constructed facility. As discussed for operation effects in Impact VEG-1, the construction impact acreages

for the recreation areas are overestimated and there would be no additional operations impacts on sensitive natural communities in the recreation areas.

Maintenance of Alternatives 1 and 3 facilities would require access that is adjacent to sensitive natural communities. Although 15-foot-wide maintenance roads would be constructed to provide access to the main dams, saddle dams and dikes, I/O Works, and Funks PGP, there is potential for maintenance equipment to cause erosion of or sedimentation into adjacent sensitive natural communities in the buffer areas and adversely affect vegetation cover or habitat quality. SWPPP and erosion and sedimentation control measures would be required as part of maintenance activities, and these effects would be avoided through implementation of these measures. Vegetation maintenance activities for land around facilities that involve grading, tilling, disking, or controlled burns could affect sensitive natural communities if they are present in the vegetation maintenance areas.

CEQA Significance Determination and Mitigation Measures

Alternative 1 or 3 would result in significant impacts on state- and federally protected sensitive natural communities by direct removal of vegetation in these communities for the regulating reservoirs and conveyance complex, Sites Reservoir, roads, and recreation areas. Indirect impacts under Alternative 1 or 3 due to erosion and sedimentation into sensitive natural communities located outside of the construction area would be avoided with implementation of applicable BMPs (e.g., implementation of a SWPPP). The sensitive natural communities in the construction footprint are significant because they are rare and/or declining in California and elsewhere. Measures would be implemented before and during construction to avoid and minimize impacts on sensitive natural communities. The construction of Alternative 1 or 3 would still result in the loss of sensitive natural communities and habitat quality degradation. The loss of sensitive natural communities would be significant. Implementation of Mitigation Measures VEG-2.1 and VEG-2.2 would reduce the level of impact because all locations of sensitive natural communities in and within 300 feet of the Project footprint would be identified and mapped, and the acquisition and permanent protection of in-kind communities for each affected sensitive natural community at identified ratios would ensure survival of the affected sensitive natural community in perpetuity. Mitigation for impacts on sensitive communities within annual grassland could be accomplished in one or two seasons because of the relatively rapid growth rate of herbaceous plants. Implementation of mitigation would reduce the level of impact on sensitive communities within annual grassland to less than significant. For upland riparian and oak savanna communities, the removal of mature trees would be a long-term impact because of the length of time that would be required for newly planted trees to reach mature size and fully replace the habitat function and habitat value of the removed trees. This impact would remain significant and unavoidable even with mitigation because of the long-term loss of upland riparian and oak savanna habitat.

Operation impacts on sensitive natural communities from erosion and sedimentation would be avoided and applicable BMPs (e.g., implementation of a SWPPP) would be implemented. Operation impacts from vegetation maintenance could result in losses of sensitive natural

communities in annual grasslands, oak savanna, oak woodland, or upland riparian, and this would be a significant impact. Implementation of Mitigation Measure VEG-2.3 would reduce the level of impact to less than significant because sensitive natural communities in vegetation maintenance areas would be identified, fenced, and avoided during vegetation maintenance activities.

Mitigation Measure VEG-2.1: Conduct Surveys for Sensitive Natural Communities and Oak Woodlands in the Project Area Prior to Construction Activities

Prior to the start of any Project construction activities, the Authority will employ qualified botanists to conduct surveys of the Project area, including all permanent and temporary impact areas and an additional buffer of 250 feet to encompass potential indirectly affected areas. The surveys will be conducted in accordance with *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (California Department of Fish and Wildlife 2018), or most current protocols. Surveys will occur during the season that plant species would be evident and identifiable, which generally is during their blooming season. The surveys will be conducted no more than 3 years prior to the start of ground-disturbing activities. The results of the survey will be submitted in a report to CDFW and/or USFWS for review no less than 1 year prior to the start of ground-disturbing activities.

The report will include the location and description of all work areas and the location and description of all sensitive natural communities and oak woodlands, and it will identify locations where effective avoidance measures could be implemented. In areas where no sensitive natural communities or oak woodlands are present, no further mitigation will be required.

Mitigation Measure VEG-2.2: Avoid and Compensate for Adverse Effects on Sensitive Natural Communities

Where surveys determine that a sensitive natural community is present in or adjacent to an area where temporary ground-disturbing activities would take place, the Authority will avoid Project impacts on the community through the establishment of activity exclusion zones, in which no ground-disturbing activities will take place, including construction staging or other temporary work areas. Activity exclusion zones for sensitive natural communities will be established around each community site, the boundaries of which will be clearly marked with construction exclusion fencing or its equivalent. The establishment of activity exclusion zones will not be required if no construction-related disturbances will occur in 250 feet of the community site. The size of activity exclusion zones may be reduced through consultation with a qualified biologist and with concurrence from CDFW or, for any federally protected communities of concern, from USFWS based on site-specific conditions.

Prior to any activities that would result in permanent impacts on sensitive natural communities, the Authority will acquire and permanently protect compensation habitat

for each affected sensitive natural community at a minimum 1:1 ratio (1 acre restored or created for every 1 acre removed), but the final compensation ratios will be based on site-specific information and determined through coordination with state and/or federal agencies (CDFW, USFWS) during permit processing. In addition to mitigating the loss of riparian habitat, specific measures will be included to compensate for the loss of SRA cover (area and linear feet), as portions of the affected riparian habitat also provide SRA cover for fish. The mitigation credits for SRA cover mitigation will apply toward riparian habitat mitigation requirements (i.e., the acreage required for compensation will not be duplicated).

Compensation habitat will consist of existing off-site occupied habitat acquired in-fee, through conservation easements, or from a certified conservation bank. The Authority will monitor compensation communities annually to verify that the community suitability is maintained. The Authority will prepare and implement an operations and management plan for each compensation community, with funding provided through an endowment. The plan will include requirements to monitor the community and determine and implement appropriate management measures to maintain the community. The Authority will submit annual monitoring reports to CDFW or, for any federally protected communities, to USFWS for review and determination that the Project remains in compliance with the mitigation.

Mitigation Measure VEG-2.3: Establish Activity Exclusion Zones Around Sensitive Natural Communities Prior to Vegetation Maintenance Activities

A biologist employed by the Authority will use the results of the surveys conducted under Mitigation Measure VEG-2.1 to mark the locations of sensitive natural communities in vegetation maintenance areas. The Authority will fence and avoid any parts of sensitive natural communities that occur in or within 50 feet of the vegetation maintenance areas that could be affected by surface-disturbing maintenance activities. The fencing will allow for wildlife movement and the Authority will maintain the fencing throughout the operations period. Alternatively, if sensitive natural communities cannot be completely avoided, the size of the affected area will be minimized to the full extent possible. If the remaining impacts on sensitive natural communities as the result of vegetation maintenance activities exceed 0.1 acre, the Authority will implement additional compensatory mitigation based on the same requirements as described in Mitigation Measure VEG-2.2.

NEPA Conclusion

The construction and operation effects under Alternative 1 or 3 would be the same as those described above for CEQA. Construction of Alternative 1 or 3 would result in a substantial adverse effect on sensitive natural communities. Implementation of BMPs and the Mitigation Measures VEG-2.1 and VEG-2.2 would reduce the construction effects to no adverse effect for sensitive communities in annual grassland, but the effects would remain substantially adverse for

upland riparian and oak savanna. Operation of Alternative 1 or 3 could result in a substantial adverse effects on sensitive natural communities. Implementation of BMPs and Mitigation Measure VEG-2.3 would reduce operation effects on sensitive natural communities to no adverse effect.

Alternative 2

Construction

The extent of Alternative 2 permanent and temporary impacts, quantified as described above in Section 9.3, *Methods of Analysis,* is shown in Tables 9-4a and 9-4b. All land cover type acreages are preliminary and subject to change pending field review. The BMPs for Alternatives 1 and 3 would also apply to Alternative 2. While these preconstruction and construction measures are part of Alternative 2, their implementation would not prevent the permanent loss or habitat quality degradation of sensitive natural communities in the Alternative 2 footprint.

Construction of Alternative 2 would result in the loss of sensitive natural communities through direct removal of vegetation and habitat quality degradation. Permanent and temporary impacts on sensitive natural communities would result from construction of the same facilities as described for Alternatives 1 and 3, with three differences. First, additional permanent impacts from construction of the new South Road under Alternative 2 would result in permanent loss of upland riparian, foothill pine woodland, and oak savanna. Second, permanent impacts resulting from fill of Sites Reservoir on sensitive natural communities would be smaller due to the decreased reservoir size and inundation area. Third, additional impacts from construction of the Sacramento River discharge would result in permanent loss of upland riparian. The effects on upland riparian that is also a component of SRA cover for fish are described for Impact FISH-1 in Chapter 11.

Under Alternative 2, temporary impacts would be as described for Alternatives 1 and 3, except for additional temporary loss of upland riparian at the Sacramento River discharge.

Operation

As described for Alternatives 1 and 3, there would be no additional impact in recreation areas on sensitive natural communities under Alternative 2. All impacts on sensitive natural communities in the recreation areas have been included in the construction phase impacts, and additional impacts for access roads in the area of disturbance under Alternative 2 would be avoided during the operation phase by implementation of BMPs, including a SWPPP. The impacts of vegetation maintenance would also be the same between Alternatives 1, 2, and 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in similar impacts to Alternatives 1 and 3 except that construction of the new South Road under Alternative 2 would result in permanent loss of upland riparian, foothill pine woodland, and oak savanna; the smaller reservoir would result in

somewhat smaller loss of sensitive natural communities; and construction of the Sacramento River discharge would result in permanent loss of upland riparian. As with Alternatives 1 and 3, implementation of Mitigation Measures VEG-2.1 and VEG-2.2 would reduce the level of impact to less than significant for the loss of sensitive communities in annual grassland. This impact would remain significant and unavoidable even with mitigation for upland riparian, foothill pine woodland, and oak savanna.

Operation impacts on sensitive natural communities would be avoided and applicable BMPs (e.g., implementation of a SWPPP) would be implemented. There would be no impact in the recreation areas, but there would be potential impacts in vegetation maintenance areas. As with Alternatives 1 and 3, implementation of Mitigation Measure VEG-2.3 would reduce the level of impact from vegetation maintenance to less than significant.

NEPA Conclusion

The construction effects under Alternative 2 would be the same as those described above for CEQA. Construction of Alternative 2 would result in a substantial adverse effect on sensitive natural communities, but through implementation of BMPs and the Mitigation Measures VEG-2.1 and VEG-2.2 construction effects would be reduced to no adverse effect for sensitive communities in annual grassland. Effects on upland riparian, foothill pine woodland, and oak savanna would remain significant and unavoidable. Operation of Alternative 2 could result in a substantial adverse effect on sensitive natural communities. Through implementation of BMPs and Mitigation Measure VEG-2.3, operation effects would be reduced to no adverse effect.

Impact VEG-3: Substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means

No Project

The No Project Alternative would not construct or operate any new facilities. State and federally protected wetlands and non-wetland waters occur in the study area. Because the No Project Alternative would not construct or operate new facilities, there would be no temporary impacts on wetlands and non-wetland waters from temporary construction staging or other disturbance or permanent impacts from placement of facilities in wetlands or non-wetland waters.

Significance Determination

Under the No Project Alternative, no new facilities would be constructed or operated, and there would be no temporary or permanent impacts due to the Project. The No Project Alternative would have no impact on state or federally protected wetlands and non-wetland waters.

Alternatives 1 and 3

Construction

Construction of Alternative 1 or 3 would result in direct permanent and temporary impacts and indirect impacts on wetlands and non-wetland waters, including waters of the state regulated by the State Water Board and federally protected wetlands and non-wetland waters of the United States regulated by the USACE. Tables 9-2a and 9-2b show the acreages of direct permanent and temporary impacts on each wetland and non-wetland water type in each component area under Alternatives 1 and 3.

The Authority has incorporated BMPs into the design of Alternatives 1 and 3 to avoid and minimize permanent and temporary impacts on wetlands and non-wetland waters. These BMPs would limit direct impacts on wetlands and non-wetland waters because they would train construction workers on the importance of preserving wetlands and non-wetland waters outside of the construction footprint and require fencing of wetlands and non-wetland waters where avoidance is feasible. The BMPs would also restrict off-road driving in the construction area, where avoided wetlands and non-wetland waters could be damaged or destroyed. BMPs for controlling invasive species by removing, bagging, and disposing at a waste facility would reduce the potential for the spread of invasive plant species into wetlands and non-wetland waters. The BMPs would also limit indirect impacts on wetlands and non-wetland waters by implementing a SWPPP that would protect habitats outside of the construction area from erosion and sedimentation. While these preconstruction and construction measures are part of Alternatives 1 and 3, the measures would not prevent the permanent loss or habitat quality degradation of wetlands and non-wetland waters in the Alternatives 1 and 3 footprint.

Wetlands

Construction of Alternative 1 or 3 would result in the loss of wetlands through direct removal, filling, and hydrological interruption and in habitat quality degradation. Permanent impacts on wetlands would result from earth moving and vegetation removal for construction of facilities associated with the regulating reservoirs and conveyance complex, Sites Reservoir and related facilities, conveyance to the Sacramento River, recreation areas, and new roads. Construction of the aforementioned facilities would result in the permanent loss of forested wetland, freshwater marsh, scrub-shrub wetland, and seasonal wetland in the Alternatives 1 and 3 footprint. The impacts on forested wetland or scrub-shrub wetland that is also a component of SRA cover for fish are described for Impact FISH-1 in Chapter 11. There would be no permanent impacts on wetlands from the construction of the Sacramento River diversion and conveyance to regulating reservoirs.

Because exact locations of construction-related activities are not known, construction of the new roads is expected to result in direct permanent loss of wetlands in the entire construction disturbance area. A substantial portion of these impacts would be avoided or be temporary if the wetlands were avoided or restored after construction. The maximum extent (in acres) of wetlands that would be affected by construction of the new roads is shown in Table 9-2a.

Under Alternatives 1 and 3, construction activities would also result in the temporary disturbance of wetlands during construction and reduced habitat quality in the interim between the completion of construction and the establishment of habitat restoration plantings. Temporary impacts on wetlands would occur during construction of the regulating reservoirs and conveyance complex, Sites Reservoir and related facilities, conveyance to Sacramento River, the day-use boat ramp/parking recreation area, and roads. Construction of most facilities would result in temporary impacts on freshwater marsh, managed wetland, scrub-shrub wetland, and seasonal wetland. There would be no temporary impacts on wetlands from the construction of the Sacramento River diversion and conveyance to regulating reservoirs.

Indirect impacts due to construction of Alternative 1 or 3 could occur due to changes in hydrology of wetlands outside the construction area due to erosion and sedimentation during construction.

Non-Wetland Waters

Construction would result in the loss of non-wetland waters and habitat quality degradation through direct removal, filling, and hydrological interruption. Permanent impacts on non-wetland waters would result from earth moving and vegetation removal for construction of the regulating reservoirs, Sites Reservoir and related facilities, conveyance to Sacramento River, recreation areas, and new roads. Construction of these facilities would result in the permanent loss of canal, ditch, ephemeral stream, intermittent stream, perennial stream, pond, and a small area of Funks Reservoir in the footprint of Alternative 1 or 3. There would be no permanent impacts on non-wetland waters from the construction of the Sacramento River diversion and conveyance to regulating reservoirs.

Because exact locations of construction-related activities are not known, construction of the new roads is expected to result in direct permanent loss of non-wetland waters in the entire construction disturbance area. A substantial portion of these impacts would be avoided or be temporary if the non-wetland waters were avoided or restored after construction. The maximum extent (in acres) of non-wetland waters that would be affected by construction of the new roads is shown in Table 9-2a.

Construction activities would also result in the temporary disturbance of non-wetland waters during construction and reduced habitat quality in the interim between the completion of construction and the establishment of habitat restoration plantings. Temporary impacts on non-wetland waters would occur during construction of the Sacramento River diversion and conveyance to regulating reservoirs, Sites Reservoir and related facilities, conveyance to Sacramento River, the day-use boat ramp/parking recreation area, and roads. Construction of these facilities would result in temporary impacts on canal, ditch, ephemeral stream, intermittent stream, pond, and reservoir.

Indirect construction impacts, such as erosion and sedimentation, could change the hydrology of non-wetland waters outside the construction area.

Operation

Operation of the Sites Reservoir under Alternative 1 or 3 would not result in additional impacts beyond those described for construction, including ongoing recreational activities in the three recreation areas after construction, and impacts on wetlands and non-wetland waters from maintenance activities after construction. As discussed for operation effects in Impact VEG-1, the construction impact acreages for the recreation areas are overestimated and there would be no additional operations impacts on wetlands and non-wetland waters in the recreation areas.

Maintenance of Alternatives 1 and 3 facilities would require access that is adjacent to wetlands and non-wetland waters. Although 15-foot-wide maintenance roads would be constructed to provide access to the main dams, saddle dams and dikes, I/O Works, and Funks PGP, there is potential for maintenance equipment to cause erosion of or sedimentation into adjacent wetlands and non-wetland waters in the buffer areas and adversely affect vegetation cover or habitat quality. As part of the SWPPP, erosion and sedimentation control measures would be required as part of maintenance activities, and these effects would be avoided. Vegetation maintenance activities for land around facilities that involve grading, tilling, disking, or controlled burns could affect wetlands or non-wetland waters if they are present in the vegetation maintenance areas.

CEQA Significance Determination and Mitigation Measures

Alternative 1 or 3 would result in significant impacts on state- and federally protected wetlands and non-wetland waters by direct removal, filling, hydrological interruption, and other indirect impacts due to erosion and sedimentation into wetlands and non-wetland waters located outside of the construction area. The loss of ditch and canal habitats would be considered significant only where the ditch or canal supports wetland habitat, such as freshwater marsh, scrub-shrub wetland, or seasonal wetland. While measures would be implemented before and during construction to minimize impacts on wetlands and non-wetland waters, Alternatives 1 or 3 would still result in the permanent loss of wetlands and non-wetland waters and habitat quality degradation. The permanent loss of wetlands and non-wetland waters would be significant. Implementation of Mitigation Measures VEG-3.1, VEG-3.2, and VEG-3.3 would reduce the level of impact to less than significant because all wetlands and non-wetland waters in and within 300 feet of the Project footprint would be identified and mapped, and the acquisition and permanent protection of in-kind wetlands and non-wetland waters for each affected wetland and non-wetland water at identified ratios would ensure no net loss of wetlands and non-wetland waters in perpetuity.

Operation impacts on wetlands and non-wetland waters from erosion and sedimentation would be avoided and applicable BMPs (e.g., implementation of a SWPPP) would be implemented. Operation impacts on wetlands and non-wetlands waters from vegetation maintenance could result in losses of wetlands and non-wetland waters, and this would be a significant impact. Implementation of Mitigation Measure VEG-3.4 would reduce the level of impact to less than significant, because all locations of wetlands and non-wetland waters within the vegetation maintenance areas would be identified, fenced, and avoided by vegetation maintenance activities.

Mitigation Measure VEG-3.1: Avoid and Minimize Disturbance of Wetlands and Non-Wetland Waters During Construction Activities

To the extent practicable, the Authority will avoid and minimize impacts on wetlands and non-wetland waters during construction by implementing the measures listed below. These measures will be incorporated into contract specifications and implemented by the construction contractor. Compliance will be monitored by a qualified biologist and reported as indicated in the BMP "Construction Best Management Practices and Monitoring for Fish, Wildlife, and Plant Species Habitats, and Natural Communities".

- The roads, pipelines, electrical corridors, and recreation areas will be designed, to the extent practicable, to avoid direct and indirect impacts on wetlands and non-wetland waters.
- In wetlands and non-wetland waters that will be preserved, construction activities will be avoided in saturated or ponded natural wetlands and drainages during the wet season (spring and winter) to the maximum extent feasible. Where such activities are unavoidable, protective practices such as use of padding or vehicles with balloon tires will be employed.
- Exposed drainage banks and levees above drainages will be stabilized immediately following completion of construction activities. Non-wetland waters will be restored in a manner that encourages vegetation to reestablish to its pre-Project condition and reduces the effects of erosion on the drainage system.
- Any trees, shrubs, debris, or soils that are inadvertently deposited below the ordinary high-water mark of streams will be removed in a manner that minimizes disturbance of the drainage bed and bank.
- To the extent feasible, in-stream construction below the ordinary high-water mark of natural drainages will be restricted to the low-flow period (generally April through October).

Where wetlands or non-wetland waters (streams or ponds) are present in or adjacent to an area where temporary ground-disturbing activities would take place, the Authority will avoid Project impacts on wetlands, streams, and ponds through the establishment of activity exclusion zones, in which no ground-disturbing activities will take place, including construction staging or other temporary work areas. Activity exclusion zones will be established around each wetland and at the edges of each stream or pond, the boundaries of which will be clearly marked with construction exclusion fencing. The establishment of activity exclusion zones will not be required if no construction-related disturbances will occur in 250 feet of wetland, stream, or pond. The size of activity exclusion zones may be reduced through consultation with a qualified biologist. Where temporary impacts on wetlands, streams, or ponds cannot be avoided, the impact will be compensated as a permanent impact.

Mitigation Measure VEG-3.2: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Wetlands

For permanently affected wetlands, the Authority will compensate for the loss by creation or acquisition and permanent protection of suitable wetland habitat to ensure no net loss of wetland habitat functions and values. The compensation will be at a minimum 1:1 ratio (1 acre restored or created for every 1 acre filled), but the final compensation ratios may include additional compensation and will be based on site-specific information and determined through coordination with state and federal agencies (State Water Board, USACE) during permit processing. Where wetland impacts overlap with listed species impacts, mitigation will be coordinated for both resources and not be duplicated. Where impacts on forested wetland and scrub-shrub wetland overlap with loss of SRA cover for fish, specific measures will be included to compensate for the loss of SRA cover (area and linear feet). The mitigation credits for SRA cover mitigation will apply toward wetland mitigation requirements (i.e., the acreage required for compensation will not be duplicated).

Wetland mitigation will consist of replacement habitat that may be a combination of the following two options, purchase of mitigation bank credits and permittee-responsible mitigation.

- The Authority will purchase offsite mitigation bank credits for the affected wetland type (i.e., forested wetland [riparian], freshwater marsh, scrub-shrub wetland [riparian], seasonal wetland) at a USACE-approved mitigation bank to allow for economy of scale and higher quality habitat due to large patch size. The Authority will provide written evidence to the resource agencies that compensation has been established through the purchase of mitigation credits.
- The Authority will employ a qualified restoration biologist to develop a wetland restoration and monitoring plan that involves creating or enhancing the affected wetland type (i.e., forested wetland [riparian], freshwater marsh, scrub-shrub wetland [riparian], seasonal wetland) in open space in the Project area or at an offsite location. The Authority will coordinate with CDFW, USACE, and the State Water Board for final plan approval prior to the removal of any wetland habitat and will ensure implementation of the wetland restoration plan. The plan will be based on the Project alternative selected and the extent of wetlands at the time of construction. The plan will identify how, where, and when mitigation will occur, monitoring and maintenance activities, success criteria, funding assurances, appropriate long-term management measures, and agency reporting requirements. The plan will include a species list and specify the number of each species, planting locations, and maintenance requirements. Plantings will use an appropriate method (i.e., seed, container plant, or plug) for the best survival potential and cost efficiency. The extent of planting will be adequate to ensure that the required mitigation ratio will be reached by the end of the monitoring period and that stem density, canopy cover, and species composition requirements are met. Species seeded will be similar to those

removed from the Project area and will consist of inoculum taken from the affected wetlands. The survival rates and vegetative cover of wetland plantings and wetland hydrology will be monitored annually for 3 years, or as required in the Project permits, and compared with nearby undisturbed reference wetlands. Progress reports will be provided to the USACE and the State Water Board at the completion of each monitoring period. If vegetative cover of wetland plants is equivalent to reference sites at the end of the monitoring period, the revegetation will be considered successful. If the survival criterion is not met in any monitoring year or at the end of the monitoring period, planting and monitoring will be repeated after mortality causes have been identified and remedial measures have been implemented, and the monitoring period will be extended to account for the required number of monitoring years for all plantings. Mitigation sites will be protected in perpetuity in a conservation easement or through deed restriction.

Mitigation Measure VEG-3.3: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Non-Wetland Waters

For permanently affected streams and ponds, the Authority will compensate for the loss by creation or acquisition and permanent protection of suitable open-water habitat to ensure no net loss of stream or pond habitat functions and values. The compensation will be at a minimum 1:1 ratio (1 acre restored or created for every 1 acre filled), but the final compensation ratios may include additional compensation and will be based on site-specific information and determined through coordination with state and federal agencies (State Water Board, USACE) during permit processing. Where stream or pond impacts overlap with listed species impacts, mitigation will be coordinated for both resources and not be duplicated.

Stream and pond mitigation will consist of replacement habitat that may be a combination of the following two options, which include purchase of mitigation bank credits and permittee-responsible mitigation.

- The Authority will purchase offsite mitigation bank credits at a USACE-approved mitigation bank. Out-of-kind compensation may be used based for stream or pond (i.e., forested wetland [riparian], freshwater marsh, scrub-shrub wetland [riparian], or seasonal wetland), if approved by the regulatory agencies. The Authority will provide written evidence to the USACE and State Water Board that compensation has been established through the purchase of mitigation credits.
- The Authority will employ a qualified restoration biologist to develop a non-wetland restoration and monitoring plan that involves creating or enhancing the affected water type (i.e., ephemeral, intermittent, or perennial stream or pond) in open space in the Project area or at an offsite location. The Authority will coordinate with USACE and the State Water Board for final plan approval prior to the removal of any stream or pond habitat and will ensure implementation of the restoration plan. The plan will be based on the Project alternative selected and the extent of streams and ponds at the

time of construction. The plan will identify how, where, and when mitigation will occur, monitoring and maintenance activities, success criteria, funding assurances, appropriate long-term management measures, and agency reporting requirements. The plan will include grading specifications and design information for creation of stream and pond habitat. The bank stability and downcutting of streams and hydrology of ponds will be monitored annually for 3 years, or as required in the Project permits. Progress reports will be provided to the USACE and the State Water Board at the completion of each monitoring period. If stream and pond structure and stability are retained at the end of the monitoring period, the mitigation will be considered successful. If the stream stability or pond hydrology is not met in any monitoring year or at the end of the monitoring period, remedial measures will be implemented, and the monitoring period will be extended to account for the required number of monitoring years. Mitigation sites will be protected in perpetuity in a conservation easement or through deed restriction.

Mitigation Measure VEG-3.4: Establish Activity Exclusion Zones Around Wetlands and Non-Wetland Waters Prior to Vegetation Maintenance Activities

A wetland specialist employed by the Authority will mark the boundaries of wetlands and non-wetland waters in vegetation maintenance areas using the verified aquatic resources delineation prepared for Project permitting. If wetlands or non-wetland waters occur in or within 50 feet of the vegetation maintenance areas, the wetlands or non-wetland waters will be fenced and avoided by all surface-disturbing maintenance activities. All requirements of the SWPPP will also be implemented to avoid indirect impacts on water quality. Alternatively, if wetlands and non-wetland waters cannot be completely avoided, the size of the affected area will be minimized to the full extent possible. The Authority will implement additional compensatory mitigation that is based on the same requirements as those specified in Mitigation Measures VEG-3.2 and VEG-3.3 for any remaining impacts on wetlands or non-wetland waters from vegetation maintenance activities.

NEPA Conclusion

The construction and operation effects under Alternatives 1 and 3 would be the same as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternatives 1 and 3 would result in a substantial adverse effect on wetlands and non-wetland waters, but through implementation of BMPs and the Mitigation Measures VEG-3.1, VEG-3.2, and VEG-3.3, construction effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 could result in substantial adverse effects on wetlands and non-wetland waters. Through implementation of BMPs and Mitigation Measure VEG-3.4, operation effects would be reduced to no adverse effect.

Alternative 2

Construction

Construction of Alternative 2 would result in direct permanent and temporary impacts and indirect impacts on wetlands and non-wetland waters, including waters of the state regulated by the State Water Board and federally protected wetlands and non-wetland waters of the U.S. regulated by the USACE. Tables 9-4a and 9-4b show the acreages of direct permanent and temporary impacts on each wetland and non-wetland water type under Alternative 2. The BMPs for Alternatives 1 and 3 would also apply to Alternative 2. While these preconstruction and construction measures are part of Alternative 2, their implementation would not prevent the permanent loss or habitat quality degradation of wetlands and non-wetland waters in the Alternative 2 footprint.

Construction of Alternative 2 would result in the loss of wetlands and non-wetland waters and habitat quality degradation through direct removal, filling, and hydrological interruption. Permanent and temporary impacts on wetlands and non-wetland waters would result from construction of the same facilities as described for Alternatives 1 and 3 with two differences. First, additional impacts from construction of the new South Road under Alternative 2 would result in permanent loss of forested wetland, seasonal wetland, scrub-shrub wetland, ephemeral stream, and intermittent stream. Second, permanent impacts resulting from fill of Sites Reservoir on forested wetland, freshwater marsh, managed wetland, scrub-shrub wetland, and seasonal wetland would be smaller due to the decreased reservoir size and inundation area. The impacts on forested wetland or scrub-shrub wetland that is also a component of SRA cover for fish are described for Impact FISH-1 in Chapter 11.

Under Alternative 2, temporary and indirect impacts would be as described for Alternatives 1 and 3.

Operation

As described for Alternatives 1 and 3, there would be no additional impacts from operation of the recreation areas for Alternative 2 on wetlands and non-wetland waters. The impacts of vegetation maintenance would also be the same between Alternatives 1, 2, and 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in similar impacts to Alternatives 1 and 3. Construction of the South Road would result in greater loss of forested wetland, seasonal wetland, scrub-shrub wetland, ephemeral stream, and intermittent stream when comparted to Alternatives 1 and 3, given the larger footprint. Construction of the smaller reservoir would result in somewhat smaller losses of forested wetland, freshwater marsh, managed wetland, scrub-shrub wetland, and seasonal wetland due to the locations of these resources and the smaller reservoir footprint. As with Alternatives 1 and 3, implementation of Mitigation Measures VEG-3.1, VEG-3.2, and VEG-3.3 would reduce the level of impact to less than significant.

Operation impacts on wetlands and non-wetland waters would be the same as Alternatives 1 and 3. There would be no impact in the recreation areas, but there would be potential impacts in vegetation maintenance areas. As with Alternatives 1 and 3, implementation of Mitigation Measure VEG-3.4 would reduce the level of impact from vegetation maintenance to less than significant.

NEPA Conclusion

The construction effects under Alternative 2 would be the same as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on wetlands and non-wetland waters, but through implementation of BMPs and the Mitigation Measures VEG-3.1, VEG-3.2, and VEG-3.3, construction effects would be reduced to no adverse effect. Operation of Alternative 2 could result in substantial adverse effects on wetlands and non-wetland waters. Through implementation of BMPs and Mitigation Measure VEG-3.4, operation effects would be reduced to no adverse effect.

Impact VEG-4: Conflict with any local policies or ordinances protecting vegetation resources (including wetlands and non-wetland waters), such as a tree preservation policy or ordinance

All local policies and ordinances that could pertain to the Project are described in Appendix 4A, Section 4A.5.3, *Local/Regional Policies and Regulations*.

No Project

The No Project Alternative would not construct or operate any new facilities. Therefore, there would be no conflict with local policies or ordinances that protect vegetation and wetland resources.

Significance Determination

Under the No Project Alternative, no new facilities would be constructed or operated, and there would be no temporary or permanent impacts due to the Project. The No Project Alternative would have no conflicts with local policies or ordinances.

Alternatives 1 and 3

Construction

As described in Impacts VEG-1, VEG-2, and VEG-3, construction of Alternative 1 or 3 would affect vegetation and wetland resources. These resources are protected by policies in the Colusa County General Plan (Colusa County 2012), Glenn County General Plan (Glenn County 2020), Tehama County General Plan (Tehama County 2009), and Yolo County General Plan (County of Yolo 2009). General plan policies for these counties protect vegetation and wetland resources

such as special-status plant species, riparian habitat, oak woodlands, wetlands, and streams. The Yolo County General Plan also protects large valley oaks (*Quercus lobata*), although there are none in the Alternatives 1 and 3 footprint in Yolo County, and promotes removal of invasive plant species.

As described under Impacts VEG-1, VEG-2, and VEG-3, BMPs are incorporated into Alternatives 1 and 3 to avoid and minimize permanent and temporary impacts on special-status species, sensitive natural communities, wetlands, and non-wetland waters.

The BMPs would not prevent the permanent loss or habitat quality degradation of special-status species habitats, sensitive natural communities, wetlands, and non-wetland waters in the footprint for Alternatives 1 and 3. As described for Impacts VEG-1, VEG-2, and VEG-3, construction of Alternative 1 or 3 facilities would result in permanent and temporary impacts on special-status species habitats, sensitive natural communities, wetlands, and non-wetland waters. One vegetation community not included in Impact VEG-2 as a sensitive natural community is blue oak woodland, which is protected by county policies, as well as the state Oak Woodlands Conservation Act. The extent of blue oak woodland that would be permanently and temporarily affected by construction of Alternative 1 or 3 is shown in Tables 9-2a and 9-2b.

In Glenn County, construction of the GCID Main Canal head gate and improvements would result in temporary impacts on upland riparian habitat and wetlands located in staging areas. In Colusa County, construction of the Sites Reservoir and related facilities would result in permanent and temporary impacts on special-status species habitats, sensitive natural communities, wetlands, non-wetland waters, and blue oak woodland. In Yolo County, construction of the Dunnigan Pipeline and CBD outlet would result in permanent and temporary impacts on upland riparian habitat, wetlands, and non-wetland waters. No vegetation or wetland resources protected by policies in the Tehama General Plan would be affected by work at the RBPP, the only Alternative 1 or 3 facility in Tehama County, because no ground disturbance would occur.

Operation

Operation under Alternative 1 or 3 in the recreation areas would not result in additional impacts or require additional mitigation measures. Vegetation maintenance activities for land around facilities that involve grading, tilling, disking, or controlled burns could affect blue oak woodland if it is present in the vegetation maintenance areas.

CEQA Significance Determination and Mitigation Measures

Alternative 1 or 3 would have significant impacts on sensitive vegetation and wetland resources protected by local general plan policies. Mitigation Measures VEG-1.2, VEG-2.2, VEG-3.1, VEG-3.2, and VEG-3.3 would minimize and compensate for impacts on these protected sensitive resources except blue oak woodland. Oak woodlands are considered important under the state Oak Woodlands Conservation Act and county general plans. Loss of blue oak woodland from construction under Alternative 1 or 3 would be considered significant.

Implementation of Mitigation Measures VEG-2.1, VEG-4.1, and VEG-4.2 would reduce the level of impact because all locations of blue oak woodland in and within 300 feet of the construction footprint would be identified and mapped, and the acquisition and permanent protection of blue oak woodland for each affected woodland at identified ratios would ensure survival of blue oak woodland in perpetuity. However, the removal of mature blue oak trees would be a long-term impact due to the length of time required for newly planted trees to reach mature size and fully replace the habitat function and habitat value of the removed trees in the woodland community. Additionally, in accordance with the California Oak Woodland Conservation Act (California Public Resources Code 21083.4), no more than 50% of the blue oak woodland loss could be compensated directly through planting. Therefore, there would be a long-term and permanent loss of blue oak woodland habitat from construction even with mitigation and this impact would remain significant and unavoidable.

Operation impacts from vegetation maintenance could result in loss of blue oak woodland, and this would be a significant impact. Implementation of Mitigation Measure VEG-4.3 would reduce the level of impact to less than significant, because all locations of blue oak woodland in the vegetation maintenance areas would be identified, fenced, and avoided during vegetation maintenance activities.

Mitigation Measure VEG-2.1: Conduct Surveys for Sensitive Natural Communities and Oak Woodlands in the Project Area Prior to Construction Activities

This mitigation measure is described for Impact VEG-2.

Mitigation Measure VEG-4.1: Avoid and Minimize Potential Adverse Effects on Oak Woodlands During Construction

Where surveys determine that oak woodlands are present in or adjacent to an area where temporary ground-disturbing activities would take place, the Authority will avoid impacts on oak woodlands through the establishment of activity exclusion zones, within which no ground-disturbing activities will take place, including construction staging or other temporary work areas. Activity exclusion zones for oak woodlands will be established at the edges of oak woodland habitat that is within 50 feet of construction activity, the boundaries of which will be clearly marked with construction exclusion fencing. The establishment of activity exclusion zones will not be required if no construction-related disturbances will occur within 50 feet of an oak woodland.

The following measures will also be implemented during construction of each Project component to protect and minimize effects on retained oak woodland trees that are adjacent to construction activities.

- The potential for long-term loss of woody vegetation will be minimized by pruning vegetation rather than removing entire trees or shrubs in areas where complete removal is not required. Any trees or shrubs that need to be trimmed will be cut at least 1 foot above ground level to leave the root systems intact and allow for more

rapid regeneration. Cutting will be limited to the minimum area necessary in the construction zone. To protect nesting birds, no pruning or removal of woody vegetation will be performed between February 1 and August 31 without preconstruction bird surveys conducted in accordance with CDFW and/or USFWS requirements, as described in Mitigation Measures WILD-1.21 and WILD-1.22.

- Operation or parking of vehicles, digging, trenching, slope cuts, soil compaction, grading, paving, or placement of fill will be prohibited in at least 6 feet outside the driplines of retained oak woodland trees.
- Any off-site drainage will be directed in such a way as to prevent drainage into adjacent oak woodlands.

Mitigation Measure VEG-4.2: Compensate for Adverse Effects on Oak Woodlands

Per Policy CON 1-9 from the Colusa County General Plan, the Authority, in coordination with Colusa County, will develop a management plan for the protection and enhancement of oak woodlands to offset the loss of oak woodlands. This plan will mitigate the loss of oak woodlands using one or more of the following options:

- Offsite deed restriction or conservation easement acquisition and/or acquisition in fee title by a land conservation organization for purposes of offsite oak woodland conservation;
- In-lieu fee payment to the Oak Woodlands Conservation Fund;
- Replacement planting onsite in an area subject to deed restriction or conservation easement;
- Replacement planting off site in an area subject to a conservation easement; or
- A combination of these options.

Prior to any activities that would result in permanent impacts on oak woodlands, the Authority will mitigate the loss of oak woodlands at a minimum 1:1 ratio (1 acre restored or created for every 1 acre removed), but the final compensation ratios will be based on site-specific information and determined through coordination with Colusa County during permit processing. In accordance with requirements of the California Oak Woodland Conservation Act (California Public Resources Code 21083.4), replacement planting will not account for more than 50% of the oak woodland mitigation requirement. Therefore, up to half of the oak woodland impact mitigation requirement may consist of onsite or offsite replacement planting. The replacement planting area must be suitable for tree planting, not conflict with current or planned land uses, and be large enough to accommodate replacement plantings at a density equal to the density of the affected oak woodlands, up to a maximum density of 200 trees per acre. The remaining portion of the oak woodland impact mitigation requirement will be implemented in the form of an in-lieu fee payment to the county in which the oak woodland is affected.

The Authority will prepare and implement a mitigation and monitoring plan for oak woodlands, with funding provided through an endowment. The plan will include requirements to implement appropriate management measures to maintain the oak woodlands. The Authority will monitor oak woodland plantings annually for at least 5 years to verify that the habitat quality is maintained. Success criteria for oak woodland plantings may include criteria such as survival of plantings, tree canopy cover, and plant density. If the criteria are not met in any monitoring year or at the end of the monitoring period, planting and monitoring will be repeated after mortality or insufficient growth causes have been identified and remedial measures have been implemented, and the monitoring period will be extended to account for the required number of monitoring years for all plantings. Mitigation sites will be protected in perpetuity in a conservation easement or through deed restriction.

Mitigation Measure VEG-4.3: Establish Activity Exclusion Zones Around Blue Oak Woodlands Prior to Vegetation Maintenance Activities

A botanist employed by the Authority will mark the locations of blue oak woodlands in vegetation maintenance areas using the results of the surveys conducted under Mitigation Measure VEG-2.1. If blue oak woodland occurs in or within 50 feet of the vegetation maintenance areas, the outer dripline of the woodland canopy will be fenced and avoided by all surface-disturbing maintenance activities. Alternatively, if blue oak woodlands cannot be completely avoided, the size of the affected area will be minimized to the full extent possible. If the remaining impacts on blue oak woodland by vegetation maintenance activities exceed 0.1 acre, the Authority will implement additional compensatory mitigation based on the same requirements as described in Mitigation Measure VEG-4.2.

NEPA Conclusion

The construction and operation effects of Alternatives 1 and 3 would be the same as described above for CEQA. Construction of Alternative 1 or 3 would result in a substantial adverse effect on vegetation and wetland resources that are protected under local general plan policies. Implementation of BMPs and the Mitigation Measures VEG-2.1, VEG-4.1, and VEG-4.2 would reduce the construction effects, but the long-term effects would remain adverse. Operation of Alternative 1 or 3 could result in a substantial adverse effect on oak woodlands protected by general plan policies and the California Oak Woodland Conservation Act, but through implementation of BMPs and Mitigation Measure VEG-4.3 operation effects would be reduced to no adverse effect.

Alternative 2

Construction

As described in impacts VEG-1, VEG-2, and VEG-3, construction of Alternative 2 would affect vegetation and wetland resources that are protected by policies in the Colusa County General

Plan (Colusa County 2012), Glenn County General Plan (Glenn County 2020), Tehama County General Plan (Tehama County 2009), and Yolo County General Plan (County of Yolo 2009). General plan policies for these counties protect vegetation and wetland resources, including special-status species, riparian habitat, oak woodlands, wetlands, and streams. The BMPs for Alternatives 1 and 3 would also apply to Alternative 2. Blue oak woodland is protected by county policies, as well as the state Oak Woodlands Conservation Act, but is not included in Impact VEG-2 as a sensitive natural community. The extent of blue oak woodland that would be permanently and temporarily affected by construction is shown in Tables 9-4a and 9-4b. Loss of blue oak woodland would be less under Alternative 2 than under Alternative 1 or 3 due to the smaller size of the inundation area.

Operation

Operation of recreation areas for Alternative 2 would not result in additional impacts or require additional mitigation measures. All impacts on vegetation and wetland resources protected under local general plan policies have been included in the construction phase impacts for recreation areas, and additional impacts within access road areas throughout the Alternative 2 area would be avoided during the operation phase by implementation of BMPs, including a SWPPP. Impacts of vegetation maintenance would also be the same between Alternatives 1, 2, and 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in similar impacts to Alternatives 1 and 3 except that the smaller reservoir size would result in a somewhat smaller loss of blue oak woodland. Implementation of Mitigation Measures VEG-2.1, VEG-4.1, and VEG-4.2 would reduce the level of impact. There would be a long-term and permanent loss of blue oak woodland habitat even with mitigation and this impact would remain significant and unavoidable.

As with Alternatives 1 and 3, operation of Alternative 2 would not result in additional impacts in the recreation areas, but there would be potential impacts in vegetation maintenance areas. As with Alternatives 1 and 3, implementation of Mitigation Measure VEG-4.3 would reduce the level of impact from vegetation maintenance to less than significant.

NEPA Conclusion

The construction and operation effects of Alternative 2 would be the same as described above for CEQA and the same mitigation measures would be implemented. Construction of Alternative 2 would result in substantial adverse effects on vegetation and wetland resources protected by general plan policies, but through implementation of BMPs and the Mitigation Measures VEG-2.1, VEG-4.1, and VEG-4.2 would reduce the construction effects, but the long-term effects would remain substantially adverse. Operation of Alternative 2 could result in a substantial adverse effect on blue oak woodlands protected by general plan policies and the California Oak Woodland Conservation Act. Through implementation of BMPs and Mitigation Measure VEG-4.3, operation effects would be reduced to no adverse effect.

Impact VEG-5: Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan

No Project

The No Project Alternative would not construct or operate any new facilities. Therefore, there would be no conflict with adopted conservation plans.

Significance Determination

Under the No Project Alternative, no new facilities would be constructed or operated, and there would be no temporary or permanent impacts due to the Project. The No Project Alternative would have no conflicts with any approved conservation plans.

Alternatives 1 and 3

Construction

The Yolo County HCP/NCCP (Yolo Habitat Conservancy 2018) and the Yolo Bypass Wildlife Area Land Management Plan (Yolo Bypass Wildlife Area LMP) (California Department of Fish and Game 2008) are the only conservation plans that apply to Alternatives 1 and 3. These plans apply to the Dunnigan Pipeline and CBD outlet, which are the only parts of the Alternatives 1 and 3 footprint located in Yolo County. The construction of Alternatives 1 and 3 is not covered under the Yolo County HCP/NCCP, because the project was not included in the 2030 Countywide General Plan for Yolo County or in the covered activities of the Yolo County HCP/NCCP. Construction of the Dunnigan Pipeline and CBD outlet would create primarily temporary impacts and a small area of permanent impact that would not conflict with the establishment of conservation areas under the HCP/NCCP. No construction would occur in the Yolo Bypass Wildlife Area under Alternatives 1 and 3, and potential impacts in the wildlife area would consist of only water releases that would not adversely affect vegetation or wetland resources.

As discussed in Impacts VEG-1, VEG-2, and VEG-3 for the conveyance to Sacramento River component, construction of Alternatives 1 and 3 in the Dunnigan Pipeline and CBD outlet footprint would have permanent and temporary impacts on sensitive natural communities, wetlands, and non-wetland waters that are habitats for covered species in the Yolo County HCP/NCCP, consisting of upland riparian, managed wetland, and intermittent stream. Mitigation Measures VEG-2.2, VEG-3.1, VEG-3.2, VEG-3.3, VEG-4.1, and VEG-4.2 for riparian habitat, wetlands, and streams would align with the conservation strategy of the Yolo County HCP/NCCP, in that they would require compensatory mitigation for impacts on these habitat types.

Operation

Operation under Alternative 1 or 3 would not result in additional impacts or require additional mitigation measures. There would be no operation-related impacts due to conflicts with the Yolo County HCP/NCCP or Yolo Bypass Wildlife Area LMP.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 1 or 3 would result in significant impacts on special-status plant species habitats, sensitive natural communities, wetlands, and non-wetland waters through direct removal of vegetation, filling, hydrological interruption, and other indirect impacts as described above under Impacts VEG-2, VEG-3, and VEG-4. Implementation of Mitigation Measures VEG-2.1, VEG-2.2, VEG-3.1, VEG-3.2, VEG-3.3, VEG-4.1, and VEG-4.2 would reduce the level of these impacts and avoid conflicts with the adopted Yolo County HCP/NCCP and Yolo Bypass Wildlife Area LMP because all locations of special-status species, sensitive natural communities, wetlands, and non-wetland waters in and within 300 feet of the construction footprint under Alternatives 1 and 3 would be identified and mapped, and the acquisition and permanent protection of these resources at identified compensation ratios would ensure survival of special-status plant species, sensitive natural communities, wetlands, and non-wetland waters in perpetuity. Therefore, the level of this impact would be reduced to less than significant with mitigation. Operation of Alternative 1 or 3 would not result in additional impacts.

Mitigation Measure VEG-2.1: Conduct Surveys for Sensitive Natural Communities and Oak Woodlands in the Project Area Prior to Construction Activities

This mitigation measure is described above for Impact VEG-2.

Mitigation Measure VEG-2.2: Avoid and Compensate for Adverse Effects on Sensitive Natural Communities

This mitigation measure is described above for Impact VEG-2.

Mitigation Measure VEG-3.1: Avoid and Minimize Disturbance of Wetlands and Non-Wetland Waters During Construction Activities

This mitigation measure is described above for Impact VEG-3.

Mitigation Measure VEG-3.2: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Wetlands

This mitigation measure is described above for Impact VEG-3.

Mitigation Measure VEG-3.3: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Non-Wetland Waters

This mitigation measure is described above for Impact VEG-3.

Mitigation Measure VEG-4-1: Avoid and Minimize Potential Adverse Effects on Oak Woodlands

This mitigation measure is described above for Impact VEG-4.

Mitigation Measure VEG-4.2: Compensate for Adverse Effects on Oak Woodlands

This mitigation measure is described above for Impact VEG-4.

NEPA Conclusion

The construction effects under Alternatives 1 and 3 would be the same as those described above for CEQA. Construction of Alternative 1 or 3 would result in a substantial adverse effect on vegetation and wetland resources that are protected under the adopted Yolo County HCP/NCCP or Yolo Bypass Wildlife Area LMP, but through implementation of BMPs and the Mitigation Measures VEG-2.1, VEG-2.2, VEG-3.1, VEG-3.2, VEG-3.3, VEG-4.1, and VEG-4.2 construction effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 would have no additional effects on vegetation and wetland resources protected by the adopted Yolo County HCP/NCCP or Yolo Bypass Wildlife Area LMP.

Alternative 2

Construction

As described for Alternatives 1 and 3, construction of Alternative 2 in the Dunnigan Pipeline and CBD outlet footprint would have permanent and temporary impacts on habitats for covered species in the Yolo County HCP/NCCP. Impacts under Alternative 2 would be slightly larger, due to the extension of the pipeline alignment to the Sacramento River. As discussed for Alternatives 1 and 3, construction of the pipeline would not conflict with establishment of conservation areas under the Yolo County HCP/NCCP and the compensatory mitigation proposed for impacts on sensitive natural communities, wetland, and non-wetland waters would align with the Yolo County HCP/NCCP conservation strategy. The BMPs identified in Section 9.3.1, *Construction*, would also apply to Alternative 2.

Operation

Under Alternative 2, the impacts related to conflicts with the adopted Yolo County HCP/NCCP or Yolo Bypass Wildlife Area LMP during operation would be as described for Alternatives 1 and 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in similar impacts to Alternatives 1 and 3 but slightly greater, due to the extension of the pipeline alignment to the Sacramento River. As with Alternatives 1 and 3, implementation of BMPs and Mitigation Measures VEG-2.1, VEG-2.2, VEG-3.1, VEG-3.2, VEG-3.3, VEG-4.1, and VEG-4.2 would reduce the level of impact to less than significant.

Under Alternative 2, the impacts related to conflicts with the adopted Yolo County HCP/NCCP or Yolo Bypass Wildlife Area LMP during operation would be as described for Alternatives 1 and 3 and there would be no additional impacts.

NEPA Conclusion

The construction effects under Alternative 2 would be the same as those described above for CEQA and the same mitigation measures would be implemented. Construction of Alternative 2 would result in substantial adverse effects on special-status plant species habitats, sensitive natural communities, wetlands, and non-wetland waters protected by the Yolo County HCP/NCCP and Yolo Bypass Wildlife Area LMP. Through implementation of BMPs and Mitigation Measures VEG-2.1, VEG-2.2, VEG-3.1, VEG-3.2, VEG-3.3, VEG-4.1, and VEG-4.2, potential conflicts with the adopted Yolo County HCP/NCCP or Yolo Bypass Wildlife Area LMP would be reduced to no adverse effect. Operation of Alternative 2 would have no additional conflicts with these plans.

Impact VEG-6: Introduction or increased spread of invasive plant species

No Project

The No Project Alternative would not construct or operate any new facilities. Therefore, there would be no potential to introduce or increase the spread of invasive plant species.

Significance Determination

Under the No Project Alternative, no new facilities would be constructed or operated, and there would be no temporary or permanent impacts due to the Project. The No Project Alternative would have no impact due to introduction or spread of invasive plant species.

Alternatives 1, 2, and 3

Construction and Operation

The Authority would incorporate BMPs into Alternatives 1, 2, and 3 to avoid and minimize permanent and temporary impacts due to the spread of invasive plants, including “Control of Invasive Plant Species during Construction and Operation” Additionally, the invasive plant species identified Table 9B-5 (Appendix 9B) are also very common and widespread throughout

California and the Central Valley; consequently, there is a relatively low likelihood they would spread from the Alternatives 1, 2, and 3 footprints to places where they are not present and have an adverse effect on sensitive terrestrial natural communities, wetlands, or non-wetland waters.

During the operation of Alternative 1, 2, or 3, the use of the on-water recreation facilities and boat ramp could cause the spread of aquatic invasive plant species, such as Brazilian water weed (*Egeria densa*), water hyacinth (*Eichhornia crassipes*), and water milfoil (*Myriophyllum spicatum*) through boating on the Sites Reservoir. The reservoir would be in an area that was mostly terrestrial prior to inundation, and invasive aquatic species could be introduced from boats and boating equipment and become established in the reservoir. Conveyance of water from the Sites Reservoir into canals and downstream systems could further spread aquatic invasive plant propagules.

The operation of Alternative 1, 2, or 3 includes vegetation control that would limit the spread and introduction of invasive species around proposed facilities. Vegetation control activities that are part of Project operation would include the use of vegetation control and grazing around all facilities, recreation areas, and the Project buffer around all facilities. The Reservoir Management Plan would include protocols for invasive aquatic weed control.

CEQA Significance Determination and Mitigation Measures

Construction and operation of Alternative 1, 2, or 3 would not result in the increased spread of invasive plants that would result in an adverse effect on sensitive terrestrial natural communities, wetlands, or non-wetland waters because of the low likelihood of spread. Implementation of BMPs and vegetation control measures as part of construction, and the Reservoir Management Plan for invasive weed control as part of operation would reduce the potential for introduction and spread. Therefore, the potential for introduction and increased spread of invasive plants is a less-than-significant impact.

NEPA Conclusion

The construction and operation effects under Alternative 1, 2, or 3 would be the same as those described for CEQA. The potential effects associated with the introduction and increased spread of invasive plants would not be adverse.

9.6 References

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

Calflora. 2021. Information on California plants for education, research, and conservation. Search for Cal-IPC Invasive Plant Species. Available: http://www.calflora.org/. Accessed: January 7, 2021.

California Department of Fish and Game. 2008. Land Management Plan for the Yolo Bypass Wildlife Area. Final. June 2008. Available: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=84924&inline. Accessed: February 6, 2021.

California Department of Fish and Wildlife. 2021. California Natural Diversity Database, RareFind 5, January 13, 2021 [43 Quadrangles: Balls Ferry, Bend, Bird Valley, Black Butte Dam, Dunnigan, Eldorado Bend, Foster Island, Fruto NE, Gerber, Gilmore Peak, Glenn, Hamilton City, Hough Springs, Kirkville, Kirkwood, Knights Landing, Leesville, Lodoga, Logandale, Los Molinos, Manor Slough, Maxwell, Meridian, Moulton Weir, Nord, Ord Ferry, Orland, Panther Spring, Princeton, Rail Canyon, Red Bank, Red Bluff East, Red Bluff West, Sites, Stone Valley, Sutter Causeway, Taylor Monument, Tuscan Springs, West of Gerber, Wildwood School, Williams, Willows, Zamora]. Available: https://apps.wildlife.ca.gov/rarefind/view/RareFind.aspx.

California Department of Fish and Wildlife. 2020. *California Sensitive Natural Communities.* Last revised: September 9, 2020. Available: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=153609&inline. Accessed: December 11, 2020.

California Department of Fish and Wildlife. 2018. Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities. March 20. Available: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=18959&inline.

California Department of Water Resources. 2000a. North-of-Delta Offstream Storage Investigation Progress Report. January 4.

California Department of Water Resources. 2000b. North-of-Delta Offstream Storage Investigation Progress Report Appendix B: Wetland Delineation Field Studies Report. April.

California Invasive Plant Council. 2021. Inventory of Invasive Plant Species of California. Last revised: February 1, 2017. Available: https://www.cal-ipc.org/plants/inventory/. Accessed: January 8, 2021.

California Native Plant Society, Rare Plant Program. 2020. Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39). [Quads 4012242, 4012232, 4012222, 4012212, 4012223, 4012213, 4012214, 4012221, 4012211, 4012127, 3812271, 3812188, 3812177, 3812178, 3812281, 3812187, 3912117, 3912127, 3912128, 3912126, 3912273, 3912271, 3912272, 3912263, 3912262, 3912261, 3912252, 3912251, 3912242, 3912253,

3912241, 3912231, 3912232, 3912233, 3912244, 3912234, 3912224, 3912223, 3912222, 3912168, 3912178 3912116 and 3812176;]. Website http://www.rareplants.cnps.org Accessed: [December 16, 2020].

Colusa County. 2012. Colusa County General Plan, 5. Conservation Element. Available: https://countyofcolusa.org/DocumentCenter/View/2722/Conservation-Element_Colusa_Final?bidId=.

County of Yolo. 2009. 2030 Countywide General Plan, Conservation and Open Space Element. Adopted November 2009, Resolution No 09-189. Available: https://www.yolocounty.org/home/showpublisheddocument?id=8005.

Glenn County. 2020. Glenn County General Plan Update Existing Conditions Report. Available: https://static1.squarespace.com/static/5c8a73469b7d1510bee16785/t/5e556b56c253f84cdc287783/1582656403698/GlennCounty-ECR-Final-Feb2020.pdf.

Hill, S. R. 2015. *Sidalcea keckii.* Flora of North America. Available: http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=250101137.

Natural Resources Conservation Service. 2006. *Soil Survey of Colusa County, California*. USDA, in cooperation with Colusa County Resource Conservation District; State of California, Department of Conservation; Regents of the University of California; United States Department of Agriculture, Forest Service; and United States Department of the Interior, Bureau of Land Management and Fish and Wildlife Service.

Natural Resources Conservation Service. 2020a. *Soil Survey Geographic (SSURGO) Database for Colusa and Glenn counties, California* [Online]. U.S. Department of Agriculture. Available: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx. Accessed: October 21, 2020.

Natural Resources Conservation Service. 2020b. Climate Data for Colusa, California. Available: http://agacis.rcc-acis.org/?fips=06011 and http://agacis.rcc-acis.org/?fips=06021. Accessed December 10, 2020.

Natural Resources Conservation Service. 2020c. Climate Data for Stony Gorge, California. Available: http://agacis.rcc-acis.org/?fips=06011 and http://agacis.rcc-acis.org/?fips=06021. Accessed: December 10, 2020.

Sites Project Authority and U.S. Bureau of Reclamation 2017. Sites Reservoir Project Draft Environmental Impact Report/Environmental Impact Statement. August 2017. Available: https://sitesproject.org/resources/environmental-review/draft-environmental-impact-report-environmental-impact-statement/.

Tehama County. 2009. Tehama County General Plan Update, 2009-2029. March 2009. Available: https://www.co.tehama.ca.us/images/stories/planning/2009-2029%20Tehama%20County%20General%20Plan%20r1.pdf.

U.S. Fish and Wildlife Service. 2021. *Information for Planning and Consultation (IPaC). List of threatened and endangered species that may occur in the proposed project, and/or may be affected by the proposed project*. (Consultation Code 08ESMF00-2021-SLI-0961.) Available: https://ecos.fws.gov/ipac/. Accessed: February 9, 2021.

Yolo Habitat Conservancy. 2018. Yolo Habitat Conservation Plan/Natural Community Conservation Plan. Final. April 2018. Available: https://www.yolohabitatconservancy.org/documents. Accessed: February 5, 2021.

Chapter 10 Wildlife Resources

10.1 Introduction

This chapter describes the environmental setting, methods of analysis, and impact analysis for wildlife resources that would potentially be affected by the construction and operation of the Project. Wildlife resources are defined as special-status wildlife species (excluding fish) and the habitats on which they depend, migratory birds, colonies of non-special-status roosting bats, and wildlife corridors.

The study area for wildlife resources consists of areas of disturbance under all Project alternatives plus a 300-foot-wide buffer area. For operational impacts only, the study area for wildlife resources also includes the Sacramento River between the RBPP and the Delta. This area is referred to as the operations study area. Project components not included in the study area are offsite commercial quarries and existing roads that would provide construction access to the Project. The offsite quarries that would be aggregate sources for dam construction are not included in the study area for wildlife resources because the quarries are existing active locations. Obtaining aggregate from these offsite quarries during Project construction would not result in additional impacts on wildlife resources.

Tables 10-1a and 10-1b summarize the CEQA determinations and NEPA conclusions for construction and operation impacts, respectively, between alternatives that are described in the impact analysis.

Table 10-1a. Summary of Construction Impacts and Mitigation Measures for Wildlife Resources

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Impact WILD-1: Substantial adverse effect (i.e., loss or removal), either directly or through habitat modifications, on wildlife species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.			
No Project	NI NE	-	NI NE
Alternative 1	S SA	**Mitigation Measure WILD-1.1:** Assess Habitat Suitability and Survey Suitable Habitat for Vernal Pool Branchiopods **Mitigation Measure WILD-1.2:** Avoid and Minimize Potential Effects on Vernal	LTSM NE

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
		Pool Branchiopods and Western Spadefoot **Mitigation Measure WILD-1.3:** Compensate for Impacts on Occupied Vernal Pool Branchiopod Habitat **Mitigation Measure WILD-1.6:** Conduct Surveys for Suitable Valley Elderberry Longhorn Beetle Habitat **Mitigation Measure WILD-1.7:** Fence Elderberry Shrubs to be Protected **Mitigation Measure WILD-1.8:** Transplant Permanently Affected Elderberry Shrubs and Compensate for Loss of Valley Elderberry Longhorn Beetle and its Habitat **Mitigation Measure WILD-1.10:** Assess Habitat Suitability and Survey for Presence of Monarch Butterfly Nectar and Larval Host Plants **Mitigation Measure WILD-1.11:** Compensate for Loss of Monarch Butterfly Nectar and Larval Host Plants **Mitigation Measure WILD-1.12:** Assess Habitat Suitability and Survey for Presence of Crotch Bumble Bee and Western Bumble Bee Food Plants **Mitigation Measure WILD-1.13:** Compensate for Loss of Crotch Bumble Bee and Western Bumble Bee Habitat **Mitigation Measure WILD-1.14:** Assess Habitat Suitability and Survey Suitable Habitat for Western Spadefoot, California Red-legged Frog, and Western Pond Turtle **Mitigation Measure VEG-2.2:** Avoid and Compensate for Adverse Effects on Sensitive Natural Communities **Mitigation Measure VEG-3.2:** Compensate for Temporary and Permanent Impacts on State- or Federally Protected Wetlands	

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
		Mitigation Measure WILD-1.15: Implement California Red-legged Frog Protective Measures **Mitigation Measure WILD-1.16:** Compensate for Permanent and Temporary Losses of Occupied California Red-legged Frog Aquatic and Upland Habitats **Mitigation Measure WILD-1.17:** Conduct Preconstruction Surveys for Western Pond Turtle and Monitor Initial In-Water Work **Mitigation Measure VEG-3.1:** Avoid and Minimize Disturbance of Wetlands and Non-Wetland Waters During Construction Activities **Mitigation Measure VEG-3.3:** Compensate for Temporary and Permanent Impacts on State- or Federally Protected Non-Wetland Waters **Mitigation Measure WILD-1.18:** Implement Protective Measures for Giant Gartersnake **Mitigation Measure WILD-1.19:** Restore Temporarily Disturbed Giant Gartersnake Aquatic and Upland Habitat to Pre-Project Conditions **Mitigation Measure WILD-1.20:** Compensate for Permanent and Temporary Losses of Giant Gartersnake Aquatic and Upland Habitats **Mitigation Measure WILD-1.21:** Conduct Vegetation Removal during the Non-Breeding Season of Nesting Migratory Birds **Mitigation Measure WILD-1.22:** Conduct Preconstruction Surveys for Nesting Migratory Birds and Implement Protective Measures if Found **Mitigation Measure WILD-1.23:** Conduct Surveys for Western Burrowing Owl Prior to Construction and Implement	

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
		Avoidance and Minimization Measures if Found **Mitigation Measure WILD-1.24:** Restore Temporarily Disturbed Habitat and Compensate for the Permanent Loss of Occupied Burrowing Owl Habitat **Mitigation Measure WILD-1.26:** Construct Overhead Power Lines and Associated Equipment Following Suggested Practices to Reduce Bird Collisions with Power Lines **Mitigation Measure WILD-1.27:** Conduct Focused Surveys for Golden Eagle and Bald Eagle and Implement Protective Measures if Found **Mitigation Measure VEG-4.1:** Avoid and Minimize Potential Adverse Effects on Oak Woodlands During Construction **Mitigation Measure VEG-4.2:** Compensate for Adverse Effects on Oak Woodlands **Mitigation Measure WILD-1.28:** Conduct Focused Surveys for Nesting Swainson's Hawk and White-tailed Kite Prior to Construction and Implement Protective Measures during Construction **Mitigation Measure WILD-1.29:** Compensate for the Permanent Loss of Foraging Habitat for Swainson's Hawk **Mitigation Measure WILD-1.30:** Conduct Surveys and Implement Protection Measures for Special-Status Bat Species Prior to Building/Structure Demolition **Mitigation Measure WILD-1.31:** Conduct Surveys and Implement Protection Measures for Special-Status Bat Species Prior to Tree Trimming and Removal **Mitigation Measure WILD-1.32:** Compensate for Permanent Impacts on Occupied Roosting Habitat	

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
		Mitigation Measure WILD-1.33: Implement Protective Measures to Avoid and Minimize Potential Impacts on American Badger	
Alternative 2	S SA	Same as Alternative 1, plus: **Mitigation Measure WILD-1.4:** Evaluate and Survey Potential Habitat for Antioch Dunes Anthicid and Sacramento Anthicid Beetles and Implement Protective Measures **Mitigation Measure WILD-1.5:** Compensate for the Loss of Occupied Antioch Dunes Anthicid and Sacramento Anthicid Beetle Habitat	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE
Impact WILD-2: Substantial interference with the movement of a native resident or migratory wildlife species or with established native resident or migratory wildlife corridors, or impediment of the use of native wildlife nursery sites			
No Project	NI NE	-	NI NE
Alternative 1	S SA	Same as for Impact WILD-1	SU SA
Alternative 2	S SA	Same as Alternative 1	SU SA
Alternative 3	S SA	Same as Alternative 1	SU SA
Impact WILD-3: Conflict with any local policies or ordinances protecting wildlife resources			
No Project	NI NE	-	NI NE
Alternative 1	S SA	Same as for Impacts WILD-1 and WILD-2	LTSM NE
Alternative 2	S SA	Same as Alternative 1	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE
Impact WILD-4: Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan			
No Project	NI NE	-	NI NE

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Alternative 1	S SA	Same as for Impact WILD-1	LTSM NE
Alternative 2	S SA	Same as Alternative 1	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE

Notes:
NI = CEQA determination of no impact
LTS = CEQA determination of less-than-significant impact
LTSM = CEQA determination of less than significant with mitigation
SU = CEQA determination of significant and unavoidable
B = NEPA conclusion of beneficial effects
NE = NEPA conclusion of no effect or no adverse effect
AE = NEPA conclusion of adverse effect
SA = NEPA conclusion of substantial adverse effect

Table 10-1b. Summary of Operation Impacts and Mitigation Measures for Wildlife Resources

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Impact WILD-1: Substantial adverse effect (i.e., loss or removal), either directly or through habitat modifications, on wildlife species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.			
No Project	NI NE	-	NI NE
Alternative 1	S SA	**Mitigation Measure WILD-1.9:** Protect Special-status Invertebrates and their Host and Food Plants from Herbicide and Pesticide Use **Mitigation Measure WILD-1.25:** Protect Special-status Wildlife from Rodenticide Use	LTSM NE
Alternative 2	S SA	Same as Alternative 1	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE
Impact WILD-2: Substantial interference with the movement of a native resident or migratory wildlife species or with established native resident or migratory wildlife corridors, or impediment of the use of native wildlife nursery sites			
No Project	NI NE	-	NI NE

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Alternative 1	S SA	**Mitigation Measure WILD-2.1:** Design and Construct Wildlife Crossings for New Roadways at Suitable Locations **Mitigation Measure WILD-2.2:** Monitor and Maintain Wildlife Crossings	SU SA
Alternative 2	S SA	Same as Alternative 1	SU SA
Alternative 3	S SA	Same as Alternative 1	SU SA
Impact WILD-3: Conflict with any local policies or ordinances protecting wildlife resources			
No Project	NI NE	-	NI NE
Alternative 1	S SA	Same as for Impacts WILD-1 and WILD-2	LTSM NE
Alternative 2	S SA	Same as Alternative 1	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE
Impact WILD-4: Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan			
No Project	NI NE	-	NI NE
Alternative 1	S SA	Same as for Impact WILD-1	LTSM NE
Alternative 2	S SA	Same as Alternative 1	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE

Notes:
NI = CEQA determination of no impact
LTS = CEQA determination of less-than-significant impact
LTSM = CEQA determination of less than significant with mitigation
SU = CEQA determination of significant and unavoidable
B = NEPA conclusion of beneficial effects
NE = NEPA conclusion of no effect or no adverse effect
AE = NEPA conclusion of adverse effect
SA = NEPA conclusion of substantial adverse effect

10.2 Environmental Setting

This section presents the methods for assessing wildlife resources in the study area, describes the habitats and wildlife commonly associated with each land cover type in the study area, and discusses the federally and state listed special-status wildlife species identified as potentially present in the study area. Table 10A-1 in Appendix 10A, *Special-status Wildlife Table and Non-listed Wildlife Species Accounts*, includes the status, habitat requirements, and likelihood of occurrence for the special-status species. The appendix also provides species accounts for non-special-status wildlife species with moderate to high potential to occur in the study area. Appendix 10B, *Wildlife Habitat Models and Methods*, contains special-status species model descriptions.

10.2.1. Methods for Assessing Wildlife Resources in the Study Area

Potential wildlife resources in the study area were evaluated by reviewing existing information and identifying potentially suitable habitat with geographic information system (GIS) modeling. Property access restrictions precluded field surveys of wildlife resources in the study area since the preparation of the 2017 Draft EIR/EIS. Previous surveys to characterize habitat and wildlife communities and for focused surveys for groups of wildlife species (i.e., amphibians and reptiles, birds, and mammals) were conducted from 1998 to 2004 and in 2010 to 2011. Results of these surveys were reported in the 2017 Draft EIR/EIS and are not included in this chapter. Limited information from January 2021 focused bird surveys conducted for geotechnical boring investigations for the Project is reported in Appendix 10A. The following information was reviewed.

- California Natural Diversity Database (CNDDB) search results for occurrences of special-status wildlife species (defined in Section 10.2.3) within 5 miles of the study area (Appendix 9A, *Special-Status Plant Species*) (California Department of Fish and Wildlife 2021a).
- An unofficial endangered and threatened species list for the study area, obtained from the Information, Planning, and Consultation (IPaC) website (Appendix 9A) (U.S. Fish and Wildlife Service 2021).
- Historical and recent (i.e., 2020) aerial imagery of the study area in Google Earth Pro.
- Species distribution, habitat association, and habitat requirement information from numerous sources cited in this chapter and Appendices 10A and 10B.
- California Essential Habitat Connectivity Project (Spencer et al. 2010).

Potentially suitable habitat for special-status wildlife species in the study area was determined based on scientific literature and GIS modeling. Available literature was reviewed to identify known habitat associations and habitat requirements for each species. These requirements were then compared with the existing land cover types mapped in the study area, and a series of assumptions were made regarding which land cover types could provide potentially suitable habitat for each species based on its habitat requirements. The land cover types associations,

model assumptions and rationales are in the species model descriptions (Appendix 10B). Using the assumptions and rationales from the model descriptions, a list of potentially suitable land cover types was created for each species, which was then modeled using GIS software to identify areas of potential habitat for most species in the study area (models were not created for a few species). Because the models are limited in part by the accuracy of aerial imagery interpretation and the inability to field verify the land cover mapping, they may over- or underestimate the amount of potential habitat in the study area for one or more species.

10.2.2. Land Cover Types and Associated Wildlife

The study area and vicinity are predominantly vegetated by natural and agricultural vegetation. Aerial imagery interpretation was primarily used to map the land cover types in the study area. The land cover types identified in the study area are shown in Figure 9B-1 in Appendix 9B, *Vegetation and Wetland Methods and Information*, and are listed in Table 9B-1, which also provides acreage estimates for each type. The habitats and wildlife commonly associated with each land cover type are described below.

10.2.2.1. Annual Grassland

Annual grassland is the dominant land cover type in the study area. Annual grasslands are used by many wildlife species for foraging. Some of these species also inhabit annual grassland if special features such as cliffs, caves, ponds, or woody plants are available for breeding or resting habitat, or as escape cover. Reptiles that breed in annual grassland habitats include western fence lizard (*Sceloporus occidentalis*), common garter snake (*Thamnophis sirtalis*), and northern pacific rattlesnake (*Crotalus oreganus oreganus*). Grasslands provide foraging habitat for wide-ranging species such as red-tailed hawk (*Buteo jamaicensis*), turkey vulture (*Cathartes aura*), American kestrel (*Falco sparverius*), and northern harrier (*Circus hudsonius*). Mammals typically found in this habitat include California vole (*Microtus californicus*), western harvest mouse (*Reithrodontomys megalotis*), California ground squirrel (*Otospermophilus beecheyi*), black-tailed hare (*Lepus californicus*), coyote (*Canis latrans*), and American badger (*Taxidea taxus*) (California Department of Fish and Wildlife 2021b). In addition, many species that nest or roost in open woodlands may forage in associated grasslands, including western bluebirds (*Sialia mexicana*), western kingbirds (*Tyrannus verticalis*), and some species of bats (Zeiner et al. 1990a:428, 510; 1990b).

10.2.2.2. Barren

The barren land cover type is characterized by areas where vegetation cannot grow. Barren was mapped in one location in the study area in a landslide on a hillslope where vegetation was not present. Because of the lack of vegetation, barren ground has a limited use by wildlife. However, some species, such as western burrowing owl (*Athene cunicularia*) and California horned lark (*Eremophila alpestris actia*), prefer areas with limited or very low-growing vegetation.

10.2.2.3. Blue Oak Woodland

The blue oak woodland vegetation community, dominated by blue oak, is the most common vegetation in the low foothills of the western portion of the study area. Oak woodlands are

important habitats because of their high value to wildlife in the form of nesting sites, cover, and food (California Department of Fish and Wildlife 2021b). Birds associated with oak woodlands include acorn woodpecker (*Melanerpes formicivorus*), western scrub jay (*Aphelocoma californica*), yellow-billed magpie (*Pica nuttalli*), and many warblers and flycatchers (Zeiner et al. 1990a:376, 452, 460). Cavities in oak trees are important nesting sites for acorn woodpecker, oak titmouse (*Baeolophus inornatus*), Bewick's wren (*Thryomanes bewickii*), and western bluebird (California Partners in Flight 2002:24). Oak woodlands provide nesting sites and/or foraging habitat for raptors, such as red-tailed hawk, red-shouldered hawk (*Buteo lineatus*), and great-horned owl (*Bubo virginianus*) (Zeiner et al. 1990a:132, 136, 326; California Partners in Flight 2002:24). Mammals associated with oak woodlands include western gray squirrel (*Sciurus griseus*), pallid bat (*Antrozous pallidus*), bobcat (*Lynx rufus*), mule deer (*Odocoileus hemionus*), and gray fox (*Urocyon cinereoargenteus*) (Zeiner et al. 1990b:70, 146, 324, 352). Acorns are an important food source for species such as California quail (*Callipepla californica*), wild turkey (*Meleagris gallopavo*), western gray squirrel, and mule deer (California Department of Fish and Wildlife 2021b).

10.2.2.4. Canal

Canals occur throughout the lower elevation portions of the study area in agricultural areas. Canals, including the TC Canal, GCID Main Canal, and CBD, were defined as constructed channels used for irrigation that may be earth- or concrete-lined. Most canals are subject to ongoing maintenance, including vegetation removal. Wildlife use of canals depends on several factors, including the extent of vegetation in and along the canal, whether the canal is concrete lined, the period of time that water remains in the canal, and the velocity of flow. Concrete-lined canals or those with high flow velocities typically have low value for wildlife, although large canals with slower flows can be used by waterfowl.

10.2.2.5. Chamise Chaparral

The chamise chaparral community is uncommon in the study area and is concentrated along South Road in the western portion where it is the dominant vegetation. Chaparral provides habitat for a variety of birds and mammals. Numerous rodents, deer, and other herbivores are common in chaparral communities. Rabbits and hares will eat twigs, evergreen leaves, and bark from chaparral in fall and winter when there isn't an abundance of grasses. Shrubby vegetation provides mammals with cover and shade during hot weather and protection from wind in the winter. Chaparral provides seeds, fruits, insects, protection from predators and the weather, in addition to singing, roosting, and nesting sites for many species of birds (California Department of Fish and Wildlife 2021b). California quail, Bewick's wren (*Thryomanes bewickii*), wrentit (*Chamaea fasciata*), California thrasher (*Toxostoma redivivum*), black-tailed hare, brush mouse (*Peromyscus boylii*), dusky-footed woodrat (*Neotoma fuscipes*), and black-tailed deer (*Odocoileus hemionus columbianus*) are common in chaparral habitats (Zeiner et al. 1990a, 1990b).

10.2.2.6. Developed

Developed areas are generally paved or covered with an impermeable substrate (i.e., asphalt, concrete). Structures in developed areas may provide suitable roosting habitat for bats or nesting habitat for birds. Roadways and other paved surfaces do not provide habitat for wildlife.

10.2.2.7. Disturbed

Disturbed areas are regularly compacted but still have a permeable surface. Because these areas are typically subject to disturbance from human activity on a regular basis, they provide low-quality habitat for wildlife. Wildlife species commonly found in urban areas are also found in disturbed areas. Such species may include Brewer's blackbird (*Euphagus cyanocephalus*), house finch (*Carpodacus mexicanus*), house sparrow (*Passer domesticus*), yellow-billed magpie, mourning dove (*Zenaida macroura*), Virginia opossum (*Didelphus virginiana*), and striped skunk (*Mephitis mephitis*) (Zeiner et al. 1990a:310, 460, 646, 668, 682; Zeiner et al.1990b:2, 316). American kestrel and red-tailed hawk frequently forage in this habitat (Zeiner et al. 1990a:136, 144).

10.2.2.8. Ditch

Ditches are defined as earth-lined, constructed channels used for irrigation or drainage, including roadside drainages, and are present throughout the study area in the lower elevation agricultural areas. Most ditches are subject to ongoing maintenance, including vegetation removal. Wildlife use of ditches is dependent on several factors including the extent of vegetation in and along the ditch, the period of time that water remains in the ditch, and the velocity of flow. Ditches with high flow velocities typically have low value for wildlife. Ditches with vegetation in the channel and along the banks and an adequate duration of water can provide food, water, cover, and dispersal corridors for various wildlife species, such as Sierran treefrog (*Pseudacris sierra*), California newt (*Taricha torosa*), great egret (*Ardea alba*), raccoon (*Procyon lotor*), and striped skunk. The banks of ditches could be used by California ground squirrel and western fence lizard.

10.2.2.9. Ephemeral Stream

Ephemeral streams occur throughout the Antelope Valley and surrounding hills. These unnamed features convey flows only during and immediately after rainfall events. Ephemeral streams provide temporary sources of water for several common wildlife species but do not provide breeding habitat for amphibians. The banks of the channels may be used by California ground squirrels, western fence lizards, and gopher snakes (*Pituophis melanoleucus*).

10.2.2.10. Foothill Pine

Foothill pine occurs only in the western part of the study area along the South Road alignment. A large variety of wildlife species breed in foothill pine habitat, although no species is completely dependent on it for breeding, feeding, or cover. Most species utilizing this habitat breed during late winter and early spring (California Department of Fish and Wildlife 2021b). Blue oak-foothill pine woodland habitat provides forage opportunities for a variety of bird species that feed on acorns, bark, and foliage insects. Primary cavity-nesting birds (e.g., woodpeckers)

excavate nest holes in living and dead trees, which are subsequently used by other cavity-nesting species such as the American kestrel, white-breasted nuthatch (*Sitta carolinensis*), and western bluebird. Other species that may occur in this habitat include wild turkey, oak titmouse, and western gray squirrel (Zeiner et al. 1990a and 1990b).

10.2.2.11. Forested Wetland

Forested wetlands (i.e., riparian forest) occur in one segment of Willow Creek (northeast of Willows) and in segments of Antelope Creek, Stone Corral Creek, Grapevine Creek, Funks Creek, and unnamed intermittent streams that are tributary to these creeks, as well as at the edge of a pond southwest of Funks Reservoir. When the vegetation is diverse and well developed, riparian forest provides high value habitat for wildlife, including several special-status species. Riparian forest habitat provides food, water, and migration and dispersal corridors, as well as escape, nesting, and thermal cover for many wildlife species (California Department of Fish and Wildlife 2021b). Invertebrates, amphibians, and aquatic reptiles live in aquatic and adjacent upland habitats. Raptors, herons, egrets, and other birds nest in the upper canopy. A variety of songbirds use the shrub canopy, and cavity-nesting birds, such as Nuttall's woodpecker (*Picoides nuttallii*), and oak titmouse, occupy dying trees and snags (Zeiner et al. 1990a:388, 472). Several mammals including raccoon, Virginia opossum, and striped skunk are common in riparian habitats (Zeiner et al. 1990b:2, 298, 316).

10.2.2.12. Freshwater Marsh

Freshwater marsh occurs at the saturated edges of riparian vegetation, ponds (including Salt Lake), seasonal wetlands, Funks Reservoir, Stone Corral Creek, GCID Main Canal near the Sacramento River at the RBPP, and unnamed intermittent streams. Most irrigation ditches and agricultural field edges are regularly maintained, and freshwater marsh is infrequently in ditches. Freshwater marsh provides food, cover, and water for a variety of amphibians, reptiles, birds, and mammals. (California Department of Fish and Wildlife 2021b). Wildlife species that use freshwater marsh habitat include Sierran treefrog, western aquatic gartersnake (*Thamnophis couchi*) (Zeiner et al. 1988:78, 216), great blue heron (*Ardea herodias*), great egret, Virginia rail (*Rallus limicola*), and red-winged blackbird (*Agelaius phoeniceus*) (Zeiner et al. 1990a:32, 34, 176, 638).

10.2.2.13. Hayfield

The largest areas of hayfields in the study area are located on the Antelope Valley floor. Alfalfa fields are included with this land cover type. Hayfield provides high-quality seasonal habitat for reptiles (e.g., gopher snakes, king snakes [*Lampropeltis californiae*]), birds (e.g., blackbirds, doves, egrets, hawks, owls, sandhill cranes, waterfowl), and mammals (gophers, voles, deer, elk [*Cervus canadensis*], fox [*Vulpia* spp.]). However, when hayfields are harvested repeatedly, reproduction values for ground-nesting birds are reduced to zero. If rotational cropland is adjacent to hayfields, the hayfields can provide cover during seasonal disking and planting on the rotated fields. (California Department of Fish and Wildlife 2021b). Alfalfa is also high-quality wildlife habitat because it provides nesting cover, abundant insects, and feeding opportunities throughout the year due to its perennial growth pattern. Many types of insects and vertebrate herbivores, such as gophers and rabbits, feed in alfalfa fields. The insect and vertebrate

herbivores are then prey for songbirds, migratory birds, raptors, foxes, snakes, and lizards. Deer, antelope, and elk commonly feed in alfalfa fields, especially in times of drought. Swainson's hawk (*Buteo swainsoni*) and other raptors can be found hunting in alfalfa fields (Agronomy Research and Information Center 2021).

10.2.2.14. Intermittent Stream

There are numerous intermittent streams in the study area, including Willow Creek, Stone Corral Creek, Lurline Creek, Grapevine Creek, Wilson Creek, tributaries to these creeks, and many unnamed streams. Segments of Hunters Creek, Funks Creek, and Antelope Creek also have intermittent flows. Intermittent streams have the most water flow during the wet season and may contain pools that remain inundated into late summer. Intermittent streams have a more limited use by wildlife species than perennial streams because of their restricted flows. When flowing or when pools are present, these streams may provide sources of drinking water for birds and mammals and may provide movement corridors for some species of amphibians.

10.2.2.15. Managed Wetland

Managed wetlands in the study area include created wetlands in a mitigation area on the west side of the CBD. Wildlife species and habitat use for managed wetland are similar to those described for freshwater marsh.

10.2.2.16. Mixed Chaparral

Mixed chaparral is generally found in the western and southern portions of the study area at elevations ranging from 800–1,800 feet. Wildlife species and habitat use for mixed chaparral are similar to those described for chamise chaparral.

10.2.2.17. Oak Savanna

Oak savanna in the study area can be found on gently sloping hills and occasionally on terraces and valley floors. Wildlife species and habitat use for oak savanna are similar to those described for annual grassland and blue oak woodland.

10.2.2.18. Orchard

Orchards in the study area are located east of Funks Reservoir on the Central Valley floor. Orchards are typically planted on deep fertile soils that supported diverse and productive natural habitats in the past. Orchards can provide shade or water, if irrigated, for wildlife. Deer may browse on trees. Orchards may provide cover and nesting sites for various species of birds including mourning dove and California quail. California ground squirrels may also feed on nuts in orchards. Birds that commonly feed on almonds and walnuts are northern flicker (*Colaptes auratus*), western scrub jay, American crow, oak titmouse, Brewer's blackbird, and house finch. Birds that frequently feed on orchard fruit include yellow-billed magpie, western bluebird, American robin (*Turdus migratorius*), northern mockingbird (*Mimus polyglottos*), cedar waxwing (*Bombycilla cedrorum*), and Bullock's oriole (*Icterus bullockii*). (California Department of Fish and Wildlife 2021b). Western red bat (*Lasiurus blossevillii*) has been found roosting in fruit and nut orchards (Pierson et al. 2006:12, 15).

10.2.2.19. Ornamental Woodland

Ornamental woodlands in the study area are stands of nonnative trees that have been planted around buildings or agricultural lands. Ornamental woodland provides a location where animals can escape, nest, and obtain thermal cover. Common and special-status birds may perch or nest in stands of nonnative woodland. Common mammals such as raccoon, Virginia opossum, and striped skunk may take cover in nonnative woodland. Foliage roosting bats, such as western red bat and hoary bat (*Lasiurus cinereus*) may roost in the foliage of nonnative woodland trees.

10.2.2.20. Perennial Stream

Several streams in the study area carry water year-round and are considered perennial streams, including the Sacramento River; Hunters Creek, including a realigned segment and several tributaries that carry water from the GCID Main Canal through areas of rice fields; Stone Corral Creek, downstream of the confluence with Antelope Creek; most of Antelope Creek; and most of Funks Creek. Perennial streams with adjacent riparian or emergent wetland vegetation, provide food, water, and migration and dispersal corridors, as well as escape, nesting, and thermal cover for a variety of wildlife and fish species. The open water areas of large rivers and creeks provide resting and escape cover for many species of waterfowl and other waterbirds. Insectivorous birds, such as swallows, swifts, and flycatchers catch insects over open water areas. The river shore and shallow water areas provide foraging opportunities for waterfowl, herons, and shorebirds. (California Department of Fish and Wildlife 2021b). Other wildlife species that may use the riverine habitat and/or associated riparian habitat include western pond turtle (*Actinemys marmorata*) (Zeiner et al. 1988:100), river otter (*Lutra canadensis*), raccoon, and striped skunk (Zeiner et al. 1990b:298, 316, 318).

10.2.2.21. Pond

There are numerous ponds in the Antelope Valley and surrounding hills, as well as one detention basin in the Dunnigan Pipeline alignment. Ponds provide habitat for several species of amphibians including Sierran treefrog, California newt, and California toad (*Anaxyrus boreas halophilus*), and aquatic reptiles such as western pond turtle and valley gartersnake (*Thamnophis sirtalis fitchi*). Freshwater marsh vegetation is commonly associated with ponds and provides cover habitat for these species, and may provide cover, resting, or breeding habitat for various bird species. Bats and insectivorous birds may drink from and forage over ponds, and other mammal species may use ponds as a source of water.

10.2.2.22. Reservoir

Funks Reservoir is the only reservoir in the study area. Reservoirs provide habitat for a variety of amphibians, reptiles, birds, and mammals for reproduction, food, water, or cover (California Department of Fish and Wildlife 2021b). Various species of ducks and geese inhabit reservoirs, and other birds such as herons and belted kingfishers (*Megaceryle alcyon*) forage along the water's edge. Many species of insectivorous birds, including barn swallow (*Hirundo rustica*), cliff swallow (*Petrochelidon pyrrhonota*), and black phoebe (*Sayornis nigricans*), catch their prey over open water (Zeiner et al. 1990a). Bald eagles feed on fish and some birds associated with reservoirs (California Department of Fish and Wildlife 2021b).

10.2.2.23. Rice

Rice is the most dominant agricultural type in the easternmost portion of the study area. Flooded rice fields provide freshwater wetlands for a variety of wetland-associated wildlife, including shorebirds, wading birds, and gulls (California Department of Fish and Wildlife 2021b). Wildlife species associated with flooded rice fields include great egret, white-faced ibis (*Plegadis chihi*), snow goose (*Chen caerulescens*), northern pintail (*Anas acuta*), black-necked stilt (*Himantopus mexicanus*), and greater yellowlegs (*Tringa melanoleuca*) (Zeiner et al. 1990a:34, 44, 52, 66, 198, 203). Rice fields and associated irrigation ditches also provide suitable habitat for giant gartersnake (*Thamnophis gigas*) (U.S. Fish and Wildlife Service 2015a).

10.2.2.24. Row Crops

Row crops are mostly scattered in the eastern portion of the study area on the valley floor. Agricultural lands (including row crops) are established on fertile soils that historically supported abundant wildlife. The quality of habitat for wildlife is greatly diminished when the land is converted to agricultural uses and is intensively managed. Many species of rodents and birds have adapted to agricultural lands, but they are often controlled by fencing, trapping, and poisoning to prevent excessive crop losses (California Department of Fish and Wildlife 2021b). Wildlife species that may be associated with row crops include mourning dove, American crow (*Corvus brachyrhynchos*), Brewer's blackbird, sandhill crane (*Grus canadensis*), raptors, egrets, and rodents.

10.2.2.25. Ruderal

Ruderal areas are mostly scattered in the eastern portion of the study area on the valley floor. Ruderal refers to weedy or disturbed conditions including areas surrounding residences, out-buildings, and stockyards. Depending on the size and location of ruderal areas, wildlife species and habitat use for ruderal are similar to those described above for annual grassland (larger areas or near other natural land cover types) or disturbed (smaller areas or near developed areas).

10.2.2.26. Scrub-Shrub Wetland

Scrub-shrub wetland is present along Willow Creek and Grapevine Creek (intermittent streams); perennial streams, including Sacramento River, Stone Corral Creek, Antelope Creek, and Funks Creek; Funks Reservoir; edges of ponds; and irrigation and drainage ditches with enough water supply to support woody vegetation. Scrub-shrub wetland provides cover, a place to escape, and nesting substrate for a variety of animals. Songbirds perch and nest in the woody vegetation and other birds such as red-winged blackbird and Virginia rail may use the emergent vegetation for cover and nesting (Zeiner et al. 1990a:176, 638). Because the vegetation in scrub-shrub wetlands is dependent on long-term sources of water, open water associated with scrub-shrub wetland provides habitat for amphibians and aquatic reptiles, including western pond turtle and giant gartersnake.

10.2.2.27. Seasonal Wetland

Seasonal wetlands occur throughout the study area in isolated depressions in annual grassland, as well as in association with other wetlands and non-wetland waters, such as freshwater marsh,

ponds, and streams. Some of the seasonal wetlands in the study area would be considered vernal pools, because they have higher species diversity and support native or obligate-wetland species (California Department of Water Resources 2000). Several seasonal wetlands northwest of Funks Reservoir are alkali wetlands. Seasonal wetlands and vernal pools provide unique habitat for a variety of aquatic invertebrates that are food for other wildlife species, including great blue heron, killdeer (*Charadrius vociferus*), American avocet (*Recurvirostra americana*), black-necked stilt, and greater yellowlegs (Zeiner et al. 1990a:32, 192, 200, 202). In addition, amphibians such as Sierran treefrog, western spadefoot (*Spea hammondii*), and California toad use vernal pools and seasonal swales for breeding and feeding (Zeiner et al. 1988:56, 64, 78).

10.2.2.28. Upland Riparian

Riparian vegetation in the study area is associated with intermittent and perennial stream corridors and floodplain terraces, although most of the riparian areas are narrow and degraded by cattle use. Well-developed, native riparian vegetation occurs in small remnant patches along foothill portions of the larger creeks in the study area. The largest concentration of riparian habitat is in the southern portion of the inundation area along Antelope Creek. One large stand of upland riparian also occurs along the Sacramento River at the end of the Dunnigan Pipeline alignment. Wildlife species and habitat use for upland riparian are similar to those described for forested wetland.

10.2.2.29. Vineyard

Small portions of two individual vineyards are located in the northern portion of the study area on the outer edges of the city of Willows and in the southern portion of the study area along the Dunnigan Pipeline alignment. Wildlife species and habitat use for vineyard are similar to those described for orchard and row crops.

10.2.3. Special-Status Wildlife Species

For the purpose of this chapter, special-status wildlife are animals that are legally protected under the Endangered Species Act (ESA), the California Endangered Species Act (CESA), or other regulations, and species that are considered sufficiently rare by the scientific community to qualify for such listing.

Special-status wildlife are those animals in any of the following categories:

- Species listed or proposed for listing as threatened or endangered under ESA (50 Code of Federal Regulations [CFR] 17.11 [listed animals] and various notices in the Federal Register [FR] [proposed species]).
- Species that are candidates for possible future listing as threatened or endangered under ESA (85 FR 73164 [November 16, 2020]).
- Species listed or proposed for listing by the State of California as threatened or endangered under CESA (14 California Code of Regulations 670.5).

- Animal species of special concern identified on the Special Animals List by California Department of Fish and Wildlife (CDFW) (California Department of Fish and Wildlife 2021c).
- Animals fully protected in California (California Fish and Game Code Section 3511 [birds], 4700 [mammals], 5050 [amphibians and reptiles], and 5515 [fish]).
- Animals that are considered biologically rare, very restricted in distribution, or declining throughout their range, as determined by the scientific community (such as the Western Bat Working Group) and/or identified on the CDFW Special Animals List (California Department of Fish and Wildlife 2021c).

Forty-one special-status wildlife species occur in or within 5 miles of the study area or have suitable habitat in the study area and were evaluated for their potential to occur in the study area (Table 10A-1 in Appendix 10A).

Based on a review of species distribution and habitat requirements and land cover types in the study area, eight of the 41 species are not expected to occur in the study area because the area lacks suitable habitat for the species or is outside the species' known range. Table 10A-1 provides an explanation for the absence of each of these species from the study area. These eight species are not addressed further. Federally listed, state listed, and fully protected species (13 species) that have potential to occur in the study area are discussed below. Non-listed and non-fully-protected species (20 species) are discussed in Appendix 10A.

10.2.3.1. Conservancy Fairy Shrimp

Status and Distribution

Conservancy fairy shrimp is federally listed as endangered (59 FR 48136–48153). Historically, Conservancy fairy shrimp was probably found in suitable vernal pool habitats throughout much of the Central Valley and southern coastal regions of California (U.S. Fish and Wildlife Service 2005a:II-181). Except for one population along the Central Coast in Ventura County, all current locations of Conservancy fairy shrimp are in the Central Valley (U.S. Fish and Wildlife Service 2012:3).

Habitat Requirements and Biology

Conservancy fairy shrimp primarily occurs in large turbid vernal pools (playa pools) that stay inundated for much longer than typical vernal pools, often into summer (Eriksen and Belk 1999:88, U.S. Fish and Wildlife Service 2012:3). Conservancy fairy shrimp has been found in vernal pools on a variety of landforms, geologic formations, and soil types (U.S. Fish and Wildlife 2005a:II-183) and within a wide elevation range (16 to 5,577 feet) (Eriksen and Belk 1999:88).

Similar to other vernal pool branchiopods, Conservancy fairy shrimp is adapted to the environmental conditions of its ephemeral vernal pool habitats. These adaptations include the ability of fairy shrimp cysts to remain dormant in the soil when vernal pool habitats are dry. Fairy shrimp are also able to complete their lifecycle (from cyst hatching to reproducing) within

the relatively short time period when vernal pools are inundated with water (U.S. Fish and Wildlife Service 2005a:II-195). Differences in the rate of maturation and reproduction of vernal pool branchiopods are thought to be the result of variations in water temperature (Helm 1998:134).

Occurrence in and Near the Study Area

There are no recorded occurrences of Conservancy fairy shrimp in the study area (California Department of Fish and Wildlife 2021a). There is one known occurrence of Conservancy fairy shrimp at the Sacramento National Wildlife Refuge, approximately 1.5 miles from the study area (California Department of Fish and Wildlife 2021a). Potentially suitable habitat for this species in the study area consists of the seasonal wetland and ditch land cover types when adjacent to or surrounded by annual grassland.

10.2.3.2. Vernal Pool Fairy Shrimp

Status and Distribution

Vernal pool fairy shrimp is federally listed as threatened (59 FR 48136–48153). Vernal pool fairy shrimp is known to occur in a wide range of vernal pool habitats in the southern and Central Valley areas of California (U.S. Fish and Wildlife Service 2005a:II-192). The species is currently found in fragmented habitats across the Central Valley of California from Shasta County to Tulare and Kings Counties, in the central and southern Coast Ranges from Napa County to Los Angeles County, and inland in western Riverside County, California (U.S. Fish and Wildlife Service 2005a:II-193; 2007a:17).

Habitat Requirements and Biology

Vernal pool fairy shrimp commonly inhabit vernal pools or vernal pool-like habitats, typically in grassland landscapes. Most frequently, vernal pool fairy shrimp are found in vernal pools or vernal swales, in unplowed grasslands (Eng et al. 1990:257). Vernal pool fairy shrimp sometimes occur in other wetlands that provide habitat characteristics similar to those of vernal pools; these other wetlands include alkaline rain pools, rock outcrop pools, and some disturbed and constructed sites, including tire ruts, ditches, and puddles (59 FR 48136–48153; Eriksen and Belk 1999:93; Helm 1998:129–130; U.S. Fish and Wildlife Service 2007a:24, 58). Occupied habitats range in size from 6-square-foot puddles to pools exceeding 24 acres (Eriksen and Belk 1999:93). Vernal pool fairy shrimp is not found in riverine, marine, or other permanent waters (U.S. Fish and Wildlife Service 2007a:4). Suitable pools must stay inundated long enough for the shrimp to complete their life cycle.

Vernal pool fairy shrimp matures very quickly and can have multiple clutches of eggs per lifespan (Eriksen and Belk 1999:93). In a study using large plastic pools to simulate natural vernal pools, Helm (1998:133) found that vernal pool fairy shrimp reached maturity in an average of 18 days following hatching and reproduced an average of 40 days after hatching. Differences in the rate of maturation and reproduction of vernal pool branchiopods are thought to be the result of variations in water temperature (Helm 1998:134).

Occurrence in and Near the Study Area

There are no recorded occurrences of vernal pool fairy shrimp in the study area (California Department of Fish and Wildlife 2021a). There are several records for vernal pool fairy shrimp occurrences at the Sacramento National Wildlife Refuge, approximately 2.75–3.75 miles from the study area. There are also records for occurrences near the RBPP, the closest being approximately 1.2 miles northwest of the pumping plant (California Department of Fish and Wildlife 2021a). Potentially suitable habitat for this species in the study area consists of the seasonal wetland and ditch land cover types when adjacent to or surrounded by annual grassland.

10.2.3.3. Vernal Pool Tadpole Shrimp

Status and Distribution

Vernal pool tadpole shrimp is federally listed as endangered (59 FR 48136–48153). The historical range of vernal pool tadpole shrimp likely consisted of the Central Valley and Central Coast regions of California (U.S. Fish and Wildlife Service 2005a:II-204). Vernal pool tadpole shrimp presently occurs sporadically in the Central Valley from Shasta County to northwestern Tulare County and the San Francisco Bay area (U.S. Fish and Wildlife Service 2005a:II-204-205; 2007b:4).

Habitat Requirements and Biology

Vernal pool tadpole shrimp occurs in a variety of seasonal habitats, including vernal pools and other seasonal pools, ponded clay flats, roadside ditches, and stock ponds (Helm 1998:132; Rogers 2001:1002). Habitats where vernal pool tadpole shrimp have been observed range in size from small (less than 25 square feet), clear, vegetated vernal pools to large (more than 80 acres) winter lakes (Helm 1998:133). Vernal pool tadpole shrimp produce cysts (eggs) that lie in the soil until the next winter rains trigger the eggs to hatch (U.S. Fish and Wildlife Service 2007b:3).

In the laboratory, vernal pool tadpole shrimp eggs collected from dry pond sediments at the end of summer hatched in 17 days (Ahl 1991:137). In a study using large plastic pools to simulate natural vernal pools, Helm (1998:133) found that vernal pool tadpole shrimp reached maturity in an average of 38 days following hatching and reproduced an average of 54 days after hatching (Helm 1998:133). Differences in water temperature, which strongly effects the growth rates of aquatic invertebrates, may cause variation in rates of growth and maturation (U.S. Fish and Wildlife Service 2005a:II-206). Vernal pool tadpole shrimp can produce additional eggs during the wet season that hatch without going through a dormant period (Ahl 1991:137).

While vernal pool tadpole shrimp is adapted to seasonal habitats, it has a relatively long lifespan compared to other large branchiopods (U.S. Fish and Wildlife Service 2005a:II-206). In Helm's study (1998:133), vernal pool tadpole shrimp lived an average of 143 days. The long lifespan of vernal pool tadpole shrimp is attributed to its ability to tolerate drying pool conditions and warm water (Helm 1998:135).

Occurrence in and Near the Study Area

There are no recorded occurrences of vernal pool tadpole shrimp in the study area (California Department of Fish and Wildlife 2021a). There are several known occurrences of vernal pool tadpole shrimp at the Sacramento National Wildlife Refuge, approximately 1.25–3 miles from the study area (California Department of Fish and Wildlife 2021a). Potentially suitable habitat for this species in the study area consists of the seasonal wetland and ditch land cover types when adjacent to or surrounded by annual grassland.

10.2.3.4. Valley Elderberry Longhorn Beetle

Status and Distribution

Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) is federally listed as threatened. The current range of valley elderberry longhorn beetle consists of the Central Valley from approximately Shasta County south to to Fresno County. It includes the valley floor and lower foothills, with most beetle observations recorded at elevations below 500 feet (U.S. Fish and Wildlife Service 2017a).

Habitat Requirements and Biology

Valley elderberry longhorn beetle is found only in association with its host plant, elderberry (*Sambucus* spp.), which is commonly present in riparian forests and adjacent grasslands in the Central Valley (Barr 1991:4–5). Elderberry shrubs can also be present in non-riparian valley oak (*Quercus lobata*) and blue oak (*Quercus douglasii*) woodland habitats (U.S. Fish and Wildlife Service 2017a:5). Adult valley elderberry longhorn beetles feed on elderberry foliage and are present from March through early June, during which time the adults mate and lay eggs (U.S. Fish and Wildlife Service 2006a:5). Females lay their eggs in bark crevices or at the junction of stem and trunk or leaf petiole and stem (Barr 1991:4). After hatching, the larva burrows into the stem where it develops for 1–2 years and feeds on the pith in the center of the stem (Talley 2007:1480). Before pupation, the larva creates an exit hole, plugs the hole with wood shavings, and returns to the pith to pupate.

After transforming into an adult, valley elderberry longhorn beetle emerges through the previously created exit hole (U.S. Fish and Wildlife Service 2017:4). Exit holes are 0.3–0.4 inch wide (Barr 1991:5). Adult emergence, mating, and egg laying takes place in the spring and summer (March to July) (U.S. Fish and Wildlife Service 2017a:4). Adults feed on elderberry leaves and flowers (Talley 2007:1480). Valley elderberry longhorn beetle abundance is associated with higher levels of nitrogen available in the pith of stressed elderberries (Talley 2007:1480).

Occurrence in and Near the Study Area

There are numerous records for occurrences of valley elderberry longhorn beetle along the Sacramento River in the operations study area (California Department of Fish and Wildlife 2021a). Potentially suitable habitat for this species in the study area consists of upland riparian, scrub-shrub wetland, forested wetland, blue oak woodland, oak savanna, annual grassland, and ruderal land cover types.

10.2.3.5. California Red-legged Frog

Status and Distribution

California red-legged frog (*Rana draytonii*) is federally listed as threatened. The historical range of California red-legged frog extended along the coast from the vicinity of Mendocino in Mendocino County, California, and inland from the vicinity of Redding, California, southward to northwestern Baja California, Mexico (Storer 1925:235–236; Jennings and Hayes 1985:95). The species is known from isolated locations in the Sierra Nevada and the North Coast and northern Transverse Ranges. It is locally abundant in portions of the San Francisco Bay area and along the Central Coast and is still present in Baja California, Mexico (69 FR 19622). California red-legged frog is believed to be extirpated from the floor of the Central Valley (U.S. Fish and Wildlife Service 2002:5). California red-legged frogs have been found at elevations that range from sea level to about 5,000 feet. Nearly all sightings have occurred below 3,500 feet (U.S. Fish and Wildlife Service 2002:1).

Habitat Requirements and Biology

California red-legged frog uses a variety of habitat types that include various aquatic systems, as well as riparian and upland habitats (U. S. Fish and Wildlife Service 2002:12). However, the frogs may complete their entire life cycle in a pond or other aquatic site that is suitable for all life stages (66 FR 14626). California red-legged frogs inhabit marshes, streams, lakes, ponds, and other, usually permanent, sources of water that have dense riparian vegetation (Stebbins 2003:225). Habitat generally consists of still or slow-moving water that is at least 2.5 feet deep and adjacent to shrubby riparian vegetation (willows [*Salix* spp.]) or tules [*Scirpus* sp.] and cattails [*Typha* sp.]) (Jennings and Hayes 1994:64). Although California red-legged frog can inhabit either intermittent or permanent streams or ponds, populations probably cannot be maintained in streams in which all surface water disappears (Jennings and Hayes 1994:64–65).

California red-legged frogs are highly aquatic and spend most of their lives in the riparian zone (Brode and Bury 1984:32). Adults may take refuge during dry periods in rodent holes or leaf litter in riparian habitats (U.S. Fish and Wildlife Service 2002:14). Adult California red-legged frogs have been observed using large cracks in the bottoms of dried ponds as refugia (Alvarez 2004:162). Although California red-legged frogs typically remain near streams or ponds, marked and radio-tagged frogs have been observed to move more than 2 miles through upland habitat. These movements are frequently made during wet weather and at night (U.S. Fish and Wildlife Service 2002:12–13.)

Aestivation habitat consists of riparian vegetation and landscape features within 300 feet of riparian vegetation that provide cover and moisture during the dry season including boulders, rocks, organic debris (e.g., downed trees or logs), industrial debris, and agricultural features (e.g., drains, watering troughs, spring boxes, abandoned sheds, haystacks) (61 FR 25814).

California red-legged frogs breed from November through April and typically lay their eggs in clusters around aquatic vegetation (U.S. Fish and Wildlife Service 2002:16). Larvae typically undergo metamorphosis from July to September, 3.5 to 7 months after hatching (66 FR 14626),

but larvae have been observed to take more than a year to complete metamorphosis in four counties on the Central Coast of California (Fellers et al. 2001:156).

Occurrence in and Near the Study Area

There are no recorded California red-legged frog occurrences within 5 miles of the study area (California Department of Fish and Wildlife 2021a). The closest reported occurrence is approximately 34 miles from the study area in Butte County (California Department of Fish and Wildlife 2021d). California red-legged frog was not found in the Sites Reservoir portion of the survey area during focused surveys for the species in 1997–1998 (Brown and Yip 2000:20). California red-legged frog is considered extirpated from the floor of the Central Valley (U.S. Fish and Wildlife Service 2002:5), which constitutes the portion of the study area generally east of Funks Reservoir. Potentially suitable aquatic habitat for this species in the study area consists of freshwater marsh, perennial stream, intermittent stream, pond, and reservoir land cover types. Potentially suitable upland habitat in the study area consists of annual grassland, blue oak woodland, foothill pine, oak savanna, ruderal, forested wetland, ephemeral stream, scrub-shrub wetland, seasonal wetland, and upland riparian land cover types within 300 feet of aquatic habitat. Potentially suitable upland habitat land cover types within 1 mile of potentially suitable aquatic habitat land cover types in the study area are considered dispersal habitat for California red-legged frog.

10.2.3.6. Giant Gartersnake

Status and Distribution

Giant gartersnake is federally listed as threatened and state listed as threatened. Giant gartersnake is endemic to the Sacramento and San Joaquin Valleys, where it is found in lowland areas (U.S. Fish and Wildlife Service 2015b:I-8). Historically, this species was found throughout the Central Valley from Butte County in the north to Kern County in the south. Giant gartersnake is presently known to occur only in nine discrete populations in Butte, Colusa, Contra Costa, Fresno, Glenn, Kern, Kings, Madera, Merced, Placer, Sacramento, San Joaquin, Solano, Stanislaus, Sutter, Tulare, Yolo, and Yuba Counties (U.S. Fish and Wildlife Service 2015b:9, 11–12).

Habitat Requirements and Biology

Giant gartersnake inhabits marshes, ponds, sloughs, small lakes, low-gradient streams and other waterways, and agricultural wetlands, including irrigation and drainage canals, rice fields, and the adjacent uplands (U.S. Fish and Wildlife Service 2006b:3).

Suitable giant gartersnake aquatic habitat consists of slow-moving or static water that is present from March through November with a mud substrate and the presence of prey (amphibians or fish) (U.S. Fish and Wildlife Service 2017b:I-3). Emergent and bankside vegetation that provides cover from predators and for thermoregulation are also required. Other components of suitable aquatic habitat are basking sites with supportive vegetation (such as folded tule [*Schoenoplectus* spp.] clumps) adjacent to escape cover, upland refugia in locations that are not subject to

recurrent flooding, and the absence of a continuous riparian canopy and large predatory fish, (U.S. Fish and Wildlife Service 2017b:I-3).

Characteristics of suitable upland habitat are available bankside vegetation, such as cattail or tule; shelter that is more permanent in nature, such as bankside cracks and crevices, holes, or small mammal burrows; and banksides that are not subjected to overgrazing (U.S. Fish and Wildlife Service 2017b:I-3). Riparian woodland is generally considered unsuitable habitat because of the lack of basking sites, presence of excessive shade, and lack of prey (U.S. Fish and Wildlife Service 1999:22).

Small mammal burrows and other areas of cover above the flooding zone, such as riprap, are used for overwintering (generally October 1 through April 1). Overwintering snakes have been documented in burrows as far as 656 to 820 feet from the edge of summer aquatic habitat (U.S. Fish and Wildlife Service 2017b:I-3, I-5, I-6). The breeding season extends from March through May. Females give birth to live young from summer to early fall. Giant gartersnake feeds primarily on small fish and amphibians (U.S. Fish and Wildlife Service 2017b:I-5, I-6).

Occurrence in and Near the Study Area

There are four records for occurrences of giant gartersnake in the study area and numerous occurrences of giant gartersnake recorded within 5 miles of the study area, including at Sacramento National Wildlife Refuge, in other areas east of the inundation area, and at the east end of the Dunnigan Pipeline (California Department of Fish and Wildlife 2021a). Potentially suitable aquatic habitat for giant gartersnake in the study area consists of canal, ditch, freshwater marsh, managed wetland, pond, and rice land cover types. Suitable giant gartersnake upland habitat in the study area consists of annual grassland, disturbed, and ruderal land cover types within 200 feet of suitable aquatic habitat. Aquatic and upland habitats for giant gartersnake in the study area are east of the GCID Main Canal except for upland habitat within 200 feet west of GCID Main Canal; and east and west of the GCID Main Canal south of Stone Corral Creek.

10.2.3.7. Golden Eagle

Status and Distribution

Golden eagle is fully protected under the California Fish and Game Code and protected by the Bald and Golden Eagle Protection Act (BGEPA). Golden eagle is a year-round resident throughout much of California. The species does not breed in the center of the Central Valley but breeds in much of the rest of the state (Zeiner et al. 1990a:142–143).

Habitat Requirements and Biology

Golden eagle inhabits nearly all terrestrial habitats of the western United States, except densely forested, densely populated, and agricultural areas (Katzner et al. 2020). Secluded, protected cliffs with overhanging ledges are usually preferred for nesting but large trees are also used for nesting and cover (Driscoll 2010:1, Hunt et al. 1999:4). Preferred territory sites include those that have a favorable nest site, a dependable food supply (medium to large mammals and birds), and broad expanses of open country for foraging. Hilly or mountainous country where takeoff

and soaring are supported by updrafts is generally preferred to flat habitats (Johnsgard 1990:262). In the interior central Coast Ranges of California, golden eagles favor open grasslands and oak savanna, with lesser numbers in oak woodland and open shrublands. In the Diablo Range of California, all except a few pairs nest in trees in oak woodland and oak savanna habitats due to a lack of suitable rock outcrops or cliffs. Nest trees include several oak species (*Quercus* spp.), foothill pine (*Pinus sabiniana*), Coulter pine (*Pinus coulteri*), California bay laurel (*Umbellularia californica*), eucalyptus *(Eucalyptus* spp.), and western sycamore (*Platanus racemosa*). Eagles will also nest on electrical transmission towers traversing grasslands (Hunt et al. 1999:13).

Grasslands, deserts, savannas, and early successional stages of forest and shrub habitats provide open foraging terrain for golden eagles (Zeiner et al. 1990a:142). Golden eagle preys on a variety of animal species, with mammals making up 80–90% of its diet (Driscoll 2010:2). The golden eagle nesting season is generally late March through the end of August. In the Diablo Range of California, courtship behaviors have been observed in December and January (Katzner et al. 2020).

Occurrence in and Near the Study Area

Although there are no recorded occurrences of golden eagle in the study area or within 5 miles of the study area (California Department of Fish and Wildlife 2021a), there are numerous observations of individuals in the study area that are recorded in eBird (Cornell Lab of Ornithology 2021). Potentially suitable golden eagle nesting habitat in the study area consists of blue oak woodland, foothill pine, and oak savanna land cover types. Potentially suitable foraging habitat for golden eagle in the study area consists of annual grassland, oak savanna, mixed chaparral, ornamental woodland, and ruderal land cover types.

10.2.3.8. Bald Eagle

Status and Distribution

Bald eagle is state listed as endangered and is protected under the BGEPA. Bald eagle is a permanent resident and uncommon winter migrant in California (California Department of Fish and Game 1999a).

Habitat Requirements and Biology

Bald eagle breeds at coastal areas, rivers, lakes, and reservoirs with forested shorelines or cliffs in northern California. Wintering bald eagles are associated with aquatic areas containing some open water for foraging. Bald eagle nests in trees in mature and old growth forests that have some habitat edge and are somewhat close (within 1.25 miles) to water with suitable foraging opportunities. The average distance of bald eagle nests to human is 0.3 mile for most populations, which indicates a preference for nesting away from human developments. (Buehler 2020). Bald eagle will occasionally nest in riparian habitats, where nests are often in black cottonwoods (*Populus trichocarpa*) (Anthony et al. 1982:333). In California, ponderosa pine (*Pinus ponderosa*) and sugar pine (*Pinus lambertiana*) are the most frequently used tree species for nesting (Lehman 1979:13, Anthony et al. 1982:333). Where no large conifers are present,

bald eagle will nest in deciduous trees such as oaks and cottonwoods (*Populus* spp.). Bald eagles build their nests in the upper canopy, generally selecting the largest trees in the area (Buehler 2020).The breeding season is February through July (Zeiner et al. 1990a:122).

Roost sites, like nest sites, are associated with aquatic foraging areas, but roost sites are farther from water than nest sites (Buehler 2020). Bald eagle is an opportunistic forager that takes live prey and scavenges carrion. Bald eagles hunt for live fish in shallow water but more frequently scavenge dead or dying fish. Bald eagle also eats other aquatic and terrestrial animals including waterfowl, muskrats (*Ondatra zibethicus*), raccoons, and small mammals (Buehler 2020; Jackman et al. 1999:87, 90–92; California Department of Fish and Game 1999a).

Occurrence in and Near the Study Area

Although there are no recorded occurrences of bald eagle in the study area (California Department of Fish and Wildlife 2021a), there is one known bald eagle occurrence at Sacramento National Wildlife Refuge, approximately 1.5 miles from the study area (California Department of Fish and Wildlife 2021a). Several bald eagles were observed by an ICF biologist at Funks Reservoir in January 2021 during focused bird surveys for geotechnical boring investigation locations. Potentially suitable habitat for this species in the study area consists of blue oak woodland, foothill hill pine, forested wetland, perennial stream, reservoir, and upland riparian land cover types.

10.2.3.9. Swainson's Hawk

Status and Distribution

Swainson’s hawk is state listed as threatened. The breeding range for Swainson’s hawk in California consists of the extreme northeast portion of the state, the Sacramento and San Joaquin Valleys, valleys of the Sierra Nevada in Inyo and Mono Counties, and occasionally elsewhere in the state (Bechard et al. 2020). Swainson’s hawks primarily winter in South America but some individuals winter in the Sacramento–San Joaquin River Delta (Bechard et al. 2020).

Habitat Requirements and Biology

Swainson’s hawks arrive in the Central Valley in March or April to establish nesting territories and breed (California Department of Fish and Wildlife 2016:5). They usually nest in large, mature trees. Most nest sites (87%) in the Central Valley are found in riparian habitats (Estep 1989:35), primarily because trees are more available there. Swainson’s hawk also nests in mature roadside trees and in isolated trees in agricultural fields or pastures. The breeding season is from March through August (Estep 1989:12, 35). Nest sites are generally adjacent to, or within flying distance of, suitable foraging habitat and near large tracts of agricultural lands (California Department of Fish and Wildlife 2016:8).

Swainson’s hawk forages in grasslands, grazed pastures, alfalfa and other hay crops, and certain grain and row croplands. Vineyards, orchards, rice, and cotton crops are generally unsuitable for foraging because of the density of the vegetation (California Department of Fish and Game 1992:41). Important land cover types for foraging are alfalfa and other irrigated hay crops, grain

and row crops, fallow fields, dryland pasture, grassy ruderal lots, and annual grasslands (Swolgaard et al. 2008:192, 194; California Department of Fish and Wildlife 2016:7). In California, voles make up a large portion of Swainson's hawk's diet, but it will also eat ground squirrels, pocket gophers, and deer mice (*Peromyscus* spp.) (Bechard et al. 2020).

Occurrence in and Near the Study Area

There are numerous records for Swainson's hawk nest sites along the Sacramento River and other locations in the study area. Potentially suitable nesting habitat in the study area consists of blue oak woodland, forested wetland, oak savanna, ornamental woodland, and upland riparian land cover types. Foraging habitat for Swainson's hawk in the study area consists of annual grassland, hayfield, managed wetland, oak savanna, row crops, ruderal, and seasonal wetland land cover types.

10.2.3.10. White-tailed Kite

Status and Distribution

White-tailed kite is fully protected under the California Fish and Game Code. In California, white-tailed kite occurs in coastal and valley lowlands and is rarely found away from agricultural areas (Zeiner et al. 1990a:120).

Habitat Requirements and Biology

White-tailed kite nests in trees or shrubs in open grassland, agricultural, wetland, oak woodland, and savanna habitats (Dunk 2020). Habitat elements that influence nest site selection and nesting distribution include habitat structure (usually trees with a dense canopy) and prey abundance and availability (primarily the association with California vole), while the association with specific vegetation types (e.g., riparian, oak woodland, etc.) appears less important (Erichsen et al. 1996:165, 173; Dunk 2020). White-tailed kite nests have been documented in a variety of tree species, including oaks, Fremont's cottonwood (*Populus fremontii*), willow, eucalyptus, box elder (*Acer negundo*), coast redwood (*Sequoia sempervirens*), ornamental trees including olive (*Olea* sp.) and pine (*Pinus* sp.) trees, and in shrubs less than 10 feet tall (e.g., *Atriplex* and *Baccharis*) (Dixon et al. 1957:159; Erichsen et al. 1996:172; Dunk 2020). Nest trees appear to be selected based on structure and security, and thus typically have a dense canopy or are in a dense group of trees or large stands (more than 250 acres). White-tailed kites also nest in single isolated trees and communally roost in small stands of trees (Dunk 2020). The breeding season lasts from February through October and peaks between May and August (Zeiner et al. 1990a:120).

White-tailed kites forage in undisturbed, open grassland, meadows, farmland, and emergent wetlands (Zeiner et al. 1990a:120). The foraging success of white-tailed kite is directly proportional to the abundance and composition of prey species (Erichsen et al. 1996:173), with rodents being the main prey type (Dunk 2020; Mendelsohn and Jaksic 1989:8). Preferred foraging habitats are ungrazed grasslands, open woodlands, low shrubs, wetlands dominated by grasses, and fence rows and irrigation ditches with residual vegetation adjacent to grazed lands (Mendelsohn and Jaksic 1989:2, 8; Dunk 2020). In cultivated areas, alfalfa and sugar beet fields

are preferred, as well as rice stubble fields in the spring (Erichsen et al. 1994:46; Erichsen et al. 1996:170).

Occurrence in and Near the Study Area

There are no recorded occurrences of white-tailed kite in the study area (California Department of Fish and Wildlife 2021a). There is one record for a white-tailed kite nest site approximately 2.5 miles south of the RBPP and one record for a nest site approximately 3 miles east of the southern portion of the inundation area (California Department of Fish and Wildlife 2021a). Potentially suitable nesting habitat in the study area consists of blue oak woodland, forested wetland, oak savanna, ornamental woodland, and upland riparian land cover types. Foraging habitat for white-tailed kite in the study area consists of annual grassland, hayfield, managed wetland, oak savanna, row crops, ruderal, and seasonal wetland land cover types.

10.2.3.11. Western Yellow-billed Cuckoo

Status and Distribution

The western distinct population segment of the yellow-billed cuckoo is federally listed as threatened (79 FR 59992) and state listed as endangered (California Department of Fish and Wildlife 2021b). The breeding range of western yellow-billed cuckoo in California consists of isolated locations along the South Fork Kern River, lower Colorado River, and Sacramento River (Hughes 2015).

Habitat Requirements and Biology

Breeding western yellow-billed cuckoos are riparian obligates and nest almost exclusively in riparian woodland with native broadleaf trees and shrubs (Halterman et al. 2015:3). Suitable habitat has a tree or large-shrub component with a variable overstory canopy and an understory component (U.S. Fish and Wildlife Service 2019:5, 6). The overstory of the riparian habitat typically includes cottonwood and willow trees (U.S. Fish and Wildlife Service 2019:6). Nest sites are often in dense foliage, and nests are primarily in willow, Fremont's cottonwood, and mesquite (*Prosopis* sp.). Along the Sacramento River, nests have rarely been found in prune (*Prunus* sp.), English walnut (*Juglans regia*), and almond (*Prunus dulcis*) orchards (Laymon 1998:4). Cottonwoods are used extensively for foraging and are an important component of foraging habitat (78 FR 61634).

Western yellow-billed cuckoo requires large blocks of riparian habitat for breeding (78 FR 61633). Patch size was found to be the most important habitat variable to predict presence of western yellow-billed cuckoo on the Sacramento River (Girvetz and Greco 2009). Large patch sizes (50 to 100 acres, with a minimum width of 328 feet) are typically required for cuckoo occupancy (Riparian Habitat Joint Venture 2004).

Western populations of yellow-billed cuckoos form pairs in mid-June or later and breed from June to August, with a peak in mid-July to early August (Hughes 2015). Breeding is restricted to the middle of summer, presumably because of a seasonal peak in large insect abundance (Rosenberg et al. 1982). To accommodate this, development of young is very rapid with a

breeding cycle of 17 days from egg-laying to fledging of young (Hughes 2015). Western populations continue nesting through August, and up to three broods can be raised in a season if the prey base is sufficient. The birds begin their southbound migration in mid-August, and most have left the breeding grounds by mid-September (78 FR 61632).

Little is known about western yellow-billed cuckoo migratory habitat. Yellow-billed cuckoos may be found in a variety of vegetation types during migration, which suggests that the habitat needs of the cuckoo during migration are not as restricted as their habitat needs during the breeding season. Yellow-billed cuckoo may also be found in smaller riparian patches during migration than those in which it typically nests (78 FR 61634).

Occurrence in and Near the Study Area

There are numerous records for occurrences of western yellow-billed cuckoo along the Sacramento River in the operations study area (California Department of Fish and Wildlife 2021a). Potentially suitable western yellow-billed cuckoo habitat in the operations study area consists of forested wetland, scrub-shrub wetland, and upland riparian land cover types that are a minimum of 37 acres in size and have a minimum patch width of 328 feet and a maximum canopy gap width of 328 feet.

10.2.3.12. Bank Swallow

Status and Distribution

Bank swallow (*Riparia riparia*) is state listed as a threatened (California Department of Fish and Wildlife 2021b). The geographic range for bank swallow in California includes breeding in portions of the northern and central regions of the state where appropriate habitat exists. There are scattered colonies throughout northern California, but an estimated 70% to 90% of the breeding population is along the Sacramento River and its tributaries. This species spends winters in Central and South America (Bank Swallow Technical Advisory Committee 2013:9–10) and breeds in California between approximately March and September (California Department of Fish and Game 1999b).

Habitat Requirements and Biology

Riparian, lake, and coastal areas with vertical banks, bluffs, and cliffs with fine-textured or sandy soils provide suitable habitat for bank swallow (California Department of Fish and Game 1999b). Bank swallows typically establish colonies along eroded, vertical banks in river systems with friable alluvial soils. Nesting colonies are infrequently found in artificial sites, including sand quarries and road cuts (Bank Swallow Technical Advisory Committee 2013:12–13). Nesting sites are almost always near water (California Department of Fish and Game 1999b). In addition, riparian overbank vegetation appears to be an important habitat feature for bank swallow nesting, foraging, or both on the Sacramento River; a 10-year survey indicated that colonies were more strongly associated with native herbaceous/scrub and riparian forest habitat types, than with orchards (Garcia 2009:53, 55; Bank Swallow Technical Advisory Committee 2013:13). Nesting site selection is also based on attributes such as soil moisture, soil texture, orientation of the bank

face, verticality of the bank face, and proximity to foraging areas (California Department of Fish and Game 1995:11).

Foraging habitat for bank swallow includes wetlands, open water, grasslands, riparian woodland, orchards, agricultural fields, shrub lands, and upland woodlands (Bank Swallow Technical Advisory Committee 2013:14, California Department of Fish and Game 1999b). This species typically forages within approximately 650 feet of nest sites but may forage up to 6 miles away (Garrison 1998:4). Bank swallows typically forage in flight on a wide variety of aerial and terrestrial soft-bodied insects including flies, bees, and beetles (Bank Swallow Technical Advisory Committee 2013:14, California Department of Fish and Game 1999b).

Bank swallow nests in colonies ranging in size from three to over 3,000. Females typically lay three to five eggs, and are thought to have one brood per season, but may have two. Peak egg-laying is between mid-April and mid-May, and most juveniles fledge by mid-July (Bank Swallow Technical Advisory Committee 2013:11–12).

Occurrence in and Near the Study Area

There are numerous CNDDB records for occurrences of bank swallow along the Sacramento River in the operations study area. The occurrences that are closest to construction areas are 0.2 mile from the RBPP and 0.4 mile from the GCID head gate structure, both along the Sacramento River (California Department of Fish and Wildlife 2021a). Potentially suitable bank swallow nesting habitat in the study area consists of portions of the Sacramento River with eroded, vertical banks. Potentially suitable bank swallow foraging habitat in the study area consists of annual grassland, blue oak woodland, barren, chamise chaparral, ephemeral stream, forested wetland, foothill pine, freshwater marsh, intermittent stream, mixed chaparral, oak savanna, perennial stream, pond, reservoir, scrub-shrub wetland, seasonal wetland, upland riparian, canal, disturbed, ditch, hayfield, managed wetland, orchard, ornamental woodland, reservoir, rice, row crops, ruderal, and vineyard land cover types.

10.2.3.13. Tricolored Blackbird

Status and Distribution

Tricolored blackbird is state listed as threatened. Tricolored blackbird is a highly colonial species that is largely endemic to California. The historical tricolored blackbird breeding range in California included the Sacramento and San Joaquin Valleys, the foothills of the Sierra Nevada south to Kern County, the coastal slope from Sonoma County south to the Mexican border, and, sporadically, the Modoc Plateau. However, historical surveys did not include large areas of the species' currently known breeding range (Shuford and Gardali 2008:438). The species' overall range has not changed much since the mid-1930s (Beedy et al. 2020), though more recent surveys have documented additional local populations at the periphery of the range (e.g., as far north along the Pacific Coast as Humboldt County, and in the western Mojave desert), and new colony sites within the overall historical range (Shuford and Gardali 2008:439).

Habitat Requirements and Biology

Suitable tricolored blackbird breeding colony sites have open, accessible water; a protected nesting substrate, including either flooded, thorny, or spiny vegetation; and a suitable foraging space providing adequate insect prey within a few miles of the nesting colony. Tricolored blackbird breeding colonies occur in freshwater marshes dominated by tules and cattails, in Himalayan blackberry (*Rubus armeniacus*), and in silage and grain fields (Beedy and Hamilton 1997:3–4). The breeding season is from early March to early August (Beedy et al. 2020).

Tricolored blackbird foraging habitats in all seasons include annual grasslands, dry seasonal pools, agricultural fields (such as large tracts of alfalfa with continuous mowing schedules, and recently tilled fields), cattle feedlots, and dairies. Tricolored blackbirds also forage occasionally in riparian scrub habitats and along marsh borders. Weed-free row crops and intensively managed vineyards and orchards do not serve as regular foraging sites. Most tricolored blackbirds forage within 3 miles of their colony sites but commute distances of up to 8 miles have been reported (Beedy and Hamilton 1997:5).

Occurrence in and Near the Study Area

There are two records for presumably extant tricolored blackbird colonies that overlap the study area; one is east of the inundation area and the other is east of the GCID system improvements area. There are numerous records for occurrences of tricolored blackbird colonies within 5 miles of the study area (California Department of Fish and Wildlife 2021a). Potentially suitable tricolored blackbird nesting habitat in the study area consists of freshwater marsh and managed wetland land cover types. Potentially suitable foraging habitat for tricolored blackbird in the study area consists of annual grassland, rice, row crops, and seasonal wetland land cover types within 3 miles of suitable nesting habitat. Ruderal areas are also considered suitable foraging habitat when adjacent to other suitable foraging habitat land cover types.

10.3 Methods of Impact Analysis

The methods for analysis of impacts on wildlife resources are based on professional standards and information cited throughout this section. The key impacts were identified and evaluated based on the environmental characteristics of the study area and the expected magnitude, intensity, and duration of activities related to the construction and operation of the Project.

Direct impacts are those effects that would be caused by the Project and would occur at the same time and place. Filling of the reservoir is considered a direct impact, even though it would take time for the reservoir to be filled completely. Indirect impacts are those effects that are caused by the Project but would occur later in time (e.g., impacts from operations) or be farther from the Project but are reasonably foreseeable (e.g., impacts downstream of the Project). Direct and indirect impacts may be either permanent or temporary. Short-term temporary impacts on wildlife resources would occur when temporarily affected areas would be restored to preconstruction conditions within 1 year. Long-term temporary impacts would occur when impacts on wildlife resources would be temporary but would last more than 1 year. Short-term

temporary impacts are calculated as temporary impacts and long-term temporary impacts were calculated as permanent impacts in the impact analysis. The study area for wildlife resources includes a 300-foot-wide area beyond the permanent and temporary impact areas. For vernal pool branchiopods, the amount of modeled habitat within 250 feet of impact boundaries was estimated for potential impacts such as changes in hydrology that would indirectly but permanently affect modeled habitat. The additional 300-foot area was assessed for potential temporary direct impacts on wildlife resources. For operational impacts only, the study area for wildlife resources also includes the Sacramento River between the RBPP and the Delta (i.e., operations study area).

In general, permanent and temporary impacts on potential habitat for special-status species are overestimated because the entirety of the land cover is considered affected even when specific habitat requirements may be absent (e.g., elderberry shrubs, which are host plants for valley elderberry longhorn beetle, in riparian land cover types).

10.3.1. Construction

Direct permanent impacts on special-status wildlife and their habitats were assessed using the estimated amounts of modeled habitat (as described in Section 10.2.1, *Methods for Assessing Wildlife Resources in the Study Area*) that would be converted by Project construction. Construction impacts include both construction of facilities and filling of Sites Reservoir. Short-term and long-term temporary impacts on habitat for wildlife species were calculated using the estimated acreages of land cover types that would be temporarily disturbed during Project construction based on the amount of time the land cover would be disturbed (i.e., less than or more than 1 year of disturbance). One of the assumptions of the impact analysis was that the conditions on parcels of land surrounding the reservoir would be maintained similar to existing conditions (e.g., as grazing lands).

Impacts on special-status wildlife habitats were calculated using GIS software. GIS data of the Project footprint and associated temporary impact areas were overlaid on the modeled species habitat (and in a few cases, land cover mapping data) to quantify the permanent and temporary impacts associated with the construction of the Project facilities. Impacts on individuals of special-status wildlife species were assumed if modeled habitat was affected. Special-status wildlife species identified as having moderate to high potential to occur in the study area (Table 10A-1 in Appendix 10A) were included in the impact analysis. The special-status wildlife species with low potential were not included in the impact analysis because they are not expected to occur in the study area or be affected by the Project.

The following assumptions and alternative details regarding specific Project components were applied to the impact analysis:

- Installation of the two additional TC Canal diversion pumps at the RBPP would not affect any modeled habitat for special-status wildlife because construction would occur in the existing facility footprint. In addition, work would be short term. These activities would likely be conducted during winter because dewatering would be required and because it

would be outside of the nesting bird season. No impacts are anticipated and this area is not considered further in this analysis.

- Impacts from the north-south transmission line and the east-west transmission line would be primarily long-term temporary for installation of new high-voltage electrical transmission lines to power the regulating reservoirs. Only one of the two alignments described in Chapter 2, *Project Description and Alternatives*, would be constructed. Small areas for new transmission line towers would be required in the alignment, but specific locations are currently unknown. The maximum permanent impact from the towers would total less than 0.01 acre. The entire area of the transmission line alignments is included in the long-term temporary impact acreages; therefore, this impact is overestimated.
- Quarries located outside the inundation area would be regraded and allowed to revegetate at the bottoms but would not return to pre-Project conditions.
- Offsite borrow areas would be in existing active commercial facilities and are not part of the impact analysis for wildlife resources.
- The reservoir would replace existing land cover types with open water and Alternative 1 or 3 would permanently flood a larger area than Alternative 2.
- The footprints for the Peninsula Hills, Stone Corral Creek, and day-use boat ramp/parking recreation areas represent the total area that could be used for recreation activities, but only a portion of each footprint would be permanently affected as a result of construction of campsites, parking areas, picnic areas, hiking trails, potable water sources, utility connections, kiosks (at Peninsula Hills and Stone Corral Creek Recreation Areas), and toilets. Therefore, permanent impacts from these facilities are overestimated.
- New road construction would result in the permanent loss of existing land cover types in the entire construction disturbance area, and improvements to existing roads would affect only the area to the edges of the rights-of-way. The exact locations of the realigned Huffmaster Road, new Comm Road South, and new South Road are not yet finalized. Corridors were used to identify the areas in which potential direct and indirect impacts would occur. For example, for South Road, a 400-foot-wide conceptual road alignment plus a 300-foot-wide buffer was identified to allow for design flexibility. Because the final realigned South Road location is unknown, the entire 700-foot-wide corridor was assumed to be permanently affected for the purpose of the impact analysis. Within the corridors, the actual permanent impact area would be only the footprint of roads and shoulders with additional temporarily affected areas for construction staging and equipment movement. Therefore, permanent impacts from these facilities are overestimated.

The following BMPs, which are described in Appendix 2D, *Best Management Practices*, are incorporated into the analysis of potential construction impacts on wildlife resources.

- Salvage, Stockpile, and Replace Topsoil and Prepare a Topsoil Storage and Handling Plan – requires evaluation of topsoil for salvaging suitability and storage and handling plans when topsoil cannot be used without stockpiling.
- Develop and Implement Stormwater Pollution Prevention Plan(s) (SWPPP) and Gain Coverage under Stormwater Construction General Permit (Storm Water and Non-Storm Water) – requires development and use of erosion control measures, sediment control measures, construction materials management measures, waste management measures, non-stormwater control measures, and post-construction stormwater management measures.
- Fugitive Dust Control Plans – requires various measures to minimize dust emissions.
- Visual/Aesthetic Design, Construction, and Operation Practices – requires all construction lighting to be directional to minimize glare impacts to wildlife; requires permanent outdoor lighting to be limited to safety and security requirements, to be shielded to minimize off-site light spill and glare, and to be screened and directed away from adjacent uses to the highest degree possible.
- Develop and Implement Spill Prevention and Hazardous Materials Management/Accidental Spill Prevention, Containment, and Countermeasure Plans (SPCCPs) and Response Measures – requires site-specific plans with measures to minimize effects from spills of hazardous or petroleum substances during construction and operation/maintenance.
- Worker Environmental Awareness Program (WEAP) – requires training of all construction crews and contractors on protection and avoidance of biological, cultural, archaeological, paleontological, and other sensitive resources.
- Construction Best Management Practices and Monitoring for Fish, Wildlife, and Plant Species Habitats, and Natural Communities – requires a construction monitoring plan for sensitive biological resources and in-water construction activities, use of exclusion fencing around sensitive biological resources, limiting vehicle speeds to 15–20 miles per hour on unpaved roads, and measures for construction personnel to protect wildlife.
- Nighttime Work (Alternative 2 Discharge Location on Sacramento River) – requires work lights to be shaded to minimize illumination of water in order to minimize disturbance to wildlife species.

The following BMPs would be implemented for Alternatives 1, 2, and 3 to reduce direct and indirect impacts on special-status species and are incorporated into the impact analysis.

- Training construction staff about avoiding impacts on sensitive biological resources.
- Preparing a biological monitoring plan covering all required avoidance and minimization measures.
- Construction monitoring by qualified biologists.
- Protecting sensitive biological resources with staking and flagging or fencing.

- Requiring trash to be removed from work sites daily.
- Restricting vehicle speeds to reduce the potential for vehicle strikes.
- Prohibiting firearms and pets in construction areas.
- Covering all trenches and holes at the end of each day and inspecting prior to the start of work each day to prevent wildlife entrapment.
- Prohibiting the use of netting for erosion control to prevent special-status wildlife from being entangled in the net.
- Requiring lighting during construction to be directional to minimize glare and potential nighttime impacts on special-status wildlife that are active at night.

10.3.2. Operation

Because operation of the Project would not involve additional earth-moving or substantial disturbance of new areas, acreage impacts from operation were not assessed. The operation phase would include primarily changes in water diversions to Sites Reservoir, energy generation and use, and routine tasks to maintain the facilities after construction according to operations and maintenance plans that would be developed. Maintenance would include vegetation control and grazing around all facilities, recreation areas, and a 100-foot buffer around the facilities. These activities would affect undeveloped land where special-status wildlife or their habitats could occur. Because public use of recreation areas could affect areas that support special-status wildlife or their habitats, impacts that could result during operation of recreation areas were considered.

The completion and implementation of a Land Management Plan, which is described in Appendix 2D, *Best Management Practices*, are incorporated into the analysis of potential operation impacts on wildlife resources. This plan would address management and maintenance activities on all non-recreation land resources held in fee or easement (including the Project buffer) by the Authority, including vegetation maintenance, invasive aquatic and plant control, and rodent control. The plan would include general measures and practices when working in or near habitat for special-status wildlife and specify when pre-activity surveys or monitoring would be required prior to or during maintenance activities.

10.3.3. Thresholds of Significance

An impact on wildlife resources would be considered significant if the Project would:

- Have a substantial adverse effect, either directly or through habitat modifications, on any wildlife species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFW or U.S. Fish and Wildlife Service (USFWS).
- Interfere substantially with the movement of a native resident or migratory 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 wildlife resources.
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

10.4 Impact Analysis and Mitigation Measures

Impact WILD-1: Substantial adverse effect (i.e., loss or removal), either directly or through habitat modifications, on wildlife species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service (*the following impact analysis is subdivided into lettered components, and special-status species are grouped together where appropriate*)

Summary tables showing permanent and temporary impacts on modeled habitat for special-status species by alternative are included for each group of special-status wildlife discussed below. Appendix 10C, *Wildlife Impact Tables,* has detailed tables showing permanent and temporary impacts on modeled habitat for special-status species by Project component.

No Project

Under the No Project Alternative, no new Project facilities would be constructed or operated. As described in Section 10.2, *Environmental Setting*, special-status wildlife species and their habitats are known or have the potential to occur in the Project area. Because there would be no construction or operation of new Project facilities under the No Project Alternative, there would be no temporary or permanent impacts on special-status wildlife or their habitats.

Significance Determination

The No Project Alternative would not result in a substantial adverse effect, either directly or through habitat modifications, on special-status wildlife species. There would be no impact.

Alternatives 1, 2, and 3

The analyses of Project construction and operation impacts for special-status wildlife species are presented for individual species or groups of species, where appropriate. The analyses incorporate BMPs that would be implemented to reduce potential impacts on special-status wildlife species. For example, construction workers would be trained on the importance of avoiding special-status wildlife and plant species, and fencing would be required around sensitive habitats where avoidance during construction is feasible. The BMPs would also restrict off-road driving in construction areas to prevent disturbance in and damage to habitats that would be avoided during construction (e.g., those adjacent to work areas or in activity exclusion zones). While these BMPs would reduce impacts during construction, they would not prevent the

permanent loss of habitat or degradation of habitat, described further below by species, as a result of construction of Alternative 1, 2, or 3.

Aquatic Invertebrates

Impact WILD-1a: Vernal Pool Branchiopods

Direct permanent and temporary impacts and indirect impacts on modeled habitat for Conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp (i.e., vernal pool branchiopods) from Alternatives 1, 2, and 3 are shown in Table 10-2a.

Table 10-2a. Acreages of Permanent and Temporary Impacts on Modeled Special-Status Vernal Pool Branchiopod Habitat in the Study Area

	Alternatives 1 and 3 Permanent Impacts	Alternatives 1 and 3 Temporary Impacts	Alternatives 1 and 3 Indirect Impacts	Alternative 2 Permanent Impacts	Alternative 2 Temporary Impacts	Alternative 2 Indirect Impacts
Conservancy Shrimp, Vernal Pool Fairy Shrimp, and Vernal Pool Tadpole Shrimp	366	0	120	358	0	123

Alternatives 1 and 3

Modeled habitat for vernal pool branchiopods is present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR East/Funks pipelines, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, and recreation areas.

Construction

Construction of Alternative 1 or 3 would result in permanent loss of modeled habitat for vernal pool branchiopods (Table 10-2a). Modeled habitat would also be lost when the reservoir is inundated. Clearing and grubbing, excavation, and other construction activities could result in individuals or cysts being crushed or buried by equipment. Spills or leaks of gasoline, oil, or other contaminants during construction could contaminate suitable habitat and cause illness or mortality of individuals.

Operation

Indirect effects on vernal pool branchiopods could occur during operation as a result of changes in topography, compaction of soils, and increases in surface runoff from the additional

impervious surfaces associated with the new facilities. These changed conditions could modify the existing hydrologic regime of modeled vernal pool branchiopod habitat in or within 250 feet of affected areas (Table 10-2a). Changes in topography could result in additional water entering habitat or could interfere with existing water flow into habitats, thereby increasing or reducing the amount of water entering habitat. Changes to the length of the inundation period of habitat could affect vernal pool branchiopod reproduction.

Indirect effects on vernal pool branchiopods from new or increased contaminants such as gasoline, oil, and herbicides entering habitat from adjacent new or widened roads, or new facilities, could cause illness or mortality of individuals.

Impacts on vernal pool branchiopods from maintenance activities are not expected to occur because maintenance activities would be conducted mostly in previously disturbed areas using existing roadways.

Modeled vernal pool branchiopod is present at the recreation areas, which would be used by visitors on a regular basis. There is potential for visitors to access undeveloped areas and disturb existing habitat (e.g., walk through habitat, increase trash). If vernal pool branchiopods were present in the modeled habitat, they could be crushed by visitors. The entire footprint of the recreation areas was assumed to be affected, and any operation impacts on modeled habitat in these areas would be compensated for through habitat mitigation for permanent effects.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 1 or 3 would result in significant impacts on vernal pool branchiopods from removal of suitable habitat and loss of individuals. Indirect operational effects on vernal pool branchiopods could also result from changes in topography, soil compaction, and increased amounts of impervious surfaces, which could modify the existing hydrologic regime of vernal pool branchiopod habitat. These impacts would be significant because implementation of Alternative 1 or 3 could reduce the local populations of federally listed vernal pool branchiopods through direct mortality and habitat loss. The largest continuing threats to vernal pool branchiopods are habitat loss and modification of habitat from urban development and agricultural conversion (U.S. Fish and Wildlife Service 2007a:16, U.S. Fish and Wildlife Service 2007b:27).

Implementation of Mitigation Measures WILD-1.1, WILD-1.2, and WILD-1.3 would reduce the level of impact to less than significant because surveys would be conducted to determine presence, habitat disturbance would be avoided during the rainy season, the topsoil of vernal pools in permanent impact areas would be removed for use in habitat creation or restoration, and compensation would be provided for impacts on occupied habitat. All modeled habitat would be evaluated, and suitable habitat would be surveyed for the presence of vernal pool branchiopods prior to construction. Direct and indirect impacts on occupied habitat would be mitigated through acquiring and protecting habitat in perpetuity or purchasing mitigation credits in accordance with mitigation ratios and requirements developed during ESA Section 7 consultation with USFWS.

Mitigation Measure WILD-1.1: Assess Habitat Suitability and Survey Suitable Habitat for Vernal Pool Branchiopods

The Authority will employ qualified biologists to assess habitat suitability and conduct surveys for vernal pool branchiopods in the Project area and where modeled habitat is within 250 feet of the Project area and indirect effects may occur. Qualified biologists are defined as those who have a recovery permit from USFWS to conduct surveys for listed vernal pool branchiopods. The surveys will be conducted in accordance with the *Survey Guidelines for the Listed Large Branchiopods*, which recommend surveys at 14-day intervals after initial inundation of habitat until the habitat dries or it has been inundated for a minimum of 90 consecutive days (U.S. Fish and Wildlife Service 2015b). The biologists will submit the results of the surveys in a report to USFWS, per the requirements of the biologists' recovery permits.

Mitigation Measure WILD-1.2: Avoid and Minimize Potential Effects on Vernal Pool Branchiopods and Western Spadefoot

The following steps will be taken to avoid or minimize potential effects on vernal pool branchiopods and western spadefoot.

- Ground disturbance within 250 feet of suitable habitat to be protected will be avoided during the rainy season (approximately October 15 through May 15).
- If a portion of suitable vernal pool branchiopod and western spadefoot habitat will be filled (i.e., permanent impacts), the filling will be conducted when the habitat is completely dry.
- If requested by USFWS, the top 3 to 4 inches of soil of pools occupied by listed or unlisted vernal pool branchiopods that would be destroyed or completely filled will be removed and stored in the Project area until ready for placement in created or restored habitat outside of the Project footprint. The topsoil will be covered with tarps or other appropriate material and orange construction barrier fencing or stakes and flagging will be installed around the covered topsoil. A qualified biologist will be onsite to monitor the removal and covering of the topsoil during periodic monitoring visits to the Project area. The stored topsoil will be spread over the bottom of created or restored pools prior to the start of the winter rainy season.

Mitigation Measure WILD-1.3: Compensate for Impacts on Occupied Vernal Pool Branchiopod Habitat

The Authority will compensate for direct and indirect effects on occupied vernal pool branchiopod habitat through the purchase of mitigation credits at a USFWS-approved conservation bank or through acquiring, creating or restoring, and protecting habitat in perpetuity at a location approved by USFWS. Habitat that is directly or indirectly affected will be mitigated by preserving habitat at a 2:1 ratio (habitat preserved: habitat directly or indirectly affected) and habitat that is directly affected will be mitigated by

creating habitat at a 1:1 ratio (habitat created: habitat directly affected), or as otherwise determined during ESA Section 7 consultation with USFWS. Details of the compensation will be further developed in consultation with USFWS.

NEPA Conclusion

Construction and operation of Alternative 1 or 3 would result in the same effects as those described above for CEQA. With implementation of Mitigation Measures WILD-1.1, WILD-1.2, and WILD-1.3, the effects would be reduced to no adverse effect on vernal pool branchiopods.

Alternative 2

Modeled habitat for vernal pool branchiopods may be present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR West, TRR/Funks pipelines, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, and recreation areas.

Construction

Construction of Alternatives 2 would result in the permanent loss of modeled habitat for vernal pool branchiopods. Clearing and grubbing, excavation, and other construction activities could result in the destruction of vernal pools or other suitable habitats, and individuals or cysts could be crushed or buried by equipment. Impacts would be the same as described for Alternatives 1 and 3 with two exceptions. First, construction of South Road and TRR West under Alternative 2 would result in additional loss of modeled habitat and increased potential for mortality of individuals or cysts. Second, permanent loss of modeled habitat and impacts on individuals would be less under Alternative 2 because the inundation area would be smaller.

Operation

Potential changes in the hydrologic regime of vernal pool branchiopod habitat that could result from changes in topography, soil compaction, and increased amounts of impervious surfaces and potential illness or mortality of vernal pool branchiopods from new or increased contaminants would be similar under Alternative 2 as described for Alternatives 1 and 3. Impacts would be the same as described for Alternatives 1 and 3 with one exception. The larger amount of impervious surface from South Road under operation of Alternative 2 would result in potential indirect effects on additional modeled vernal pool branchiopod habitat.

Impacts from maintenance activities and disturbance at recreation areas would be the same under Alternative 2 as described for Alternatives 1 and 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in similar impacts to Alternatives 1 and 3 except that construction of South Road would result in additional permanent loss of suitable habitat and the smaller reservoir footprint would reduce the amount of permanent habitat loss under

Alternative 2. A net increase in the amount of suitable habitat removed would also increase the potential for mortality of individuals or cysts. Operation of Alternative 2 would result in similar impacts to Alternatives 1 and 3 except that the additional impermeable surface from South Road could result in potential indirect effects on additional modeled vernal pool branchiopod habitat. These impacts would be significant because the implementation of Alternative 2 could reduce the local populations of federally listed vernal pool branchiopods through direct mortality and habitat loss. Implementation of Mitigation Measures WILD-1.1, WILD-1.2, and WILD-1.3 would reduce the level of impact to less than significant.

NEPA Conclusion

Construction of Alternative 2 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on vernal pool branchiopods. With implementation of Mitigation Measures WILD-1.1, WILD, 1.2, and WILD-1.3, effects would be reduced to no adverse effect. Operation of Alternative 2 would result in the same effects as those described above for CEQA, and there would be no adverse effect on vernal pool branchiopods.

Terrestrial Invertebrates

Permanent and temporary impacts on modeled habitat for other special-status invertebrates from Alternatives 1, 2, and 3 are shown in Table 10-2b.

Table 10-2b. Acreages of Permanent and Temporary Impacts on Modeled Special-Status Terrestrial Invertebrate Habitat in the Study Area

	Alternatives 1 and 3 Permanent Impacts	Alternatives 1 and 3 Temporary Impacts	Alternative 2 Permanent Impacts	Alternative 2 Temporary Impacts
Antioch Dunes Anthicid Beetle and Sacramento Anthicid Beetle	0	0	0	<1
Valley Elderberry Longhorn Beetle	13,535	983	12,686	964
Monarch Butterfly	15,528	1,317	15,135	1,297
Crotch Bumble Bee and Western Bumble Bee	14,104	992	13,626	949

Impact WILD-1b: Antioch Dunes Anthicid Beetle and Sacramento Anthicid Beetle

Alternatives 1 and 3

Potentially suitable habitat for Antioch Dunes anthicid beetle and Sacramento anthicid beetle is present along the Sacramento River in the operations study area.

Construction

Construction of Alternative 1 or 3 would not result in result in direct impacts on Antioch Dunes anthicid beetle or Sacramento anthicid beetle because construction activities would not be conducted in or near potentially suitable habitat.

Operation

The average (system-wide) decrease in monthly average flow between the No Action Alternative and operations under Alternative 1 or 3 is approximately 2% and diversions would occur only under higher flow regimes in the Sacramento River. Operational impacts on the geomorphic regime (including natural river geomorphic processes such as sediment transport and bank erosion) and existing river geomorphic characteristics (e.g., sinuosity, channel gradient, substrate composition, channel width and depth, and riparian vegetation) of the greater Sacramento River system are expected to be minimal. The overall volume of water available and the pattern of water diversion in the Sacramento River would generally be similar to the amount and pattern of water diversion under existing conditions. Minimal changes to the natural river geomorphic processes and existing geomorphic characteristics of the Sacramento River would not affect potentially suitable habitat for Antioch Dunes anthicid beetle or Sacramento anthicid beetle (sandy banks and sand bars).

Impacts on Antioch Dunes anthicid beetle and Sacramento anthicid beetle from maintenance activities are not expected to occur because maintenance activities would be conducted mostly in previously disturbed areas using existing roadways.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 1 or 3 would not result in any impacts on Antioch Dunes anthicid beetle or Sacramento anthicid beetle because there would be no work in potentially suitable habitat for these species. Operation of Alternative 1 or 3 would not result in indirect impacts on these anthicid beetles because changes in natural river geomorphic processes and existing geomorphic characteristics would be minor and would not affect existing potential habitat. There would be no impact.

NEPA Conclusion

Construction and operation of Alternative 1 or 3 would result in no effect on Antioch Dunes anthicid beetle and Sacramento anthicid beetle.

Alternative 2

Potentially suitable habitat for Antioch Dunes anthicid beetle and Sacramento anthicid beetle is present along the Sacramento River in the operations study area and at the location of the Sacramento River discharge.

Construction

Construction of Alternative 2 would result in the permanent loss and temporary disturbance of potentially suitable habitat for Antioch Dunes anthicid beetle and Sacramento anthicid beetle (Table 10-2b). There is potentially suitable habitat for these species at the Sacramento River discharge location.

Installation of rock slope protection would result in the permanent and temporary losses of potentially suitable habitat for Antioch Dunes anthicid beetle and Sacramento anthicid beetle. Individuals could also be crushed or buried by equipment or rock.

Operation

Operation effects on Antioch Dunes anthicid beetle and Sacramento anthicid beetle under Alternative 2 would be the same as for Alternatives 1 and 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in the permanent loss and temporary disturbance of potentially suitable habitat for Antioch Dunes anthicid beetle and Sacramento anthicid beetle and mortality of individuals. These impacts would be significant because the construction of Alternative 2 could reduce the local populations of these rare beetles through direct mortality and habitat loss. Antioch Dunes anthicid beetle has been extirpated from Antioch Dunes and both anthicid beetle species have limited distributions (California Department of Fish and Wildlife 2021a). Implementation of Mitigation Measure WILD-1.4 and WILD-1.5 would reduce the level of impact to less than significant because potentially suitable habitat would be assessed and surveyed by a qualified entomologist prior to removal or disturbance and suitable habitat that would not be affected would be protected and avoided during construction. If occupied habitat is removed, an equivalent amount of habitat would be restored or preserved in the vicinity of the affected area. There would be no impact on Antioch Dunes anthicid beetle and Sacramento anthicid beetle from operations under Alternative 2.

Mitigation Measure WILD-1.4: Evaluate and Survey Potential Habitat for Antioch Dunes Anthicid and Sacramento Anthicid Beetles and Implement Protective Measures

The Authority will employ a qualified entomologist (experienced with anthicid beetle identification and habitat suitability) to assess and survey the area of potentially suitable habitat for Antioch Dunes anthicid and Sacramento anthicid beetles prior to the start of construction of the Sacramento River discharge. If suitable habitat is not present or no Antioch Dunes anthicid and Sacramento anthicid beetles are observed and the entomologist concurs that no further surveys are needed, no further actions are required. If either beetle species is observed, the entomologist will relocate the beetles to suitable habitat outside of the impact area. The entomologist will report observations of either beetle species to CDFW. The Authority will protect any suitable habitat in the vicinity of

the work area that will not be affected with fencing or stakes and flagging. No construction related foot or vehicle traffic will be allowed in the fenced or flagged area. The Authority will remove fencing when construction of the Sacramento River discharge is complete.

Mitigation Measure WILD-1.5: Compensate for the Loss of Occupied Antioch Dunes Anthicid and Sacramento Anthicid Beetle Habitat

The Authority will compensate for the permanent loss of occupied Antioch Dunes anthicid beetle and/or Sacramento anthicid beetle habitat by restoring or preserving an equivalent amount of habitat along the Sacramento River in the vicinity of the affected area. The Authority will employ a qualified entomologist to assess habitat to be restored or preserved and provide guidance on habitat restoration. The Authority will retain a qualified entomologist to monitor the restored or preserved habitat annually for a minimum of 5 years to ensure that habitat conditions are maintained and that the habitat has not been degraded. The Authority will submit monitoring reports to the CDFW annually.

NEPA Conclusion

Construction of Alternative 2 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on Antioch Dunes anthicid beetle and Sacramento anthicid beetle. With implementation of Mitigation Measures WILD-1.4 and WILD-1.5, effects would be reduced to no adverse effect. There would be no effect on Antioch Dunes anthicid beetle and Sacramento anthicid beetle from operations under Alternative 2.

Impact WILD-1c: Valley Elderberry Longhorn Beetle

Alternatives 1 and 3

Modeled habitat for valley elderberry longhorn beetle is present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR East/Funks pipelines, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, recreation areas, TC Canal intake, and Dunnigan Pipeline. Potential habitat is also present along the Sacramento River in the operations study area.

Construction

Construction of Alternative 1 or 3 would result in the permanent and temporary losses of modeled habitat for valley elderberry longhorn beetle (Table 4-10b). Removal of elderberry shrubs would result in the permanent and temporary losses of valley elderberry longhorn beetle habitat. Elderberry shrubs could also die after filling of the Sites Reservoir if they are present in the inundation area. Removal or trimming of elderberry shrubs could result in injury or mortality

of valley elderberry longhorn beetle. Ground disturbance within 20 feet of an elderberry shrub's dripline could damage to its roots and result in stress or reduced vigor of the shrub.

Operation

Potential indirect effects on valley elderberry longhorn beetle that were considered were altered hydrology, loss of connectivity to adjacent habitat, and disturbance from maintenance activities. Reduction of water to elderberry shrubs as a result of altered hydrology from changes in topography or compaction of soils could result in reduced shrub vigor/vitality and an associated decrease in shoot, leaf, and flower production that could ultimately reduce the suitability of the shrubs to provide habitat for valley elderberry longhorn beetle. Loss of connectivity between elderberry shrubs may result when elderberries or associated vegetation is removed. Removal of such vegetation could result in gaps in vegetation that are too wide for valley elderberry longhorn beetle to travel across due to their fairly limited movement distances (Talley et al. 2006), resulting in separation of individuals or a reduction in the possibility of colonization of adjacent areas.

Maintenance activities required for operation of Project facilities could result in impacts on valley elderberry longhorn beetle. Impacts are generally expected to be minimal because maintenance activities would be conducted mostly in previously disturbed areas that likely have few elderberry shrubs present. Maintenance activities involving herbicide and pesticide use could cause mortality of elderberry shrubs or illness or mortality of valley elderberry longhorn beetle, respectively. Elderberry shrubs could also be inadvertently removed or trimmed during maintenance activities.

The average (system-wide) decrease in monthly average flow between the No Action Alternative and operations under Alternative 1 or 3 is approximately 2% and diversions would occur only under higher flow regimes in the Sacramento River. Operational impacts on the geomorphic regime (including natural river geomorphic processes such as sediment transport and bank erosion) and existing river geomorphic characteristics (e.g., sinuosity, channel gradient, substrate composition, channel width and depth, and riparian vegetation) of the greater Sacramento River system are expected to be minimal. The overall volume of water available and the pattern of water diversion in the Sacramento River (and therefore the canals, Yolo Bypass, and the Delta) would generally be similar to the amount and pattern of water diversion under existing conditions. Minimal changes to the natural river geomorphic processes and existing geomorphic characteristics for the Sacramento River and downstream of the river would not affect elderberry shrubs and valley elderberry longhorn beetle.

Stone Corral Creek would receive bypass flows from the reservoir from an outlet on the Sites Dam and Funks Creek would receive augmented flow from the Funks pipelines to its reaches immediately upstream of Funks Reservoir. Bypass flows would range from 0 to 100 cubic feet per second (cfs), with larger pulse flows to emulate natural flood conditions, and lower flows in the drier months (e.g., summer). The increase of flow in each drainage would support the existing geomorphic functions and characteristics of each channel. While increased flows from

bypass releases may result in minor increases in erosion and changes in sediment deposition, the changes are expected to be minimal and no impacts on elderberry shrubs or valley elderberry longhorn beetle are anticipated.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 1 or 3 would result in significant impacts on valley elderberry longhorn beetle from removal of suitable habitat and loss of individuals. Operation could result in indirect effects on valley elderberry longhorn beetle from altered hydrology, loss of connectivity to adjacent habitat, and disturbance from maintenance activities. These impacts would be significant because the implementation of Alternative 1 or 3 could reduce the local population of this federally listed species through direct mortality and habitat loss. The greatest historical threat to valley elderberry longhorn beetle has been the elimination, loss, or modification of its habitat by urban, agricultural, or industrial development, and other activities that reduce or eliminate its host plants (Talley et al. 2006:21–22). Implementation of Mitigation Measures WILD-1.6, WILD-1.7, WILD-1.8, and WILD-1.9 would reduce the level of impact to less than significant because surveys would be conducted to determine presence, elderberry shrubs to be protected would be fenced, and compensation would be provided for permanent loss of habitat.

Mitigation Measure WILD-1.6: Conduct Surveys for Suitable Valley Elderberry Longhorn Beetle Habitat

The Authority will employ qualified biologists or botanists (i.e., with elderberry/valley elderberry longhorn beetle experience) to conduct surveys to identify and map locations of elderberry shrubs in work areas and within 165 feet of the work areas. For shrubs located in non-riparian areas, elderberry stems will be examined for the presence of valley elderberry beetle exit holes. This information will be used to determine the amount of compensation required for the loss of elderberry shrubs in accordance with the *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle (Desmocerus californicus dimorphus)* (U.S. Fish and Wildlife Service 2017a). The biologist will mark elderberry shrubs in or within 165 feet of work areas with flagging for future removal or protection.

Mitigation Measure WILD-1.7: Fence Elderberry Shrubs to be Protected

Elderberry shrubs in or within 165 feet of work areas that will not be removed will be protected during construction. If not already marked, a qualified biologist will flag the elderberry shrubs that will be protected during construction. The Authority will install orange construction barrier fencing or stakes and flagging at the edge of the buffer areas established for each shrub and signs indicating the potential for beetle presence and excluding any Project activity within the buffer areas will be posted prior to the start of work. The buffer area distances will be proposed by the biologist and approved by

USFWS. No construction activities will be permitted in the buffer area other than those activities necessary to erect the fencing or stakes and flagging.

If orange construction barrier fencing is used, it will be placed such that there is at least a 1-foot gap between the ground and the bottom of the orange construction fencing to minimize the potential for snakes and other ground-dwelling animals to become caught in the fencing. Buffer areas around elderberry shrubs will be inspected periodically by a qualified biologist until Project construction is complete or until the fences or staking/flagging are removed, as approved by the biological monitor and the resident engineer. The Authority will be responsible for maintaining the buffer area fences around elderberry shrubs throughout construction and removing the fencing or taking and flagging when construction is complete. Biological inspection reports will be provided to the Authority.

Mitigation Measure WILD-1.8: Transplant Permanently Affected Elderberry Shrubs and Compensate for Loss of Valley Elderberry Longhorn Beetle and its Habitat

Before construction begins, the Authority will employ a qualified contractor to transplant elderberry shrubs that cannot be avoided to a USFWS-approved conservation bank or other approved area in accordance with the *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle (Desmocerus californicus dimorphus)* (U. S. Fish and Wildlife Service 2017). Elderberry shrubs that cannot be avoided will be transplanted during the plant's dormant phase (November through the first 2 weeks of February). A qualified biological monitor will remain onsite while the shrubs are being transplanted. Additionally, the Authority will provide compensatory mitigation for the loss of suitable riparian habitat at a minimum ratio of 3:1 (acres of compensation: acres of permanent impact) and for all acres that will be permanently affected. The Authority will provide compensatory mitigation for all suitable non-riparian habitat at a minimum ratio of 1:1 for all acres that will be permanently affected, or as determined during ESA Section 7 consultation with USFWS.

Mitigation Measure WILD-1.9: Protect Special-status Invertebrates and their Host and Food Plants from Herbicide and Pesticide Use

To minimize impacts on valley elderberry longhorn beetle, monarch butterfly, Crotch bumble bee, and western bumble bee from herbicide drift, herbicide application will be limited to areas immediately adjacent to Project facilities and will be conducted using handheld equipment. Herbicides and pesticides will be applied only by applicators with current licenses and/or certifications from the California Department of Pesticide Regulation. The applicator will follow the herbicide label directions. Spray nozzles will be kept within 24 inches of target vegetation during spraying. The most current information on herbicide toxicity on wildlife will be used to inform future decisions about herbicide and pesticide use during operations.

NEPA Conclusion

Construction of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 1 or 3 would result in a substantial adverse effect on valley elderberry longhorn beetle. With implementation of Mitigation Measures WILD-1.6, WILD-1.7, WILD-1.8, and WILD-1.9, effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and there would be no adverse effect on valley elderberry longhorn beetle.

Alternative 2

Modeled habitat for valley elderberry longhorn beetle is present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR West, TRR/Funks pipelines, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, recreation areas, TC Canal intake, and Dunnigan Pipeline, and the Sacramento River discharge. Potential habitat is also present along the Sacramento River in the operations study area.

Construction

Construction of Alternative 2 would result in the permanent loss of modeled habitat for valley elderberry longhorn beetle (Table 4-10b). Removal of elderberry shrubs would result in the permanent and temporary losses of valley elderberry longhorn beetle habitat, and potential injury or mortality of individuals. Ground disturbance within 20 feet of an elderberry shrub's dripline could result in disturbance of roots, which could cause stress or reduced vigor of elderberry shrubs. Impacts would be the same as described for Alternatives 1 and 3 with two exceptions. The construction of the new South Road, TRR West, and the Sacramento River discharge under Alternative 2 would result in additional loss of potential habitat. The permanent impacts on potential habitat would be less under Alternative 2 because the inundation area would be smaller. Additional removal of potential habitat would also result in an increased potential for injury or mortality of valley elderberry longhorn beetle.

Operation

Potential indirect effects on valley elderberry longhorn beetle from altered hydrology, loss of connectivity to adjacent habitat, and disturbance from maintenance activities would be similar under Alternative 2 as described for Alternatives 1 and 3. Impacts on valley elderberry beetle from operation would be the same as described for Alternatives 1 and 3 with one exception. Construction of South Road under Alternative 2 could result in indirect effects on additional potential valley elderberry longhorn beetle habitat from altered hydrology or loss of connectivity because of the additional roadway that would be constructed under this alternative.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in similar impacts to Alternatives 1 and 3 except that construction of South Road, TRR West, and the Sacramento River discharge would result in additional permanent loss of suitable habitat and the smaller reservoir footprint would reduce the amount of permanent habitat loss under Alternative 2. A net increase in the amount of suitable habitat removed would also increase the potential for mortality of individuals. Operation of Alternative 2 would result in similar impacts to Alternatives 1 and 3 except that the addition of South Road could result in more elderberry shrubs being affected by changes in hydrology and loss of connectivity to adjacent habitat. These impacts would be significant because the implementation of Alternative 2 could reduce the local valley elderberry longhorn beetle population through direct mortality and habitat loss. Implementation of Mitigation Measures WILD-1.6, WILD-1.7, WILD-1.8, and WILD-1.9 would reduce the level of impact to less than significant.

NEPA Conclusion

Construction of Alternative 2 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on valley elderberry longhorn beetle. With implementation of Mitigation Measures WILD-1.6, WILD-1.7, WILD-1.8, and WILD-1.9, effects would be reduced to no adverse effect. Operation of Alternative 2 would result in the same effects as those described above for CEQA, and there would be no adverse effect on valley elderberry longhorn beetle.

Impact WILD-1d: Monarch Butterfly

Alternatives 1 and 3

Modeled habitat for monarch butterfly is present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR East, TRR East/Funks pipelines, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, recreation areas, TC Canal intake, Dunnigan Pipeline, and Sacramento River in the operations study area.

Construction

Construction of Alternative 1 or 3 would result in the permanent and temporary losses of modeled habitat for monarch butterfly (Table 10-4b). Construction of Alternatives 1 and 3 facilities could result in the permanent and temporary losses of suitable roosting, foraging, and breeding habitats for monarch butterfly. Potentially suitable habitat would be lost when the Sites Reservoir was inundated. Clearing and grubbing, excavation, and other construction activities could result in mortality of adults or larvae from being crushed or buried by equipment. Adult monarch butterflies could be struck by vehicles and construction equipment traveling along access roads during construction if foraging or flying through the area. Construction could also disrupt roosting or foraging activities.

Operation

Maintenance activities required for operation of Alternatives 1 and 3 could result in impacts on monarch butterfly. Impacts are expected to be minimal because maintenance activities would be conducted mostly in previously disturbed areas during daytime hours and using existing roadways. However, maintenance activities involving herbicide and pesticide use have the potential to affect monarch butterfly and its larval host plants (native milkweeds) and nectar plants and cause the loss of habitat or individuals. Monarch butterflies could also be struck by vehicles and equipment traveling along access roads during operation.

The recreation areas and reservoir would be used on a regular basis, which would result in an increased human presence in these areas. There is potential for visitors to access undeveloped areas and disturb existing habitat (e.g., walk through habitat, remove nectar plants). Larval butterflies could be crushed by visitors walking through habitat and suitable nectar plants could be removed or stepped on by visitors.

New roadways, once completed, could increase the potential mortality of monarch butterfly from being struck by vehicles of workers traveling to operations facilities or those of visitors traveling to recreation areas.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 1 or 3 would result in significant impacts on monarch butterfly from removal of suitable habitat and loss of individuals. Operation of Alternative 1 or 3 could result in mortality of adult butterflies from vehicle strikes, illness or injury of adults or larvae from pesticide use, or death of nectar plants from herbicide use. These impacts would be significant because the implementation of Alternative 1 or 3 could reduce the local monarch butterfly population. The western population of monarch butterfly, located in California, has experienced precipitous decline from about 1.2 million in 1997 to fewer than 30,000 in 2019 (U.S. Fish and Wildlife Service 2020) as a result of habitat loss at breeding and overwintering sites, disease, pesticides, and climate change (U.S. Fish and Wildlife Service 2019). Implementation of Mitigation Measures WILD-1.9, WILD-1.10, and WILD-1.11 would reduce the level of impact to less than significant because surveys would be conducted to identify patches of native milkweeds and nectar plants, temporarily disturbed habitat would be restored, and permanent loss of habitat containing native milkweeds and/or nectar plants would be compensated for through offsite habitat restoration or preservation.

Mitigation Measure WILD-1.9: Protect Special-status Invertebrates and their Host and Food Plants from Herbicide and Pesticide Use

This measure is described above for valley elderberry longhorn beetle.

Mitigation Measure WILD-1.10: Assess Habitat Suitability and Survey for Presence of Monarch Butterfly Nectar and Larval Host Plants

During special-status plant surveys (Mitigation Measure VEG-1.1), botanists will identify and map locations and species of milkweed and/or nectar plants that would be permanently or temporarily affected by construction.

Mitigation Measure WILD-1.11: Compensate for Loss of Monarch Butterfly Nectar and Larval Host Plants

The Authority will compensate for permanent loss of suitable monarch butterfly habitat (as identified through implementation of Mitigation Measure WILD-1.10) by including native milkweed and nectar plants for monarch butterfly in offsite mitigation plans for sensitive natural communities (Mitigation Measure VEG-2.2). The Authority will compensate for permanent loss of suitable monarch butterfly habitat by planting native milkweed and nectar plants in offsite restoration or preservation areas at a minimum ratio of 1:1 (acres lost: acres planted). The offsite restoration areas would provide suitable habitat constituents for monarch butterfly (e.g., roosting habitat, nectar plants, native milkweed, water).

The Authority will compensate for temporary loss of suitable monarch butterfly habitat by including native milkweed and nectar plants in planting palettes for onsite restoration of sensitive natural communities (Mitigation Measure VEG-2.2) or temporarily disturbed grassland, or by planting native milkweed and nectar plants in the Project buffer if these plants cannot be feasibly included in the planting palettes for the temporarily disturbed areas.

Habitat will be maintained in the onsite and offsite restoration/preservation areas by periodically re-seeding the areas with native milkweed and nectar plants as needed. The Authority will establish a monitoring program that defines the frequency of monitoring, success criteria, and reporting requirements.

NEPA Conclusion

Construction of Alternative 1 or 3 would result in the same effects as described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 1 or 3 would result in a substantial adverse effect on monarch butterfly. With implementation of Mitigation Measures WILD-1.9, WILD-1.10, and WILD-1.11, effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and there would be no adverse effect on monarch butterfly.

Alternative 2

Modeled habitat for monarch butterfly is present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR West, TRR/Funks pipelines, Funks Reservoir, inundation area, I/O

Works, dams, new and widened roadways, recreation areas, TC Canal intake, Dunnigan Pipeline, Sacramento River discharge, and Sacramento River in the operations study area.

Construction

Construction of Alternative 2 would result in the permanent and temporary losses of modeled habitat for monarch butterfly (Table 4-10b). Impacts would be the same as described for Alternatives 1 and 3 with three exceptions. Construction of South Road and TRR West under Alternative 2 would result in additional loss of modeled habitat. Permanent impacts on modeled habitat would be less under Alternative 2 because the inundation area would be smaller. Under Alternative 2, construction of the Sacramento River discharge would result in permanent loss of additional habitat. Additional removal of potential habitat could also result in an increased potential for mortality of adults or larvae from being crushed or buried by equipment, or of adults from being struck by vehicles and equipment traveling along access roads during construction.

Operation

Potential effects on monarch butterfly as a result of operation would be the same under Alternative 2 as described for Alternatives 1 and 3.

CEQA Significance Determination and Mitigation Measures

Construction and operation of Alternative 2 would result in similar impacts to Alternatives 1 and 3 except that construction of South Road, TRR West, and the Sacramento River discharge would result in additional permanent loss of potential habitat, and the smaller reservoir footprint would reduce the amount of permanent habitat loss under Alternative 2. A net increase in the amount of potential habitat removed would also increase the potential for mortality of adults or larvae from being crushed or buried by equipment or adults being struck by vehicles and equipment traveling along access roads. These impacts would be significant because the implementation of Alternative 2 could reduce the local population of monarch butterfly through direct mortality and habitat loss. Implementation of Mitigation Measures WILD-1.9, WILD-1.10, and WILD-1.11 would reduce the level of impact to less than significant.

NEPA Conclusion

Construction of Alternative 2 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on monarch butterfly. With implementation of Mitigation Measures WILD-1.9, WILD-1.10, and WILD-1.11, effects would be reduced to no adverse effect. Operation of Alternative 2 would result in the same effects as those described above for CEQA, and there would be no adverse effect on monarch butterfly.

Impact WILD-1e: Crotch Bumble Bee and Western Bumble Bee

Alternatives 1 and 3

Modeled habitat for Crotch bumble bee and western bumble bee is present at the GCID Main Canal improvements, TRR East/Funks pipelines, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, recreation areas, TC Canal intake, and Dunnigan Pipeline.

Construction

Construction of Alternative 1 or 3 would result in the permanent and temporary losses of modeled Crotch bumble bee and western bumble bee habitat (Table 10-4b). Potentially suitable habitat would also be lost when the reservoir was inundated. Clearing and grubbing, excavation, and other activities could result in the destruction of nests or mortality of bees from being crushed or buried by equipment. Crotch and western bumble bees could also be struck by vehicles and equipment traveling along access roads during construction.

Operation

Maintenance activities required for operation of Alternatives 1 and 3 facilities could result in impacts on Crotch bumble bee and western bumble bee. Impacts are expected to be minimal because maintenance activities would be conducted mostly in previously disturbed areas using existing roadways. However, maintenance activities involving herbicide and pesticide use have the potential to affect Crotch and western bumble bees and their food plants and cause the loss of habitat or illness or mortality of individuals. Crotch and western bumble bees could also be struck by vehicles and equipment traveling along access roads during operation.

The recreation areas and reservoir would be used on a regular basis, which would result in an increased human presence in these areas, as well as additional roadway traffic, which could result in increased vehicle strikes. There is potential for visitors to access undeveloped areas and disturb existing habitat (e.g., walk through habitat, removal of nectar plants). Individual bees could be stepped on or their nests could be buried or collapsed. Suitable food plants could also be removed or stepped on by visitors walking through habitat.

New roadways, once completed, could increase the potential mortality of Crotch and western bumble bees from being struck by workers traveling to operations facilities or visitors traveling to recreation areas.

CEQA Significance Determination and Mitigation Measures

Construction and operation of Alternative 1 or 3 would result in significant impacts on Crotch bumble bee and western bumble bee from removal of potential habitat and loss of individuals. These impacts would be significant because Alternative 1 or 3 could reduce the local populations of these rare bumble bees through direct mortality and habitat loss. Although not federally or state-listed, Crotch bumble bee and western bumble bee are considered endangered with

extinction throughout their ranges. Recent studies have shown that these species have experienced significant reductions in both their range and relative abundance and are far less common than they were historically in areas where the species persist (The Xerces Society 2018:5). Implementation of Mitigation Measures WILD-1.9, WILD-1.12 and WILD-1.13 would reduce the level of impact to less than significant because surveys would be conducted to identify patches of native food plants, temporarily disturbed habitat would be restored, and permanent loss of habitat containing suitable native food plants would be compensated for through offsite habitat restoration or preservation.

Mitigation Measure WILD-1.9: Protect Special-status Invertebrates and their Host and Food Plants from Herbicide and Pesticide Use

This measure is described above for valley elderberry longhorn beetle.

Mitigation Measure WILD-1.12: Assess Habitat Suitability and Survey for Presence of Crotch Bumble Bee and Western Bumble Bee Food Plants

During special-status plant surveys (Mitigation Measure VEG-1.1), botanists will identify and map locations of patches of native plants in the taxa most commonly associated with Crotch bumble bee and western bumble bee that would be permanently or temporarily affected by construction.

Mitigation Measure WILD-1.13: Compensate for Loss of Crotch Bumble Bee and Western Bumble Bee Habitat

The Authority will compensate for permanent loss of suitable bumble bee foraging habitat (as identified through implementation of Mitigation Measure WILD-1.12) by including suitable native nectar- and pollen-producing plants commonly used as food sources by Crotch and western bumble bees in offsite mitigation plans for sensitive natural communities (Mitigation Measure VEG-2.2). Native plants of the following genera are appropriate for Crotch bumble bee: *Antirrhinum*, *Asclepias*, *Phacelia*, *Chaenactis*, *Clarkia*, *Dendromecon*, *Eriogonum*, *Eschscholzia*, *Lupinus*, *Medicago*, and *Salvia*. Native plants of the following taxa are appropriate for western bumble bee: *Asteraceae*, *Ceanothus*, *Centaurea*, *Chrysothamnus*, *Cirsium*, *Eriogonum*, *Geranium*, *Grindelia*, *Lupinus*, *Melilotus*, *Monardella*, *Rubus*, *Penstemon*, *Solidago*, and *Trifolium*. The Authority will compensate for permanent loss of suitable Crotch and western bumble bee habitat by planting native bumble bee food plants in offsite restoration or preservation areas at minimum ratio of 1:1 (acres lost: acres planted).

The Authority will compensate for temporary loss of suitable Crotch and western bumble bee habitat by including native bumble bee food plants in the aforementioned taxa in planting palettes for onsite restoration of sensitive natural communities (Mitigation Measure VEG-2.2) or temporarily disturbed grassland, or by planting suitable food plants in the Project buffer if these plants cannot be feasibly included in the planting palettes for the temporarily disturbed areas.

Habitat will be maintained in the onsite and offsite restoration/preservation areas by periodically re-seeding the areas with native bumble bee food plants as needed.

NEPA Conclusion

Construction of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 1 or 3 would result in a substantial adverse effect on Crotch bumble bee and western bumble bee. With implementation of Mitigation Measures WILD-1.9, WILD-1.12 and WILD-1.13, effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and there would be no adverse effect on Crotch bumble bee and western bumble bee.

Alternative 2

Modeled habitat for Crotch bumble bee and western bumble bee is present at the GCID Main Canal improvements, Funks pipelines, TRR West, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, recreation areas, TC Canal intake, Dunnigan Pipeline, and the Sacramento River discharge.

Construction

Construction of Alternative 2 would result in the permanent and temporary losses of modeled habitat for Crotch bumble bee and western bumble bee (Table 4-10b). Impacts would be the same as described for Alternatives 1 and 3 with two exceptions. Construction of South Road, TRR West, and the Sacramento River discharge under Alternative 2 would result in additional loss of potential habitat. Permanent impacts on potential habitat would be less under Alternative 2 because the inundation area would be smaller. Under. Additional removal of potential habitat would also result in an increased potential for mortality of individuals from being crushed or buried by equipment or being struck by vehicles and equipment traveling along access roads during construction.

Operation

Potential effects on Crotch bumble bee and western bumble bee as a result of operation would be the same under Alternative 2 as described for Alternatives 1 and 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in similar impacts to Alternatives 1 and 3 except that construction of South Road, TRR West, and the Sacramento River discharge would result in additional permanent loss of modeled habitat, and the smaller reservoir footprint would reduce the amount of permanent habitat loss under Alternative 2. A net increase in the amount of habitat removed would also increase the potential for individuals to be crushed or buried by equipment or struck by vehicles and equipment traveling along access roads. These impacts would be

significant because the implementation of Alternative 2 could reduce the local populations of Crotch bumble bee and western bumble bee through direct mortality and habitat loss. Implementation of Mitigation Measures WILD-1.9, WILD-1.12 and WILD-1.13 would reduce the level of impact to less than significant.

NEPA Conclusion

Construction of Alternative 2 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on Crotch bumble bee and western bumble bee. With implementation of Mitigation Measures WILD-1.9, WILD-1.12 and WILD-1.13, effects would be reduced to no adverse effect. Operation of Alternative 2 would result in the same effects as those described above for CEQA, and there would be no adverse effect on Crotch bumble bee and western bumble bee.

Amphibians and Reptiles

Permanent and temporary impacts on modeled habitat for special-status amphibians and reptiles from Alternatives 1, 2, and 3 are shown in Table 10-2c.

Table 10-2c. Acreages of Permanent and Temporary Impacts on Modeled Special-Status Amphibian and Reptile Habitats in the Study Area

	Alternatives 1 and 3 Permanent Impacts	**Alternatives 1 and 3 Permanent Impacts**	**Alternatives 1 and 3 Temporary Impacts**	**Alternatives 1 and 3 Temporary Impacts**	**Alternative 2 Permanent Impacts**	**Alternative 2 Permanent Impacts**	**Alternative 2 Temporary Impacts**	**Alternative 2 Temporary Impacts**
	Aquatic Habitat	Upland Habitat	Aquatic Habitat	Upland Habitat	Aquatic Habitat	Upland Habitat	Aquatic Habitat	Upland Habitat
Western Spadefoot	511	13,730	50	848	512	13,311	48	832
California Red-legged Frog	288	6,793	249	460	280	6,403	249	460
Western Pond Turtle	635	14,201	323	1,016	641	13,806	408	1,001
Giant Gartersnake	2	26	21	18	2	20	117	45

Impact WILD-1f: Western Spadefoot

Alternatives 1 and 3

Modeled habitat for western spadefoot is present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR East/Funks pipelines, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, recreation areas, and Dunnigan Pipeline.

Construction

Construction of Alternative 1 or 3 would result in the permanent and temporary losses of modeled western spadefoot habitat (Table 10-2c). Modeled habitat would also be lost when the reservoir was inundated. Clearing and grubbing, excavation, and other construction activities could result in destruction of burrows and mortality or injury of individuals from being crushed or buried by equipment. Western spadefoot could also be struck by vehicles and equipment traveling along access roads during construction. In addition, work in or adjacent to suitable aquatic habitats during the breeding season could destroy developing eggs and/or larvae. Construction activities and lighting could result in the disruption of foraging activities or dispersal. Spills or leaks of gasoline, oil, or other contaminants during construction could contaminate suitable habitat and cause illness or mortality of individuals. Construction of the reservoir could cause fragmentation or isolation of western spadefoot populations and create a barrier for movement between areas of suitable habitat.

Operation

Western spadefoot aquatic habitat could be indirectly affected as a result of changes in topography, compaction of soils, and increases in surface runoff from the additional impervious surfaces associated with the new facilities. These changed conditions could modify the existing hydrologic regime of modeled potential habitat in or near the affected areas. Changes in topography could result in additional water entering habitat or could interfere with existing water flow into habitats, thereby increasing or reducing the amount of water entering habitat. Changes to the length of the inundation period of habitat could affect western spadefoot reproduction.

Indirect effects on western spadefoot from new or increased amounts of contaminants such as gasoline, oil, and herbicides could enter suitable western spadefoot aquatic habitat from adjacent new or widened roads, or new facilities, could cause illness or mortality of individuals.

Impacts from maintenance activities required for operation under Alternatives 1 and 3 are expected to be minimal because maintenance activities would be conducted mostly in previously disturbed areas during daytime hours and using existing roadways. Western spadefoot could be struck by vehicles and equipment traveling along access roads during operation, but this is unlikely to occur because western spadefoot movement primarily occurs at night.

Modeled habitat is present at the recreation areas and near the reservoir, which would be used by visitors on a regular basis and would result in an increased human presence in these areas. There

is potential for visitors to access undeveloped areas and disturb existing habitat (e.g., walk through habitat, increase trash). If western spadefoot was present, individuals could be crushed by visitors walking through habitat. In addition, increased human activity at the recreation areas and near the reservoir could cause western spadefoot to avoid habitat in these areas. There is also potential for the introduction of exotic invasive species (e.g., bullfrogs [*Lithobates catesbeianus*], red-eared sliders [*Trachemys scripta elegans*]) from visitors releasing these animals at recreation areas or into the reservoir, which could compete with or prey on western spadefoot.

New roadways, once completed, could impede movement and increase the potential mortality of western spadefoot from being struck by the vehicles of workers traveling to operations facilities or visitors traveling to recreation areas. The presence of the reservoir could cause fragmentation or isolation of western spadefoot populations and create a barrier for movement between areas of suitable habitat.

Safety lighting would be installed at the dams, bridge, and recreation areas. Lighting could cause western spadefoot to avoid using areas illuminated by these new sources of light or modify its movement pathways to avoid the lighted areas. Lighting could also make western spadefoot more vulnerable to predation. A BMP for permanent lighting specifies that safety lighting would be shielded to minimize offsite light spill and glare and be screened and directed away from adjacent uses to the highest degree possible. This BMP would minimize the operational impacts of new lighting on western spadefoot.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 1 or 3 would result in significant impacts on western spadefoot from removal of potential habitat and loss of individuals. Operation of Alternative 1 or 3 could affect potential western spadefoot aquatic habitat as a result of changes in topography, soil compaction, and increased amounts of impervious surfaces, which could modify the existing hydrologic regime of the aquatic habitat. Operations of Alternative 1 or 3 could result in disturbance of habitat or introduction of exotic invasive species at recreation areas, or mortality of individuals from being struck by the vehicles of personnel or recreationists. These impacts would be significant because implementation of Alternatives 1 and 3 could reduce the local western spadefoot population through direct mortality and habitat loss. Western spadefoot has been eliminated from a portion of its range as a result of urban and agricultural development and additional habitat losses are expected (Morey 2005:516–517). Implementation of Mitigation Measures WILD-1.2, WILD-1.3, WILD-1.14, and VEG-2.2, and VEG-3.2 would reduce the level of impact to less than significant because surveys would be conducted to determine presence, disturbance of seasonal wetlands would be avoided during the rainy season, and compensation would be provided for the permanent and temporary losses of suitable habitat.

Mitigation Measure WILD-1.2: Avoid and Minimize Potential Effects on Vernal Pool Branchiopods and Western Spadefoot

This measure is described above for vernal pool branchiopods.

Mitigation Measure WILD-1.3: Compensate for Impacts on Vernal Pool Branchiopod Habitat

This measure is described above for vernal pool branchiopods.

Mitigation Measure WILD-1.14: Assess Habitat Suitability and Survey Suitable Habitat for Western Spadefoot, California Red-legged Frog, and Western Pond Turtle

The Authority will employ qualified biologists to assess habitat suitability and conduct surveys for western spadefoot, California red-legged frog, and western pond turtle in the Project area and where potentially suitable habitat is within 300 feet of the Project area where impacts from operation may occur. Qualified biologists are defined as those who have experience evaluating habitat and conducting focused surveys for western spadefoot, California red-legged frog, and western pond turtle. The surveys will be conducted in accordance with the following conditions.

- Western spadefoot habitat assessments and surveys of seasonal wetland habitat will be conducted during vernal pool branchiopod habitat assessments and surveys (Mitigation Measure WILD-1.1).
- Habitat assessment and surveys for California red-legged frog will be conducted in accordance with the *Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog*, which provide direction for site assessments and recommend up to eight surveys that are conducted over a period of 9–12 months (U.S. Fish and Wildlife Service 2005b). Habitat assessment and surveys for western pond turtle and western spadefoot (intermittent streams) will be conducted concurrently with the California red-legged frog surveys.

The qualified biologists will prepare and submit reports describing the methods and results of the habitat assessments and surveys to the Authority, CDFW, and USFWS.

Mitigation Measure VEG-2.2: Avoid and Compensate for Adverse Effects on Sensitive Natural Communities

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-3.2: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Wetlands

This measure is described in Chapter 9, Section 9.4.

NEPA Conclusion

Construction of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 1

or 3 would result in a substantial adverse effect on western spadefoot. With implementation of Mitigation Measures WILD-1.2, WILD-1.3, WILD-1.14, VEG-2.2, and VEG-3.2, effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and there would be no adverse effect on western spadefoot.

Alternative 2

Modeled habitat for western spadefoot is present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR West, TRR/Funks pipelines, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, recreation areas, and Dunnigan Pipeline.

Construction

Construction of Alternative 2 would result in the permanent and temporary losses of modeled habitat for western spadefoot (Table 10-2c). Impacts would be similar to those under Alternatives 1 and 3 with two exceptions. Construction of South Road and TRR West under Alternative 2 would result in additional loss of potential habitat. Permanent impacts on potential habitat would be less under Alternative 2 because the inundation area would be smaller. Additional removal of potential habitat would also result in an increased potential for injury or mortality of western spadefoot. There would also be a larger area that could be affected by construction lighting and potential contamination from spills or leaks of gasoline, oil, or other contaminants during construction.

Operation

Potential effects on western spadefoot from operation would be similar under Alternative 2 to Alternatives 1 and 3. Under Alternative 2, the length of new roadway would be substantially longer (more than 10 miles) than under Alternatives 1 and 3. Because additional roadway would be constructed under Alternative 2, the greater amount of roadway would impede western spadefoot movement over a larger area and increase the potential for individuals spadefoot to be struck by vehicles of workers traveling to operations facilities or visitors traveling to recreation areas.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in similar impacts to Alternatives 1 and 3 except that construction of South Road and TRR West would result in additional permanent loss of potential habitat and the smaller reservoir footprint would reduce the amount of permanent habitat loss under Alternative 2. A net increase in the amount of habitat removed would also increase the potential for individuals to be crushed or buried by equipment or struck by vehicles and equipment traveling along access roads. Operation of Alternative 2 would result in similar impacts to Alternatives 1 and 3 except that the increased amount of roadway would impede movement over a larger area. These impacts would be significant because the implementation of Alternative 2 could reduce the local western spadefoot population through direct mortality and

habitat loss. Implementation of Mitigation Measures WILD-1.2, WILD-1.3, WILD-1.14, VEG-2.2, and VEG-3.2 would reduce the level of impact to less than significant.

NEPA Conclusion

Construction of Alternative 2 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on western spadefoot. With implementation of Mitigation Measures WILD-1.2, WILD-1.3, WILD-1.14, and VEG-2.2, effects would be reduced to no adverse effect. Operation of Alternative 2 would result in the same effects as those described above for CEQA, and there would be no adverse effect on western spadefoot.

Impact WILD-1g: California Red-legged Frog

Alternatives 1 and 3

Modeled habitat for California red-legged frog is present at the Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, and recreation areas.

Construction

Construction of Alternative 1 or 3 would result in the permanent and temporary losses of modeled habitat for California red-legged frog (Table 10-2c). Clearing and grubbing, excavation, and other construction activities could result in destruction of burrows, and mortality or injury of individuals from being crushed or buried by equipment. California red-legged frog could be struck by vehicles and equipment traveling along access roads during construction. In addition, work in or adjacent to suitable aquatic habitats during the breeding season could destroy developing eggs and/or larvae. Construction activities and lighting could also result in disruption of foraging activities or dispersal. Spills or leaks of gasoline, oil, or other contaminants during construction could contaminate suitable habitat and cause illness or mortality of individuals.

Operation

New or increased amounts of contaminants such as gasoline, oil, and herbicides could enter suitable California red-legged frog aquatic habitat from adjacent new or widened roads, or new facilities, which could cause illness or mortality of eggs or individuals.

Impacts from maintenance activities required for operation under Alternatives 1 and 3 are expected to be minimal because maintenance activities would be conducted mostly in previously disturbed areas during daytime hours and using existing roadways. If present, California red-legged frog could be struck by vehicles and equipment traveling along access roads during operation, but this is unlikely to occur because California red-legged frog movement mostly occurs at night.

Modeled habitat is present at the recreation areas and near the reservoir, which would be used by visitors on a regular basis and would result in an increased human presence in these areas. There is potential for visitors to access undeveloped areas and disturb existing habitat (e.g., walk through habitat, increase trash). If California red-legged frog was present, individuals could be crushed by visitors walking through habitat. In addition, increased human activity at the recreation areas and near the reservoir could cause California red-legged frog to avoid habitat in these areas. There is also potential for the introduction of exotic invasive species (e.g., bullfrogs, red-eared sliders) from visitors releasing these animals at recreation areas or into the reservoir, which could compete with or prey on California red-legged frog.

New roadways could impede movement and increase the potential for mortality of California red-legged frog from being struck by vehicles of workers traveling to operations facilities or visitors traveling to recreation areas. The presence of Sites Reservoir under Alternatives 1 and 3 would be an ongoing impediment to movement of California red-legged frog. If California red-legged frogs are present in the aquatic features directly east of the reservoir, presence of the reservoir could cause fragmentation of the California red-legged frog population and create a barrier for California red-legged frog movement between these aquatic features and suitable habitat directly west of the reservoir.

Safety nighttime lighting would be installed at the dams, Funks Reservoir, bridge, and recreation areas, where modeled habitat is present. Lighting could cause California red-legged frog to avoid using areas illuminated by these new sources of light or modify its movement pathways to avoid the lighted areas. Lighting could also make California red-legged frog vulnerable to predation. A BMP for permanent lighting specifies that safety lighting would be shielded to minimize offsite light spill and glare and be screened and directed away from adjacent uses to the highest degree possible. This BMP would minimize the operational impacts of new lighting on California red-legged frog.

Stone Corral Creek would receive bypass flows from the reservoir through an outlet on the Sites Dam and Funks Creek would receive augmented flow from the Funks pipelines to its reaches immediately upstream of Funks Reservoir. Bypass flows would range from 0 to 100 cfs, with larger pulse flows to emulate natural flood conditions, and lower flows in the drier months (e.g., summer). The increase of flow in each drainage would support the existing geomorphic functions (i.e., flow regime, sediment transport, and bank erosion) and characteristics (i.e., sinuosity, channel gradient, substrate composition, channel width and depth, and riparian vegetation) of each channel. Because the bypass flows would emulate natural conditions and would not exceed 100 cfs, they would not substantially change the length of time that there is flow in the creeks or the length of ponding in the creeks. The addition of impervious surfaces would not substantially alter the existing drainage patterns of a site or area because of the limited area of impervious surfaces and the ability of the surrounding open area to infiltrate precipitation. While increased flows from bypass releases may result in minor increases in erosion and changes in sediment deposition, the changes are expected to be minimal and no impacts on California red-legged frog are expected.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 1 or 3 could result in significant impacts on California red-legged frog from removal of modeled habitat and potential loss of individuals. Operation of Alternative 1 or 3 could affect California red-legged frog as a result of new or increased contaminants entering habitat, vehicle strikes, disturbance of habitat or injury or mortality of individuals at recreation areas, and impeded movement from new roadways. These impacts would be significant because the implementation of Alternative 1 or 3 could reduce the local California red-legged frog population through direct mortality and habitat loss. California red-legged frog has been extirpated from approximately 70% of its historical range, with severe declines occurring primarily in the Central Valley and southern California (U.S. Fish and Wildlife Service 2002:1, 4–5). Implementation of Mitigation Measures WILD-1.14, WILD-1.15, and WILD-1.16 would reduce the level of impact to less than significant because surveys would be conducted to determine presence, protective measures would be implemented during construction, and compensation would be provided for the permanent and temporary losses of suitable habitat.

Mitigation Measure WILD-1.14: Assess Habitat Suitability and Survey Suitable Habitat for Western Spadefoot, California Red-legged Frog, and Western Pond Turtle

This mitigation measure is described above for western spadefoot.

Mitigation Measure WILD-1.15: Implement California Red-legged Frog Protective Measures

If California red-legged frog is found in the Project area either incidentally or during surveys conducted in accordance with Mitigation Measure WILD-1.14, the Authority will implement the following protective measures.

- Occupied aquatic habitat will not be removed or filled until California red-legged frogs have been relocated to suitable habitat outside of disturbance areas or other steps are taken to avoid mortality of individuals or effects on the population as determined during ESA Section 7 consultation with USFWS.
- Occupied aquatic habitat that will not be removed or disturbed will be protected with exclusion fencing along the edge of the work area a minimum of 200 feet from the aquatic habitat. The fencing will be installed to prevent individuals from entering the work area but will not completely enclose the pond or exclude dispersal to and from the pond. The USFWS-approved biologist will assist with preparing the fence plans and will be present during installation. The fencing will be installed to a depth of 6 inches and be at least 30 inches above grade. The contractor will avoid placing fencing on top of ground squirrel burrows. The fence will be pulled taut at each support to prevent folds or sagging. A USFWS-approved biologist will also walk all fence lines daily to look for individuals stranded along fence lines. Fencing will be

inspected and maintained in good condition throughout work and will be removed after work is complete and all construction equipment is removed from the work area.

- A USFWS-approved biologist will be present during all ground-disturbing work in California red-legged frog upland and dispersal habitats during the rainy season (generally October 15 to May 1) when frogs are dispersing. The biologist will survey work areas for frogs and for rodent burrows in potential upland habitat immediately prior to the start of any ground-disturbing work (including moving equipment into the area). If a California red-legged frog is found, it will be moved out of the work area in accordance with the USFWS biological opinion for the Project. Disturbance of suitable habitat will be minimized to the maximum extent feasible.
- In the event a California red-legged frog is trapped, construction will cease until the individual has been relocated to an appropriate location as described in a USFWS-approved relocation plan. The plan will include trapping and relocation methods, relocation sites, and post-relocation monitoring. Only USFWS-approved biologists will be allowed to relocate listed species to outside of the construction area.
- No work will occur in suitable upland or dispersal habitats during or 24 hours following a rain event. Following a rain event, no work will proceed until a USFWS-approved biologist has inspected the work areas and verified that there are no California red-legged frogs present. A rain event is to be considered precipitation of at least 0.25 inch within a 24-hour period.
- Activities in suitable upland or dispersal habitat will occur during daylight hours (from 30 minutes before sunrise to 30 minutes after sunset). Artificial lighting at a work site will be prohibited during the hours of darkness when working in suitable California red-legged frog upland/dispersal habitat, except when necessary for driver or pedestrian safety. For any night work, the driving path and work area will be surveyed for California red-legged frog immediately prior to work and nighttime work will be monitored by a USFWS-approved biologist.

Mitigation Measure WILD-1.16: Compensate for Permanent and Temporary Losses of Occupied California Red-legged Frog Aquatic and Upland Habitats

The Authority will compensate for the permanent and temporary losses of occupied California red-legged frog aquatic habitat and associated upland habitat through the purchase of mitigation credits at a USFWS-approved conservation bank or through acquiring and protecting habitat in perpetuity at a location approved by USFWS. Permanent impacts will be mitigated at a 3:1 ratio (habitat restored or preserved: habitat affected) and temporary impacts will be mitigated at a 1:1 ratio (habitat restored or preserved: habitat affected), or as required by the biological opinion from USFWS for the Project. Details of the compensatory mitigation will be further developed in consultation with USFWS.

NEPA Conclusion

Construction of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 1 or 3 would result in a substantial adverse effect on California red-legged frog. With implementation of Mitigation Measures WILD-1.14, WILD-1.15, and WILD-1.16, effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and there would be no adverse effect on California red-legged frog.

Alternative 2

Modeled habitat for California red-legged frog is present at the TRR West, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, and recreation areas.

Construction

Construction of Alternative 2 would result in the permanent loss of modeled aquatic and upland habitat for California red-legged frog (Table 10-2c). Impacts would be similar to those for Alternatives 1 and 3 with two exceptions. Construction of South Road and TRR West under Alternative 2 would result in additional loss of potential habitat. Permanent impacts on potential habitat would be less under Alternative 2 because the inundation area would be smaller. Additional removal of potential habitat would also result in an increased potential for injury or mortality of California red-legged frog. There would also be a larger area that could be affected by construction lighting and potential contamination from spills or leaks of gasoline, oil, or other contaminants during construction.

Operation

Potential operation effects on California red-legged frog under Alternative 2 would be similar to those under Alternatives 1 and 3. Under Alternative 2, the length of new roadway would be substantially longer (more than 10 miles) than under Alternatives 1 and 3. Because additional roadway would be constructed under Alternative 2, the greater amount of roadway would impede movement over a larger area and increase the potential for California red-legged frog to be struck by vehicles of workers traveling to operations facilities or visitors traveling to recreation areas.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in similar impacts to Alternatives 1 and 3 except that construction of South Road and TRR West would result in additional permanent loss of modeled habitat and the smaller reservoir footprint would reduce the amount of permanent habitat loss under Alternative 2. A net increase in the amount of habitat removed would also increase the potential for individuals to be crushed or buried by equipment or struck by vehicles and equipment traveling along access roads. The operation impacts of Alternative 2 would be similar to those for Alternatives 1 and 3 except that the increased amount of roadway would impede

movement over a larger area. These impacts would be significant because the implementation of Alternative 2 could reduce the local California red-legged frog population through direct mortality and habitat loss. Implementation of Mitigation Measures WILD-1.14, WILD-1.15, and WILD-1.16 would reduce the level of impact to less than significant.

NEPA Conclusion

Construction of Alternative 2 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on California red-legged frog. With implementation of Mitigation Measures WILD-1.14, WILD-1.15, and WILD-1.16, effects would be reduced to no adverse effect. Operation of Alternative 2 would result in the same effects as those described above for CEQA, and there would be no adverse effect on California red-legged frog.

Impact WILD-1h: Western Pond Turtle

Alternatives 1 and 3

Modeled habitat western pond turtle is present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR East, TRR East/Funks pipelines, Funks Reservoir, Sites Reservoir, dams, new and widened roadways, recreation areas, TC Canal intake, and Dunnigan Pipeline. Potential habitat is also present along the Sacramento River in the operations study area.

Construction

Construction of Alternative 1 or 3 would result in the permanent and temporary losses of modeled habitat for western pond turtle (Table 10-2c). Clearing and grubbing, excavation, and other construction activities could result in the destruction of nest sites and mortality or injury of eggs or individuals from being crushed or buried by equipment. Western pond turtle could be struck by vehicles and equipment traveling along access roads during construction. Construction activities could also result in disruption of foraging activities or dispersal. Spills or leaks of gasoline, oil, or other contaminants during construction could contaminate suitable aquatic habitat and cause illness or mortality of individuals.

Operation

Under Alternative 1 or 3, new or increased amounts of contaminants such as gasoline, oil, and herbicides could enter suitable western pond turtle aquatic habitat from adjacent new or widened roads, or new facilities, which could cause illness or mortality of individuals.

Impacts on western pond turtle from routine maintenance activities are not expected because maintenance activities would be conducted mostly in previously disturbed areas during daylight hours and using existing roadways. If present, western pond turtle could be struck by vehicles and equipment traveling along access roads during operation.

Modeled habitat is present at the recreation areas and near the reservoir, which would be used by visitors on a regular basis and would result in an increased human presence in these areas. There is potential for visitors to access undeveloped areas and disturb existing habitat (e.g., walk through habitat, increase trash). In addition, increased human activity at the recreation areas and near the reservoir could cause western pond turtle to avoid habitat in these areas.

New roadways, once completed, could create barriers to movement and increase the potential for western pond turtle to be struck by vehicles of workers traveling to operations facilities or visitors traveling to recreation areas.

The decrease in monthly average flow in the Sacramento River because of diversion would be approximately 2% under Alternative 1 or 3. The effects of the decreased flows on the geomorphic regime and geomorphic characteristics of the river are expected to be minimal. The overall volume of water and drainage pattern in the Sacramento River (and the downstream Yolo Bypass and Delta) would be similar to existing conditions. The minor changes that would result from diversions from the Sacramento River would not affect western pond turtle or its aquatic and upland habitat.

Stone Corral and Funks Creeks would have increased flows that would range from 0 to 100 cfs, with larger pulse flows to emulate natural flood conditions, and lower flows in the drier months (e.g., summer). These flow increases would support the existing geomorphic functions and characteristics of each channel. Because the bypass flows would emulate natural conditions and would not exceed 100 cfs, they would not substantially change the length of time that there is flow in the creeks or the length of ponding in the creeks. The addition of impervious surfaces would not substantially alter the existing drainage patterns of a site or area because of the limited area of impervious surfaces and the ability of the surrounding open area to infiltrate precipitation. While increased flows from bypass releases may result in minor increases in erosion and changes in sediment deposition, the changes are expected to be minimal and no impacts on western pond turtle are expected.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 1 or 3 would result in significant impacts on western pond turtle from removal of potential habitat and potential loss of individuals. Operation of Alternative 1 or 3 could affect western pond turtle as a result of new or increased contaminants entering habitat, vehicle strikes, disturbance of habitat at recreation areas, and new roads creating barriers to movement. These impacts would be significant because the implementation of Alternative 1 or 3 could reduce the local western pond turtle population through direct mortality and habitat loss. Western pond turtle populations have declined substantially, although they are still found within most of their historical range in California (Yarnal 2019:10–13). Implementation of Mitigation Measures WILD-1.14, WILD-1.17, VEG-2.2, VEG-3.1, VEG-3.2, and VEG-3.3 would reduce the level of impact to less than significant because surveys would be conducted to identify suitable habitat, qualified biologists would conduct preconstruction surveys and monitor initial

work in suitable aquatic habitat, and compensation would be provided for the permanent and temporary losses of suitable habitat.

Mitigation Measure WILD-1.14: Assess Habitat Suitability and Survey Suitable Habitat for Western Spadefoot, California Red-legged Frog, and Western Pond Turtle

This measure is described above for western spadefoot.

Mitigation Measure WILD-1.17: Conduct Preconstruction Surveys for Western Pond Turtle and Monitor Initial In-Water Work

The Authority will employ qualified biologists (i.e., experienced in the identification of and knowledge of the life history and habitats of western pond turtle) to conduct preconstruction surveys within 24 hours of the start of activities that disturb occupied or suitable western pond turtle aquatic habitat. The biologist will survey the aquatic habitat and adjacent marsh, riparian, and grassland habitat in the construction area. If in-water work does not start immediately, the biologist will return to the construction site immediately prior to the start of in-water work to conduct another preconstruction survey. The biologist will remain onsite until initial in-water work is complete. If a turtle becomes trapped during initial in-water work, a biologist who is CDFW-approved to capture and relocate turtles during construction of the Project will relocate the individual to suitable aquatic habitat upstream or downstream of the construction area. The construction crew will be instructed to notify the crew foreman who will contact the biologist if a turtle is found trapped in the construction area. Work in the area where the turtle is trapped will stop until the biologist arrives and removes and relocates the turtle. The biologist will report their activities to CDFW within 1 day of relocating any turtle.

Mitigation Measure VEG-2.2: Avoid and Compensate for Adverse Effects on Sensitive Natural Communities

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-3.1: Avoid and Minimize Disturbance of Wetlands and Non-Wetland Waters During Construction Activities

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-3.2: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Wetlands

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-3.3: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Non-Wetland Waters

This measure is described in Chapter 9, Section 9.4.

NEPA Conclusion

Construction of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 1 or 3 would result in a substantial adverse effect on western pond turtle. With implementation of Mitigation Measures WILD-1.14, WILD-1.17, VEG-2.2, VEG-3.1, VEG-3.2, and VEG-3.3, effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and there would be no adverse effect on western pond turtle.

Alternative 2

Suitable habitat for western pond turtle is present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR/Funks pipelines, TRR West, Funks Reservoir, Sites Reservoir, dams, new and widened roadways, recreation areas, TC Canal intake, Dunnigan Pipeline, and the Sacramento River discharge. Potential habitat is also present along the Sacramento River in the operations study area.

Construction

Construction of Alternative 2 would result in the permanent loss of modeled aquatic and upland habitat for western pond turtle (Table 10-2c). Impacts would be similar to those for Alternatives 1 and 3 with two exceptions. Construction of South Road, TRR West, and the Sacramento River discharge under Alternative 2 would result in additional loss of potential habitat. Permanent impacts on potential habitat would be less under Alternative 2 because the inundation area would be smaller. Additional removal of habitat would also result in an increased potential for injury or mortality of western pond turtle. There would be a larger area that could be affected by potential contamination from spills or leaks of gasoline, oil, or other contaminants during construction.

Operation

Potential effects on western pond turtle from operation would be similar under Alternative 2 as described for Alternatives 1 and 3. Under Alternative 2, the length of new roadway would be substantially longer (more than 10 miles) than under Alternatives 1 and 3. Because additional roadway would be constructed under Alternative 2, the greater amount of roadway would impede movement over a larger area and increase the potential for western pond turtle to be struck by vehicles of workers traveling to operations facilities or visitors traveling to recreation areas.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in similar impacts to Alternatives 1 and 3 except that construction of South Road, TRR West, and the Sacramento River discharge would result in additional permanent loss of modeled habitat. A net increase in the amount of potential habitat removed would also increase the potential for individuals to be crushed or buried by equipment or struck by vehicles and equipment traveling along access roads. Operation of Alternative 2 would be the same as Alternatives 1 and 3 except that the increased amount of roadway would impede movement over a larger area. These impacts would be significant because the implementation of Alternative 2 could reduce the local western pond turtle population through direct mortality and habitat loss. Implementation of Mitigation Measures WILD-1.14, WILD-1.17, VEG-2.2, VEG-3.1, VEG-3.2, and VEG-3.3 would reduce the level of impact to less than significant.

NEPA Conclusion

Construction of Alternative 2 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on western pond turtle. With implementation of Mitigation Measures WILD-1.14, WILD-1.17, VEG-2.2, VEG-3.1, VEG-3.2, and VEG-3.3, effects would be reduced to no adverse effect. Operation of Alternative 2 would result in the same effects as those described above for CEQA, and there would be no adverse effect on western pond turtle.

Impact WILD-1i: Giant Gartersnake

Alternatives 1 and 3

Modeled habitat for giant gartersnake is present at the GCID Main Canal diversion, GCID Main Canal improvements, road improvements, TC Canal intake, and Dunnigan Pipeline.

Construction

Construction of Alternative 1 or 3 would result in the permanent and temporary losses of potential giant gartersnake habitat (Table 10-2c). Clearing and grubbing, excavation, structure improvements associated with road improvements, and other construction activities could result in the destruction of burrows and mortality or injury of individuals from being crushed or buried by equipment. Giant gartersnake could be struck by vehicles and equipment traveling along access roads during construction. Construction activities could also result in disruption of foraging activities or dispersal. Spills or leaks of gasoline, oil, or other contaminants during construction could contaminate suitable aquatic habitat and cause illness or mortality of individuals.

Operation

Under Alternative 1 or 3, new or increased amounts of contaminants such as gasoline, oil, and herbicides could enter suitable giant gartersnake aquatic habitat from adjacent new or widened roads, or new facilities, which could cause illness or mortality of individuals.

Maintenance activities required for operation of Alternative 1 or 3 facilities could result in impacts on giant gartersnake. For most areas of operation, impacts are expected to be minimal because maintenance activities would be conducted mostly in previously disturbed areas using existing roadways. Maintenance of ditches or waterway crossings that provide suitable giant gartersnake habitat could result in injury or mortality of individuals. If present, giant gartersnake could be struck by vehicles and equipment traveling along access roads during operation.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 1 or 3 would result in significant impacts on giant gartersnake from removal of suitable habitat and potential loss of individuals. Operation of Alternative 1 or 3 could injure or kill giant gartersnakes during maintenance of waterway structures or if individuals are struck by vehicles during maintenance activities. These impacts would be significant because the implementation of Alternative 1 or 3 could reduce the local giant gartersnake population through direct mortality and habitat loss. Giant garternake distribution and abundance has declined in the San Joaquin Valley and giant gartersnake abundance has declined in the Sacramento Valley (U.S. Fish and Wildlife Service 2017:I-9). Implementation of Mitigation Measures WILD-1.18, WILD-1.19, and WILD-1.20 would reduce the level of impact to less than significant because construction in suitable habitat would be conducted during this species' active period to the extent feasible, surveys would be conducted to determine presence of giant gartersnake, construction would be suspended if giant gartersnakes are observed in work areas, additional measures would be implemented to avoid causing giant gartersnake injury and mortality, and compensation would be provided for the permanent and temporary losses of suitable aquatic and upland habitat.

Mitigation Measure WILD-1.18: Implement Protective Measures for Giant Gartersnake

The Authority will implement the following protective measures when working in or near giant gartersnake habitat or as otherwise specified in the biological opinion from USFWS and incidental take permit from CDFW for the Project.

- To the maximum extent possible, all construction activity in giant gartersnake aquatic and upland habitat within 200 feet of aquatic habitat will be conducted during the snake's active period (between May 1 and October 1). During this timeframe, potential for injury and mortality are reduced because snakes are actively moving and avoiding danger. For work that cannot be conducted between May 1 and October 1, additional protective measures will be determined during consultation with USFWS and CDFW.

- The movement of heavy equipment within 200 feet of the banks of potential giant gartersnake aquatic habitat will be confined to designated haul routes to minimize habitat disturbance.
- Vegetation clearing within 200 feet of the banks of suitable giant gartersnake aquatic habitat will be limited to the minimum area necessary. Avoided giant gartersnake habitat in or adjacent to the Project area will be flagged and designated as an activity exclusion zone, to be avoided by all construction personnel.
- To reduce the likelihood of snakes entering the construction area, exclusion fencing will be installed along the edge of the construction area within 200 feet of suitable aquatic habitat. The exclusion fencing will be installed during the active period for giant gartersnakes (May 1 to October 1) to reduce the potential for injury and mortality during this activity. The exclusion fencing will consist of 3-foot-tall silt fencing buried 4 to 6 inches below ground level.
- A USFWS- and CDFW-approved biologist will conduct a preconstruction survey of work areas within 200 feet of giant gartersnake habitat no more than 24 hours before the start of work.
- Prior to construction activities each morning, construction personnel will inspect exclusion and orange barrier fencing to ensure they are both in good working order. If any snakes are observed in the construction area during this inspection or at any other time during construction, the USFWS- and CDFW-approved biologist will be contacted to survey the site for snakes. The work area will be re-inspected and surveyed whenever a lapse in construction activity of 2 weeks or more has occurred. If a snake (believed to be a giant gartersnake) is encountered during construction, activities will cease until appropriate corrective measures have been completed or it has been determined that the snake will not be harmed.

Mitigation Measure WILD-1.19: Restore Temporarily Disturbed Giant Gartersnake Aquatic and Upland Habitat to Pre-Project Conditions

Upon completion of the construction, the Authority will employ a qualified contractor to restore temporarily affected suitable giant gartersnake aquatic and upland habitats to pre-Project conditions. Restoration of aquatic vegetation and annual grassland will be detailed in a mitigation and monitoring plan that will be reviewed and approved by USFWS and CDFW prior to the start of construction.

Mitigation Measure WILD-1.20: Compensate for Permanent and Temporary Losses of Giant Gartersnake Aquatic and Upland Habitats

The Authority will compensate for the permanent and temporary losses of suitable giant gartersnake aquatic habitat and associated upland habitat through the purchase of mitigation credits at a USFWS- and CDFW-approved conservation bank or through acquiring and protecting habitat in perpetuity at a location approved by USFWS and

CDFW. Permanent impacts will be mitigated at a 3:1 ratio 1 (habitat restored or preserved: habitat affected) and temporary impacts will be mitigated at a 1:1 ratio (habitat restored or preserved: habitat affected), or as required by the biological opinion from USFWS and the incidental take permit from CDFW for the Project. Details of the compensatory mitigation will be further developed in consultation with USFWS and CDFW.

NEPA Conclusion

Construction of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 1 or 3 would result in a substantial adverse effect on giant gartersnake. With implementation of Mitigation Measures WILD-1.18, WILD-1.19, and WILD-1.20, effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and there would be no adverse effect on giant gartersnake.

Alternative 2

Modeled habitat for giant gartersnake is present at the GCID Main Canal diversion, GCID Main Canal improvements, new and widened roadways, TC Canal intake, Dunnigan Pipeline, and the Sacramento River discharge.

Construction

Construction of Alternative 2 would result in the permanent and temporary losses of modeled habitat for giant gartersnake (Table 10-2c). Impacts would be similar to those under Alternatives 1 and 3 except that additional habitat would be permanently lost because of the extended Dunnigan Pipeline and construction of the Sacramento River discharge under Alternative 2. Additional removal of habitat would also result in an increased potential for injury or mortality of giant gartersnake. There would also be a larger area that could be affected by contamination from spills or leaks of gasoline, oil, or other contaminants during construction.

Operation

Potential effects on giant gartersnake from operation would be similar under Alternative 2 to those described for Alternatives 1 and 3 except that additional maintenance activities at the Sacramento River discharge could result in additional potential for injury or mortality of giant gartersnakes.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in similar impacts to those under Alternatives 1 and 3 except that extension of the Dunnigan Pipeline and construction of the Sacramento River discharge would result in permanent loss of additional habitat. A net increase in the amount of habitat removed would also increase the potential for individuals to be crushed or buried by

equipment or struck by vehicles and equipment traveling along access roads. Operation of Alternative 2 could also result in additional potential for injury or mortality of giant gartersnakes from maintenance activities at the Sacramento River discharge. These impacts would be significant because the implementation of Alternative 2 could reduce the local giant gartersnake population through direct mortality and habitat loss. Implementation of Mitigation Measures WILD-1.18, WILD-1.19, and WILD-1.20 would reduce the level of impact to less than significant.

NEPA Conclusion

Construction of Alternative 2 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on giant gartersnake. With implementation of Mitigation Measures WILD-1.18, WILD-1.19, and WILD-1.20, effects would be reduced to no adverse effect. Operation of Alternative 2 would result in the same effects as those described above for CEQA, and there would be no adverse effect on giant gartersnake.

Birds

Permanent and temporary impacts on modeled habitat for special-status birds from Alternatives 1, 2, and 3 are shown in Table 10-2d.

Table 10-2d. Acreages of Permanent and Temporary Impacts on Modeled Special-Status Bird Habitats in the Study Area

	Alternatives 1 and 3 Permanent Impacts	Alternatives 1 and 3 Permanent Impacts	Alternatives 1 and 3 Temporary Impacts	Alternatives 1 and 3 Temporary Impacts	Alternative 2 Permanent Impacts	Alternative 2 Permanent Impacts	Alternative 2 Temporary Impacts	Alternative 2 Temporary Impacts
	Nesting Habitat	**Foraging Habitat**	**Nesting Habitat**	**Foraging Habitat**	**Nesting Habitat**	**Foraging Habitat**	**Nesting Habitat**	**Foraging Habitat**
Golden Eagle	1,006	13,096	43	929	946	12,731	43	889
Swainson's Hawk and White-tailed Kite	1,083	14,171	50	1,036	969	13,615	50	1,015
Mountain Plover	N/A	14,152	N/A	994	N/A	13608	N/A	942
Bank Swallow	0	15,649	0	1,419	0	15,088	0	1,469
Tricolored Blackbird	42	13,487	19	1,043	43	12,933	16	1,113
	Nesting and Foraging		**Nesting and Foraging**		**Nesting and Foraging**		**Nesting and Foraging**	
Northern Harrier	14,273		1,084		13,711		1,154	
Burrowing Owl	13,986		989		13,469		966	
Bald Eagle	427		253		502		253	
Western Yellow-billed Cuckoo	0		0		0		0	
Yellow-breasted Chat and Yellow Warbler	71		8		104		8	
Song Sparrow ("Modesto" Population)	112		28		147		24	

Impact WILD-1j: Northern Harrier and Burrowing Owl

Alternatives 1 and 3

Modeled habitat for northern harrier and burrowing owl is present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR East, TRR East/Funks pipelines, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, recreation areas, TC Canal intake, and Dunnigan Pipeline.

Construction

Construction of Alternative 1 or 3 would result in the permanent and temporary losses of modeled northern harrier and burrowing owl habitats (Table 10-2d). Habitat loss would result from vegetation removal, conversion to unsuitable land cover types, and reservoir inundation. Clearing and grubbing, excavation, and other construction activities could result in destruction of nests and burrows or nest abandonment, which could cause injury or mortality of eggs or nestlings.

Nighttime construction lighting could temporarily disturb active nest sites if they are in the illuminated area. Noise and vibration from operation of vehicles and equipment, and presence of construction crews could result in temporary disturbance of active northern harrier and burrowing owl nests and foraging activities. Rock quarries and batch plants in the inundation area and dam and dike footprints, drill and blast activities for tunneling at the I/O Works site, and CIDH pile drilling for the bridge would result in additional temporary disturbance from noise and vibration in those areas.

Operation

Impacts from maintenance activities required for operation of Alternative 1 or 3 facilities are expected to be minimal because maintenance activities would be conducted mostly in previously disturbed areas during daytime hours and using existing roadways. Suitable northern harrier nesting habitat is not anticipated to be located near facilities that would be maintained, and noise and other disturbances from maintenance are not expected to affect nesting northern harriers. If burrowing owls were nesting near the facilities, they could be disturbed by noise, vibrations, or presence of maintenance workers. Use of rodenticides at the facilities could cause illness or mortality of northern harrier or burrowing owl because they could feed on rodents that have ingested rodenticide.

The new transmission lines installed for the reservoirs could cause mortality of northern harrier and burrowing owl through electrocution.

Modeled habitat is present at the recreation areas and near the reservoir, which would be used by visitors on a regular basis and would result in an increased human presence in these areas. Although most of the human activity would be in the developed areas, there is potential for visitors to access undeveloped areas, which could increase proximity of visitors to nests and

disturb nesting activities. In addition, increased noise and activity in developed and undeveloped areas could cause northern harrier and burrowing owl to avoid foraging or nesting in the recreation areas or in suitable habitat near the reservoir.

Safety nighttime lighting would be installed at the TRR East, Funks Reservoir, Sites Reservoir, bridge, dams, recreation areas, TC Canal intake, and CBD outlet. Artificial lighting could deter northern harrier or burrowing owl from nesting in illuminated areas. A BMP would be implemented to reduce operation impacts on nest sites by directing new facility lighting to reduce light spill and glare in surrounding areas.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 1 or 3 would result in significant impacts on northern harrier and burrowing owl from removal of modeled habitat and potential loss or disturbance of active nests. Operation of Alternatives 1 and 3 could result in disturbance of northern harrier and burrowing owl from human-generated noise and disturbance at recreation areas and near the reservoir, or illness or morality of northern harrier or burrowing owl from ingestion of rodents that have consumed rodenticide. Collision with new transmission lines could cause injury or death of individuals from electrocution. These impacts would be significant because the implementation of Alternative 1 or 3 could reduce the local northern harrier and burrowing owl populations through direct mortality and habitat loss. Conversion of wetlands and pasturelands in the Central Valley has resulted in a decline of northern harrier and local extirpations. Ground nests are particularly vulnerable to disturbance or destruction by human activity, and to predation by wild and domestic animals (Shuford and Gardali 2008:152–153). Burrowing owl populations have declined in central and southern coastal breeding areas, and the species has experienced modest breeding range reductions statewide. Burrowing owl population declines are attributed to the loss, degradation, and modification of suitable habitat, and the eradication of ground squirrels that provide the owls with burrows for nesting, protection from predators, and shelter (California Department of Fish and Game 2012:1).

Implementation of Mitigation Measures WILD-1.21, WILD-1.22, WILD-1.23, WILD-1.24, WILD-1.25, WILD-1.26, VEG-2.2, and VEG 3.2 would reduce the level of impact to less than significant because vegetation would be removed during the nonbreeding season, surveys would be conducted to determine if northern harrier and burrowing owl are nesting (or for burrowing owl, wintering) in or near work areas, no-disturbance buffers would be established around active nest (or wintering) sites, and impacts on sensitive natural communities in which northern harriers or burrowing owls may nest or forage would be compensated for through habitat restoration or protection.

Mitigation Measure WILD-1.21: Conduct Vegetation Removal during the Non-Breeding Season of Nesting Migratory Birds

The Authority will, to the maximum extent feasible, remove trees, shrubs, and herbaceous vegetation during the non-breeding season for most migratory birds

(generally between October 1 and January 31). Removing vegetation during this period is highly preferable because if an active nest is found during preconstruction surveys (Mitigation Measure WILD-1.22) in vegetation (e.g., tree) that would be removed during construction, the vegetation cannot be removed until the end of the nesting season, which could delay construction. If vegetation cannot be removed between October 1 and the end of January, or if ground cover re-establishes in areas where vegetation has been removed, the affected area will be surveyed for nesting birds, as discussed in Mitigation Measure WILD-1.22.

Mitigation Measure WILD-1.22: Conduct Preconstruction Surveys for Nesting Migratory Birds and Implement Protective Measures if Found

For special-status species where survey protocols have been established by CDFW, USFWS, or technical advisory committees, those survey protocols will supersede this measure (i.e., Mitigation Measures WILD-1.23, WILD-1.27, and WILD-1.28 for burrowing owl, golden eagle/bald eagle, and Swainson's hawk/white-tailed kite). The Authority will employ qualified wildlife biologists with knowledge of the relevant species to conduct nesting bird surveys before the start of construction. A minimum of two separate surveys will be conducted for migratory birds, including raptors. Surveys for nesting migratory birds will include examining all potential nesting habitat in and within 50 feet of work areas on foot and/or using binoculars. The survey area for nesting raptors will encompass potential habitat within 500 feet of work areas. If possible, the first survey will be conducted during the height of the breeding season (March 1 to June 1) and the second survey will be conducted within 1 week prior to the start of construction. If no active nests are detected during these surveys, no additional measures are required.

If an active nest is found in the survey area, a no-disturbance buffer will be established around the nest site to avoid disturbance or destruction of the site until the end of the breeding season (September 30) or until after a qualified wildlife biologist determines that the young have fledged and moved out of the Project area (this date varies by species). The extent of these buffers will be determined by the biologist in coordination with USFWS and CDFW and will depend on the level of noise or construction disturbance, line-of-sight between the nest and the disturbance, ambient levels of noise and other disturbances, and other topographical or artificial barriers. Suitable buffer distances may vary between species. If it is determined that the no-disturbance buffer cannot be maintained, the Authority and the qualified biologist will consult with USFWS and CDFW about implementing alternative protective measures such as a reduced buffer with full-time nest monitoring by a qualified biologist.

Mitigation Measure WILD-1.23: Conduct Surveys for Western Burrowing Owl Prior to Construction and Implement Avoidance and Minimization Measures if Found

The Authority will employ qualified biologists (experienced at identification of burrowing owls and their habitat) to conduct burrowing owl surveys in accordance with CDFW's *2012 Staff Report on Burrowing Owl Mitigation* (2012 Staff Report) (California Department of Fish and Game 2012). Biologists will conduct four surveys during the breeding season as follows: (1) one survey between February 15 and April 15, and (2) a minimum of three surveys at least 3 weeks apart between April 15 and July 15, with at least one survey after June 15. Biologists will also conduct four surveys spread evenly throughout the non-breeding season (September 1 to January 31). A report describing the methods and results of the survey will be submitted to CDFW within 30 days of completing the surveys.

The Authority will employ qualified biologists to conduct preconstruction take avoidance surveys for active burrows according to methodology in the 2012 Staff Report. If burrowing owls are found during any of the surveys, the Authority will implement Mitigation Measure WILD-1.24, which requires habitat to be replaced at a conservation area before permanent impacts occur. Because ample lead time is necessary to acquire and protect replacement habitat, these efforts should begin as soon as possible after presence of burrowing owls is determined.

Regardless of results from the surveys described above, take avoidance (preconstruction) surveys will be conducted no less than 14 days prior to and 24 hours before initiating ground-disturbing activities (i.e., two surveys).

Because burrowing owls may re-colonize a site after a few days, subsequent surveys will be conducted if more than 2 days pass between Project activities. If no burrowing owls are found, no further mitigation is required. If burrowing owls are found, the Authority will implement the following measures summarized from the 2012 Staff Report.

- Occupied burrows will not be disturbed during the breeding season (February 1–August 31).
- A 250-foot-wide buffer area will be established around occupied burrows. No construction will be authorized within the buffer unless a qualified biologist determines through non-invasive methods that egg laying and incubation have not begun or that juveniles are foraging independently and are capable of independent survival.
- To the maximum extent possible, burrows occupied during the non-breeding season by migratory or non-migratory resident burrowing owls will be avoided.

- To the maximum extent possible, destruction of unoccupied burrows in temporary impact areas will be avoided, and visible markers will be placed near burrows to ensure they are not collapsed.
- Occupied burrows that cannot be avoided will have exclusion devices installed and be collapsed. Burrow exclusion will be conducted only by qualified biologists during the non-breeding season, before breeding behavior is exhibited and after the burrow is confirmed empty by site surveillance and/or scoping.
- Qualified biologists will conduct additional take avoidance surveys, as described above.
- Qualified biologists will monitor the Project site for burrowing owls during Project construction activities.
- Impacts on burrowing owls and their habitat will be minimized by using buffer areas, visual screens, and other measures during Project construction activities. Recommended buffer distances in the 2012 Staff Report will be used or site-specific buffers and visual screens will be determined through information collected during site-specific monitoring and consultation with CDFW.
- Fumigation, treated bait, or other means of poisoning nuisance animals will not be used in areas where burrowing owls are known or suspected to occur (e.g., sites observed with nesting owls, designated use areas).
- Use of treated grain to poison mammals will be restricted to the months of January and February.

Mitigation Measure WILD-1.24: Restore Temporarily Disturbed Habitat and Compensate for the Permanent Loss of Occupied Burrowing Owl Habitat

If burrowing owls have been documented to occupy burrows at the Project site in the last 3 years, CDFW considers the site occupied and mitigation is required.

Where habitat will be temporarily disturbed, the Authority will restore the disturbed area to pre-Project conditions, including soil decompaction and revegetation. Prior to any activities that would result in permanent impacts on occupied habitat for burrowing owl, the Authority will acquire replacement habitat and permanently protect the habitat in accordance with the 2012 Staff Report. Mitigation will be provided at a minimum 1:1 ratio, but the final ratios will be determined through coordination with CDFW. Replacement habitat will be established through a conservation easement and/or credits will be purchased at a CDFW-approved conservation bank. For mitigation land under a conservation easement, a mitigation land management plan will be prepared to ensure the long-term success of the habitat and will require monitoring and reporting. The Authority will fund the maintenance and management of mitigation land through the establishment of a long-term funding mechanism such as an endowment. A qualified biologist or CDFW may determine that permanent habitat protection may be warranted if there is

potential that temporary effects may render a nesting site (nesting burrow and satellite burrows) unsustainable or unavailable, depending on the timeframe, resulting in reduced survival or abandonment.

Mitigation Measure WILD-1.25: Protect Special-status Wildlife from Rodenticide Use

To minimize the potential for wildlife to be poisoned by ingesting rodenticide, use of rodenticides will be minimized to the maximum extent feasible and limited to areas immediately surrounding Project facilities. Facilities will be maintained in a manner to reduce the potential for nuisance rodents, including sealing openings in structures, securely storing trash bins, and installing signage at recreation areas discouraging feeding of wildlife and encouraging disposal of food and other trash in designated containers. Wherever feasible, alternatives to rodenticide will be used for rodent eradication, such as traps, if they can be used safely around other wildlife.

Mitigation Measure WILD-1.26: Construct Overhead Power Lines and Associated Equipment Following Suggested Practices to Reduce Bird Collisions with Power Lines

The Authority will ensure that new transmission lines and associated equipment will be properly fitted with wildlife protective devices to isolate and insulate structures to prevent injury or mortality of birds. Protective measures shall follow the guidelines provided in *Reducing Avian Collisions with Power Lines: The State of the Art* (Avian Power Line Interaction Committee 2012), or the current guidelines in place at the time the transmission lines are installed, and will include insulating hardware or conductors against simultaneous contact, using poles that minimize impacts to birds, and increasing the visibility of conductors or wires to prevent or minimize bird collisions.

Mitigation Measure VEG-2.2: Avoid and Compensate for Adverse Effects on Sensitive Natural Communities

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-3.2: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Wetlands

This measure is described in Chapter 9, Section 9.4.

NEPA Conclusion

Construction of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 1 or 3 would result in a substantial adverse effect on northern harrier and burrowing owl. With implementation of Mitigation Measures WILD-1.21, WILD-1.22, WILD-1.23, WILD-1.24,

WILD-1.25, WILD-1.26, VEG 2.2, and VEG 3.2, effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and there would be no adverse effect on northern harrier and burrowing owl.

Alternative 2

Modeled habitat for northern harrier and burrowing owl are present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR/Funks pipelines, TRR West, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, recreation areas, TC Canal intake, Dunnigan Pipeline, and the Sacramento River discharge.

Construction

Construction of Alternative 2 would result in the permanent and temporary losses of nesting and foraging habitats for northern harrier and burrowing owl (Table 10-2d) and potential destruction of nests or nest abandonment, which could cause injury or mortality of eggs or nestlings.

Potential impacts on northern harrier and burrowing owl under Alternative 2 would be similar to those for Alternatives 1 and 3 except that construction of South Road, TRR West, and the Sacramento River discharge under Alternative 2 would result in additional loss of modeled habitat and permanent impacts on habitat would be less under Alternative 2 because the inundation area would be smaller. Additional removal of potential habitat would also result in an increased potential for destruction of nests or nest abandonment, which could cause injury or mortality of eggs or nestlings.

Operation

Potential effects on northern harrier and burrowing owl from operation would be the same under Alternative 2 as described for Alternatives 1 and 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in impacts similar to those under Alternatives 1 and 3 except that construction of South Road, TRR West, and the Sacramento River discharge would result in additional permanent loss of modeled habitat, and the smaller reservoir footprint would reduce the amount of permanent habitat loss under Alternative 2. A net increase in the amount of habitat removed would also increase the potential for destruction of nests and burrows or nest abandonment, which could cause injury or mortality of eggs or nestlings. Operation of Alternative 2 would result in the same impacts as those described above for Alternatives 1 and 3. These impacts would be significant because the implementation of Alternative 2 could reduce the local northern harrier and burrowing owl populations through direct mortality and habitat loss. Implementation of Mitigation Measures WILD-1.21, WILD-1.22, WILD-1.23, WILD-1.24, WILD-1.25, WILD-1.26, VEG 2.2, and VEG 3.2 would reduce the level of impact to less than significant.

NEPA Conclusion

Construction of Alternative 2 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on northern harrier and burrowing owl. With implementation of Mitigation Measures WILD-1.21, WILD-1.22, WILD-1.23, WILD-1.24, WILD-1.25, WILD-1.26, VEG 2.2, and VEG 3.2, effects would be reduced to no adverse effect. Operation of Alternative 2 would result in the same effects as those described above for CEQA, and there would be no adverse effect on northern harrier or burrowing owl.

Impact WILD-1k: Golden Eagle and Bald Eagle

Alternatives 1 and 3

Modeled habitat for golden eagle and bald eagle is present at the GCID Main Canal improvements, TRR East/Funks pipelines, TRR West, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, and recreation areas. Additional modeled habitat for golden eagle is present at the TC Canal intake. Modeled bald eagle habitat is also present at the GCID Main Canal diversion, TRR East Reservoir, and Dunnigan Pipeline. Potential bald eagle nesting habitat is also present along the Sacramento River in the operations study area.

Construction

Construction of Alternative 1 or 3 would result in the permanent and temporary losses of modeled nesting and foraging habitats for golden eagle and bald eagle (Table 10-2d). Habitat loss would result from vegetation removal, conversion to unsuitable land cover types, and reservoir inundation. Clearing and grubbing, excavation, and other construction activities could result in destruction of nests or nest abandonment, which could cause injury or mortality of eggs or nestlings.

Nighttime construction lighting could temporarily disturb active nest sites if they are in the illuminated area. Noise and vibration from operation of vehicles and equipment, and presence of construction crews could result in temporary disturbance of active golden eagle and bald eagle nests and foraging activities. Rock quarries and batch plants in the inundation area and dam and dike footprints, drill and blast activities for tunneling at the I/O Works site, and CIDH pile drilling for the bridge would result in additional temporary disturbance from noise and vibration in those areas.

Operation

Maintenance activities required for operation under Alternative 1 or 3 could result in impacts on golden eagle and bald eagle. While small mammals are not their preferred prey, bald eagles could become ill or die from eating rodents that have ingested rodenticides used at the facilities. Use of rodenticides at the facilities could also cause illness or mortality of golden eagle from eating rodents that have ingested rodenticide. Noise and vibration from vehicles and equipment,

and presence of maintenance crews could disturb golden eagles or bald eagles if maintenance activities are near active nests. Although maintenance activities would be temporary and short term, they could result in disturbance of active nests if conducted during a sensitive period in the nesting process (e.g., when eaglets are learning to fly).

The new transmission lines installed for the reservoirs could cause mortality of golden eagle and bald eagle through electrocution.

Modeled habitat for golden eagle and bald eagle is present at the recreation areas and near the reservoir, which would be used by visitors on a regular basis and would result in an increased human presence in these areas. Although most of the activity would be in the developed areas, there is potential for visitors to access undeveloped areas, which could increase proximity of visitors to nests and disturb nesting activities. In addition, increased noise and activity in developed and undeveloped areas could cause golden eagle and bald eagle to avoid foraging or nesting in the recreation areas or in suitable habitat near the reservoir.

Safety nighttime lighting would be installed at the TRR East Reservoir, Funks Reservoir, Sites Reservoir, bridge, dams, recreation areas, and CBD outlet where suitable nesting habitat may be present. Lighting could deter golden eagles or bald eagles from nesting in areas that are illuminated by these new sources of light. A BMP for permanent lighting specifies that safety lighting would be shielded to minimize offsite light spill and glare and be screened and directed away from adjacent uses to the highest degree possible. This BMP would minimize the operational impacts of new lighting on golden eagle and bald eagle nesting.

The decrease in monthly average flow in the Sacramento River because of diversion would be approximately 2% under Alternative 1 or 3. The effects of the decreased flows on the geomorphic regime and geomorphic characteristics of the river are expected to be minimal. The overall volume of water and drainage pattern in the Sacramento River (and the downstream Yolo Bypass and Delta) would be similar to existing conditions. The minor changes that would result from diversions from the Sacramento River would not affect suitable bald eagle nesting habitat along the river or downstream waterways.

Stone Corral and Funks Creeks would have increased flows that would range from 0 to 100 cfs, with larger pulse flows to emulate natural flood conditions, and lower flows in the drier months (e.g., summer). These flow increases would support the existing geomorphic functions and characteristics of each channel. While increased flows from bypass releases may result in minor increases in erosion and changes in sediment deposition, the changes are expected to be minimal and there would be no impacts on suitable golden eagle or bald eagle nesting habitat associated with the creeks.

The completed reservoir would provide new bald eagle foraging habitat and result in new nesting sites or wintering habitat because of the proximity to new foraging habitat. These would be beneficial effects.

CEQA Significance Determination and Mitigation Measures

Implementation of Alternative 1 or 3 would have the beneficial effects of providing new bald eagle foraging habitat (Sites Reservoir) and new nesting sites or wintering habitat because of the proximity to the new foraging habitat. Construction of Alternative 1 or 3 would result in significant impacts on golden eagle and bald eagle from removal of suitable habitat and potential loss or disturbance of active nests. Operation of Alternatives 1 and 3 may result in disturbance of bald eagle and golden eagle if nesting or foraging at or near recreation areas and the use of rodenticides could cause illness, injury, or morality of bald eagle or golden eagle if rodenticides are ingested. Collision with new transmission lines could cause injury or death of individuals from electrocution. These impacts would be significant because the implementation of Alternative 1 or 3 could reduce the local golden eagle and bald eagle populations through direct mortality and habitat loss. The population trend of golden eagle in California is largely unknown, but the species is threatened by loss of foraging areas, loss of nesting habitat, pesticide poisoning, lead poisoning and collision with man-made structures such as wind turbines (California Department of Fish and Wildlife 2021e). Bald eagle population decline has been attributed to habitat modification from urban developments; agriculture; timber harvest; pesticides and contaminants, including lead poisoning; off-road vehicles and other human disturbances; electrocution and collision at power lines; and shooting (California Department of Fish and Wildlife 2021f).

Implementation of Mitigation Measures WILD-1.21, WILD-1.25, WILD-1.26, WILD-1.27, VEG-2.2, VEG-3.2, VEG-3.3, VEG-4.1, and VEG-4.2 would reduce the level of impact to less than significant because vegetation would be removed during the nonbreeding season, surveys would be conducted to determine if golden eagle and bald eagle are nesting in or near work areas, no-disturbance buffers would be established around active nest sites, and impacts on sensitive natural communities in which golden eagles and bald eagles may nest or forage would be compensated for through habitat restoration and preservation.

Mitigation Measure WILD-1.21: Conduct Vegetation Removal during the Non-Breeding Season of Nesting Migratory Birds

This measure is described above for northern harrier and burrowing owl.

Mitigation Measure WILD-1.25: Protect Special-status Wildlife from Rodenticide Use

This measure is described above for northern harrier and burrowing owl.

Mitigation Measure WILD-1.26: Construct Overhead Power Lines and Associated Equipment Following Suggested Practices to Reduce Bird Collisions with Power Lines

This measure is described above for northern harrier and burrowing owl.

Mitigation Measure WILD-1.27: Conduct Focused Surveys for Golden Eagle and Bald Eagle and Implement Protective Measures if Found

Prior to the start of construction, the Authority will employ qualified wildlife biologists (experienced with raptor identification and behaviors) to conduct focused surveys for golden eagle and bald eagle nests in suitable habitat in the Project area and within a 2-mile radius of the Project area. The surveys will be conducted in accordance with the *Interim Golden Eagle Inventory and Monitoring Protocols; and other Recommendations* (Pagel et al. 2010), *Protocol for Evaluating Bald Eagle Habitat and Populations in California* (Jackman and Jenkins 2004), *Bald Eagle Breeding Survey Instructions* (California Department of Fish and Wildlife 2017) and *Updated Eagle Nest Survey Protocol* (U.S. Fish and Wildlife Service 2020).

Prior to conducting surveys, any known breeding area records will be reviewed, and a map of potential nest sites will be created using GIS mapping of suitable nesting habitat. If feasible, an initial survey will be conducted during the fall or winter, prior to the initial occupancy survey, to identify existing nest sites. Nest locations will be mapped using GPS software and will be used during the occupancy surveys.

For golden eagle, based on the results of the initial survey, aerial (helicopter) or ground surveys will be conducted to assess nest occupancy. A minimum of two aerial surveys or ground observation periods lasting at least 4 hours each will be conducted in a single breeding season (January 1 through August 31) to confirm presence/absence of golden eagle. Each survey will be conducted at least 30 days apart. Surveys will be conducted in the morning during favorable weather conditions.

For a bald eagle, based on the results of the initial survey, a minimum of three surveys will be conducted during the bald eagle nesting season (January 1 to July 31) in the year that construction will begin, and each year during the construction period, to look for new nests. The first survey will be conducted in the early breeding period in early March, and additional surveys will be conducted in mid-nesting season (late April or early May) and late in the season (mid-June). Surveys will be conducted in the morning, if feasible, during favorable weather conditions.

For both species, the final survey methods and survey area boundaries will be determined based on coordination with USFWS and CDFW, and all survey results will be submitted to these agencies.

If an occupied golden eagle or bald eagle nest is identified in the survey area, a no-disturbance buffer will be established around the nest site to avoid disturbance or destruction of the site within each breeding season (January 1–August 31 for golden eagle; January 1–July 31 for bald eagle) or until a qualified wildlife biologist determines that the young have fledged and the nest is no longer active. The extent of the buffer will be 1 mile or as determined by the biologist in coordination with USFWS and CDFW and

will depend on the level of noise or construction disturbance, line-of-sight between the nest and the disturbance, ambient levels of noise and other disturbances, and other topographical or artificial barriers. If it is determined that the no-disturbance buffer cannot be maintained, the Authority and the qualified biologist will consult with USFWS and CDFW about implementing alternative protective measures such as a reduced buffer with full-time nest monitoring by a qualified biologist.

Mitigation Measure VEG-2.2: Avoid and Compensate for Adverse Effects on Sensitive Natural Communities

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-3.2: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Wetlands

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-3.3: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Non-Wetland Waters

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-4.1: Avoid and Minimize Potential Adverse Effects on Oak Woodlands During Construction

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-4.2: Compensate for Adverse Effects on Oak Woodlands

This measure is described in Chapter 9, Section 9.4.

NEPA Conclusion

Construction of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 1 or 3 would result in a substantial adverse effect on golden eagle and golden eagle. With implementation of Mitigation Measures WILD-1.21, WILD-1.25, WILD-1.26, WILD-1.27, VEG 2.2, VEG 3.2, VEG-3.3, VEG-4.1, and VEG-4.2, effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and there would be no adverse effect on golden eagle and bald eagle.

Alternative 2

Modeled habitat for golden eagle and bald eagle is present at the GCID Main Canal improvements, TRR/Funks pipelines, TRR West, Funks Reservoir, inundation area, I/O Works,

dams, new and widened roadways, and recreation areas. Additional modeled habitat for golden eagle is present at the TC Canal intake. Modeled bald eagle habitat is also present at the GCID Main Canal diversion, Dunnigan Pipeline, and the Sacramento River discharge.

Construction

Construction of Alternative 2 would result in the permanent and temporary losses of potential habitat for golden eagle (Table 10-2d) and potential destruction of nests or nest abandonment, which could cause injury or mortality of eggs or nestlings. Impacts would be similar to those for Alternatives 1 and 3 except that construction of South Road, TRR West, and of the Sacramento River discharge under Alternative 2 would result in additional loss of suitable bald and golden eagle habitat and permanent impacts on suitable golden and bald eagle habitat would be less under Alternative 2 because the inundation area would be smaller. Additional removal of potential habitat would also result in an increased potential for destruction of nests or nest abandonment, which could cause injury or mortality of eggs or nestlings.

Operation

Potential effects on golden eagle and bald eagle from operation would be the same under Alternative 2 as described for Alternatives 1 and 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in impacts similar to those for Alternatives 1 and 3 except that construction of South Road would result in additional permanent loss of suitable golden eagle and bald eagle habitat, the smaller reservoir footprint would reduce the amount of permanent golden eagle and bald eagle habitat loss, and construction of the Sacramento River discharge would increase the amount of bald eagle habitat loss under Alternative 2. A net increase in the amount of suitable habitat removed would also increase the potential for destruction of nests or nest abandonment, which could cause injury or mortality of eggs or nestlings. Operation of Alternative 2 would result in the same impacts as those described above for Alternatives 1 and 3. These impacts would be significant because the implementation of Alternative 2 could reduce the local golden eagle and bald eagle populations through direct mortality and habitat loss. Implementation of Mitigation Measures WILD-1.21, WILD-1.25, WILD-1.26, WILD-1.27, VEG-2.2, VEG-2.3,VEG-3.2, VEG-3.3, VEG-4.1, and VEG-4.2 would reduce the level of impact to less than significant.

NEPA Conclusion

Construction of Alternative 2 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on bald eagle and golden eagle. With implementation of Mitigation Measures WILD-1.21, WILD-1.25, WILD-1.26, WILD-1.27, VEG-2.2, VEG-3.2, VEG-3.3, VEG-4.1, and VEG-4.2, effects would be reduced to no adverse effect. Operation of

Alternative 2 would result in the same effects as those described above for CEQA, and there would be no adverse effect on bald eagle and golden eagle.

Impact WILD-1l: Swainson's Hawk and White-tailed Kite

Alternatives 1 and 3

Modeled habitat for Swainson's hawk and white-tailed kite is present at the GCID Main Canal intake, GCID Main Canal improvements, TRR East Reservoir, TRR East/Funks pipelines, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, recreation areas, TC Canal intake, Dunnigan Pipeline, and Sacramento River in the operations study area.

Construction

Construction of Alternative 1 or 3 would result in the permanent and temporary losses of modeled habitat for Swainson's hawk and white-tailed kite (Table 10-2d). Habitat loss would result from vegetation removal, conversion to unsuitable land cover types, and reservoir inundation. Clearing and grubbing, excavation, and other construction activities could result in destruction of nests or nest abandonment, which could cause injury or mortality of eggs or nestlings.

Nighttime construction lighting could temporarily disturb active nest sites if they are in the illuminated area. Noise and vibration from operation of vehicles and equipment, and presence of construction crews could result in temporary disturbance of active Swainson's hawk and white-tailed kite nests and foraging activities. Rock quarries and batch plants in the inundation area and dam and dike footprints, drill and blast activities for tunneling at the I/O Works site, and CIDH pile drilling for the bridge would result in additional temporary disturbance from noise and vibration in those areas.

Operation

Maintenance activities required for operation Alternative 1 or 3 could result in impacts on Swainson's hawk and white-tailed kite. Noise and vibration from vehicles and equipment, and presence of maintenance crews could disturb individuals if maintenance activities are near active nests. Although maintenance activities would be temporary and short term, they could result in disturbance of active nests if conducted during a sensitive period in the nesting process (e.g., when fledglings are beginning to fly). Use of rodenticides at the facilities could cause illness or mortality of individuals because they could feed on rodents that have ingested rodenticide.

The new transmission lines installed for the reservoirs could cause mortality of Swainson's hawk and white-tailed kite through electrocution.

Modeled habitat is present at the recreation areas and near the reservoir, which would be used by visitors on a regular basis and would result in an increased human presence in these areas, as well as additional roadway traffic. Although most of the activity would be in the developed

areas, there is potential for visitors to access undeveloped areas, which could increase proximity of visitors to nests and disturb nesting activities. In addition, increased noise and activity in developed and undeveloped areas could cause Swainson's hawk and white-tailed kite to avoid foraging or nesting in the recreation areas or in suitable habitat near the reservoir.

Safety nighttime lighting would be installed at the TRR East Reservoir, Funks Reservoir, Sites Reservoir, bridge, dams, recreation areas, and CBD outlet where suitable nesting habitat may be present. Lighting could deter individuals from nesting in areas that are illuminated by these new sources of light.

The decrease in monthly average flow in the Sacramento River because of diversion would be approximately 2% under Alternative 1 or 3. The effects of the decreased flows on the geomorphic regime and geomorphic characteristics of the river are expected to be minimal. The overall volume of water and drainage pattern in the Sacramento River (and the downstream Yolo Bypass and Delta) would be similar to existing conditions. The minor changes that would result from diversions from the Sacramento River would not affect suitable Swainson's hawk and white-tailed kite nesting habitat along the river or downstream waterways.

Stone Corral and Funks Creeks would have increased flows that would range from 0 to 100 cfs, with larger pulse flows to emulate natural flood conditions, and lower flows in the drier months (e.g., summer). These flow increases would support the existing geomorphic functions and characteristics of each channel. While increased flows from bypass releases may result in minor increases in erosion and changes in sediment deposition, the changes are expected to be minimal and there would be no impacts on suitable Swainson's hawk and white-tailed kite nesting habitat associated with the creeks.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 1 or 3 would result in significant impacts on Swainson's hawk and white-tailed kite from removal of suitable habitat and potential loss or disturbance of active nests. Operation of Alternatives 1 and 3 may result in disturbance of Swainson's hawk and white-tailed kite if nesting or foraging at or near recreation areas, and the use of rodenticides could cause illness, injury, or morality of Swainson's hawk and white-tailed kite if rodenticides are ingested. Collision with new transmission lines could cause injury or death of individuals from electrocution. These impacts would be significant because the implementation of Alternative 1 or 3 could reduce the local Swainson's hawk and white-tailed kite populations through direct mortality and habitat loss. Swainson's hawk populations declined as much as 90% between the early 1900s and 1970; recent populations are still below historical numbers and this species has not reoccupied its previous range (California Department of Fish and Wildlife 2016:17, 21). Historically, white-tailed kite populations were substantially reduced by habitat loss, shooting, and egg collection, and the long-term trend suggest a continued decline (Cornell Lab of Ornithology 2019).

Implementation of Mitigation Measures WILD-1.21, WILD-1.25, WILD-1.26, WILD-1.28, WILD-29, VEG-2.2, VEG-2.3, VEG-4.1, and VEG-4.2 would reduce the level of impact to less than significant because vegetation would be removed during the nonbreeding season, surveys would be conducted to determine if Swainson's hawk or white-tailed kite is nesting in or near work areas, no-disturbance buffers would be established around active nest sites, and impacts on foraging habitat and other sensitive natural communities in which Swainson's hawk or white-tailed kite may nest or forage would be mitigated through habitat restoration and preservation.

Mitigation Measure WILD-1.21: Conduct Vegetation Removal during the Non-Breeding Season of Nesting Migratory Birds

This measure is described above for northern harrier and burrowing owl.

Mitigation Measure WILD-1.25: Protect Special-status Wildlife from Rodenticide Use

This measure is described above for northern harrier and burrowing owl.

Mitigation Measure WILD-1.26: Construct Overhead Power Lines and Associated Equipment Following Suggested Practices to Reduce Bird Collisions with Power Lines

This measure is described above for northern harrier and burrowing owl.

Mitigation Measure WILD-1.28: Conduct Focused Surveys for Nesting Swainson's Hawk and White-tailed Kite Prior to Construction and Implement Protective Measures during Construction

The Authority will employ qualified wildlife biologists (experienced with raptor identification and behaviors) to conduct focused surveys for Swainson's hawk and white-tailed kite nesting areas before construction begins. Survey methodology will follow the Swainson's Hawk Technical Advisory Committee's methodology (Swainson's Hawk Technical Advisory Committee 2000). A minimum of six surveys will be conducted during the appropriate timeframes discussed in the methodology. If needed, the qualified biologists will coordinate with CDFW regarding the extent and number of surveys. Surveys will generally be conducted from February to July. Survey methods and results will be reported to CDFW within 30 days of the completion of the surveys.

Because the area surrounding the Project area is largely undeveloped, focused surveys for Swainson's hawk and white-tailed kite will be conducted in the Project area and in a buffer area up to 0.5 mile around the Project area. The portions of the buffer area containing unsuitable nesting habitat and/or with an obstructed line of sight to the Project area will not be surveyed.

If the biologists find an active nest, the contractor will maintain a 0.25-mile no-work buffer between construction activities and the active nest(s) until it has been determined that the young have fledged. The biologists will mark the no-work buffer with stakes and signs and will check the location at least weekly to ensure that the signs are in place and the buffer is being maintained. No work will be authorized within the buffer except for vehicle travel. If a 0.25-mile buffer around the nest cannot be maintained, the Authority and a qualified biologist will consult with CDFW about implementing alternative protective measures such as a reduced buffer with fulltime nest monitoring by a qualified biologist. If nesting raptors exhibit agitated behavior indicating stress, the biological monitor will have the authority to stop construction in that area until they determine that the young have fledged.

Mitigation Measure WILD-1.29: Compensate for the Permanent Loss of Foraging Habitat for Swainson's Hawk

The Authority will compensate for permanent loss of suitable Swainson's hawk foraging habitat by providing offsite habitat management lands as described in CDFW's *Staff Report Regarding Mitigation for Impacts to Swainson's Hawks in the Central Valley of California* (California Department of Fish and Game 1994). The mitigation ratio varies from 0.5:1 to 1:1 (habitat preserved for each acre lost) and depends on the distance between the Project area and the nearest active nest site (an active nest site is one that has been used in one or more of the last 5 years). Information on the nearest nest will be obtained from Swainson's hawk surveys conducted during implementation of Mitigation Measure WILD-1.28, the CNDDB, or CDFW. If acceptable to CDFW, the Authority may purchase mitigation credits for Swainson's hawk habitat from a CDFW-approved mitigation or conservation bank. The establishment or purchase of offsite habitat management lands or the purchase of mitigation credits will occur prior to the start of construction.

Mitigation Measure VEG-2.2: Avoid and Compensate for Adverse Effects on Sensitive Natural Communities

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-4.1: Avoid and Minimize Potential Adverse Effects on Oak Woodlands During Construction

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-4.2: Compensate for Adverse Effects on Oak Woodlands

This measure is described in Chapter 9, Section 9.4.

NEPA Conclusion

Construction of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 1 or 3 would result in a substantial adverse effect on Swainson's hawk and white-tailed kite. With implementation of Mitigation Measures WILD-1.21, WILD-1.25, WILD-1.26, WILD-1.28, WILD-1.29, VEG-2.2, VEG-4.1, and VEG-4.2, effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and there would be no adverse effect on Swainson's hawk and white-tailed kite.

Alternative 2

Modeled habitat for Swainson's hawk and white-tailed kite is present at the, GCID Main Canal diversion, GCID Main Canal improvements, TRR/Funks pipelines, TRR West, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, recreation areas, TC Canal intake, Dunnigan Pipeline, and the Sacramento River discharge. Potential bald eagle nesting habitat is also present along the Sacramento River in the operations study area.

Construction

Construction of Alternative 2 would result in the permanent and temporary losses of potential habitat for Swainson's hawk and white-tailed kite (Table 10-2d) and potential destruction of nests or nest abandonment, which could cause injury or mortality of eggs or nestlings. Impacts would be similar to those described for Alternatives 1 and 3 except that construction of South Road, TRR West, and the Sacramento River discharge under Alternative 2 would result in additional loss of potential nesting and foraging habitat and permanent impacts on potential nesting and foraging habitat would be less under Alternative 2 because the inundation area would be smaller. Additional removal of habitat would also result in an increased potential for destruction of nests or nest abandonment, which could cause injury or mortality of eggs or nestlings.

Operation

Potential effects on Swainson's hawk and white-tailed kite from operation would be the same under Alternative 2 as described for Alternatives 1 and 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in impacts similar to those for Alternatives 1 and 3 except that construction of South Road, TRR West, and the Sacramento River discharge would result in additional permanent loss of suitable habitat, and the smaller reservoir footprint would reduce the amount of permanent habitat loss under Alternative 2. A net increase in the amount of suitable habitat removed would also increase the potential for destruction of nests or nest abandonment, which could cause injury or mortality of eggs or nestlings. Operation of Alternative 2 would result in the same impacts as those described above for Alternatives 1 and 3.

These impacts would be significant because the implementation of Alternative 2 could reduce the local Swainson's hawk and white-tailed kite populations through direct mortality and habitat loss. Implementation of Mitigation Measures WILD-1.21, WILD-1.25, WILD-1.26, WILD-1.28, WILD-1.29, VEG-2.2, VEG-4.1, and VEG-4.2 would reduce the level of impact to less than significant.

NEPA Conclusion

Construction of Alternative 2 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on these species. With implementation of Mitigation Measures WILD-1.21, WILD-1.25, WILD-1.26, WILD-1.28, WILD-1.29, VEG-2.2, VEG-4.1, and VEG-4.2, effects would be reduced to no adverse effect. Operation of Alternative 2 would result in the same effects as those described above for CEQA, and there would be no adverse effect on Swainson's hawk or white-tailed kite.

Impact WILD-1m: Mountain Plover

Alternatives 1 and 3

Modeled wintering habitat for mountain plover is present at the GCID Main Canal intake, GCID Main Canal improvements, TRR East/Funks pipelines, inundation area, I/O Works, dams, new and widened roadways, recreation areas, and Dunnigan Pipeline.

Construction

Construction of Alternatives 1 and 3 would result in the permanent and temporary losses of modeled mountain plover wintering habitat (Table 10-2d). Habitat loss would result from conversion to unsuitable land cover types and reservoir inundation. Potential injury or mortality of eggs or nestlings from nest destruction or nest abandonment would not occur because the area of disturbance under Alternatives 1 and 3 is outside mountain plover's nesting range.

Operation

Maintenance would be conducted mostly in previously disturbed areas during daytime hours and using existing roadways. Suitable mountain plover wintering habitat would not be in maintenance areas and operation would not result in impacts on mountain plover.

Modeled habitat is present at the recreation areas and near the reservoir, which would be used by visitors on a regular basis and would result in an increased human presence in these areas. Increased noise and activity in developed and undeveloped areas could cause mountain plover to avoid foraging in the recreation areas or in suitable habitat near the reservoir.

The new transmission lines installed for the reservoirs could cause mortality of mountain plover through electrocution.

CEQA Significance Determination and Mitigation Measures

Construction of Alternatives 1 and 3 would result in significant impacts on mountain plover from removal of suitable wintering habitat. Operation of Alternative 1 or 3 could result in significant impacts if mountain plovers are injured or die from electrocution from colliding with new transmission lines. These impacts would be significant because Alternative 1 or 3 could affect the local wintering mountain plover population through direct mortality and habitat loss. About half of the mountain plover wintering population occurs in California and there has been a decrease in the wintering population in the Central Valley; the loss of and inadequate management of wintering areas in California is a conservation concern for this species (Andres and Stone 2009:1, 19). Implementation of Mitigation Measures VEG-2.2 and VEG-3.2 would reduce the level of impact to less than significant because permanent loss of sensitive natural communities in which mountain plover may forage would be compensated for through habitat restoration.

Mitigation Measure VEG-2.2: Avoid and Compensate for Adverse Effects on Sensitive Natural Communities

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-3.2: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Wetlands

This measure is described in Chapter 9, Section 9.4.

NEPA Conclusion

Construction of Alternatives 1 and 3 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternatives 1 and 3 would result in a substantial adverse effect on mountain plover. With implementation of Mitigation Measures VEG-2.2 and VEG-3.2, effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and there would be no adverse effect on mountain plover.

Alternative 2

Modeled habitat for mountain plover is present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR/Funks pipelines, TRR West, inundation area, I/O Works, dams, new and widened roadways, recreation areas, and Dunnigan Pipeline.

Construction

Construction of Alternative 2 would result in the permanent and temporary losses of modeled mountain plover wintering habitat (Table 10-2d). Impacts would be similar to those described for

Alternatives 1 and 3 except that permanent impacts on potential wintering habitat would be less under Alternative 2 because the inundation area would be smaller.

Operation

Potential effects on mountain plover from operation would be the same under Alternative 2 as described for Alternatives 1 and 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in impacts similar to those for Alternatives 1 and 3 except that the smaller reservoir footprint would reduce the amount of permanent habitat loss under Alternative 2. Operation of Alternative 2 would result in the same impacts as those described above for Alternatives 1 and 3. These impacts would be significant because Alternative 2 could affect the local wintering mountain plover population through direct mortality and habitat loss. Implementation of Mitigation Measures VEG-2.2 and VEG-3.2 would reduce the level of impact to less than significant.

NEPA Conclusion

Construction of Alternative 2 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on mountain plover. With implementation of Mitigation Measures VEG-2.2 and VEG-3.2, effects would be reduced to no adverse effect. Operation of Alternative 2 would result in the same effects as those described above for CEQA, and there would be no adverse effect on mountain plover.

Impact WILD-1n: Western Yellow-billed Cuckoo, Yellow-breasted Chat, Yellow Warbler, and Song Sparrow (Modesto Population)

Alternatives 1 and 3

Modeled habitat for yellow-breasted chat, yellow warbler, and song sparrow (Modesto population; herein song sparrow) is present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR East/Funks pipelines, inundation area, I/O Works, dams, new and widened roadways, recreation areas, TC Canal intake, and Dunnigan Pipeline. Modeled habit for song sparrow is also present at Funks Reservoir. Potential habitat is also present for all four bird species along the Sacramento River in the operations study area.

Construction

Alternative 1 or 3 would not result in any construction impacts on modeled western yellow-billed cuckoo habitat. Construction of Alternative 1 or 3 would result in the permanent and temporary losses of modeled habitat for yellow-breasted chat, yellow warbler, and song sparrow (Table 10-2d). Habitat loss would result from vegetation removal, conversion to unsuitable land cover

types, and reservoir inundation. Vegetation removal and other construction activities could result in destruction of nests, which could cause injury or mortality of eggs or nestlings.

Nighttime construction lighting could temporarily disturb active nest sites if they are in the illuminated area. Noise and vibration from operation of vehicles and equipment, and presence of construction crews could result in temporary disturbance of yellow-breasted chat, yellow warbler, and song sparrow nests and foraging activities. Rock quarries and batch plants in the inundation area and dam and dike footprints, drill and blast activities for tunneling at the I/O Works site, and CIDH pile drilling for the bridge would result in additional temporary disturbance from noise and vibration in those areas.

Operation

Alternative 1 or 3 would not result in any operation impacts on potential western yellow-billed cuckoo habitat. Maintenance would be conducted mostly in previously disturbed areas during daytime hours and using existing roadways. Noise and vibration from vehicles and equipment, and presence of maintenance crews could disturb nesting yellow-breasted chat, yellow warbler, and song sparrow if maintenance activities are near active nests. Although maintenance activities would be temporary and short term, they could result in disturbance of active nests if conducted during a sensitive period in the nesting process.

Modeled habitat for yellow-breasted chat, yellow warbler, and song sparrow is present at the recreation areas and near the reservoir, which would be used by visitors on a regular basis and would result in an increased human presence in these areas. Although most of the activity would be in the developed areas, there is potential for visitors to access undeveloped areas, which could increase proximity of visitors to nests and disturb nesting activities. In addition, increased noise and activity in developed and undeveloped areas could cause individuals to avoid foraging or nesting in the recreation areas or in suitable habitat near the reservoir.

Safety nighttime lighting would be installed at the TRR East Reservoir, Funks Reservoir, Sites Reservoir, bridge, dams, recreation areas, TC Canal intake, and CBD outlet. Lighting could deter individuals from nesting in areas that are illuminated by these new sources of light. A BMP would be implemented to reduce operation impacts on nest sites by directing new facility lighting to reduce light spill and glare in surrounding areas.

The decrease in monthly average flow in the Sacramento River because of diversion would be approximately 2% under Alternative 1 or 3. The effects of the decreased flows on the geomorphic regime and geomorphic characteristics of the river are expected to be minimal. The overall volume of water and drainage pattern in the Sacramento River (and the downstream Yolo Bypass and Delta) would be similar to existing conditions. The minor changes that would result from diversions from the Sacramento River would not affect potential western yellow-billed cuckoo, yellow-breasted chat, yellow warbler, and song sparrow nesting habitat along the river or downstream waterways.

Stone Corral and Funks Creeks would have increased flows that would range from 0 to 100 cfs, with larger pulse flows to emulate natural flood conditions, and lower flows in the drier months (e.g., summer). These flow increases would support the existing geomorphic functions and characteristics of each channel. While increased flows from bypass releases may result in minor increases in erosion and changes in sediment deposition, the changes are expected to be minimal and there would be no impacts on suitable yellow-breasted, yellow warbler, and song sparrow nesting habitat associated with the creeks. No potential western yellow-billed cuckoo habitat is associated with Stone Corral or Funks Creeks.

CEQA Significance Determination and Mitigation Measures

Construction and operation of Alternative 1 or 3 would have no impact on western yellow-billed cuckoo. Construction of Alternative 1 or 3 would result in significant impacts on yellow-breasted chat, yellow warbler, and song sparrow from removal of modeled habitat and potential loss or disturbance of active nests. Operation of Alternatives 1 and 3 may result in disturbance of yellow-breasted chat, yellow warbler, song sparrow if nesting or foraging at or near recreation areas. Construction impacts would be significant because Alternative 1 or 3 could reduce the local yellow-breasted chat, yellow warbler, and song sparrow populations through direct mortality and habitat loss. Yellow-breasted chat populations have declined in the Sacramento Valley as a result of riparian habitat loss and nest parasitism (Shuford and Gardali 2008:353–355). Yellow warblers are nearly extirpated in the Central Valley, primarily from loss of riparian habitat and from predation (Shuford and Gardali 2008:333). The substantial loss of wetlands and riparian forests in the Central Valley is thought to have greatly reduced the overall numbers of song sparrow and resulted in local extirpation within its range (Shuford and Gardali 2008:401).

Implementation of Mitigation Measures WILD-1.21, WILD-1.22, VEG-2.2, VEG-3.2, and VEG-3.3 would reduce the level of impact to less than significant because vegetation would be removed during the nonbreeding season, preconstruction surveys for nesting birds would be conducted, no-disturbance buffers would be established around active nest sites, and impacts on sensitive natural communities in which yellow-breasted chat, yellow warbler, and song sparrow may nest or forage would be compensated for through habitat restoration.

Mitigation Measure WILD-1.21: Conduct Vegetation Removal during the Non-Breeding Season of Nesting Migratory Birds

This measure is described above for northern harrier and burrowing owl.

Mitigation Measure WILD-1.22: Conduct Preconstruction Surveys for Nesting Migratory Birds and Implement Protective Measures if Found

This measure is described above for northern harrier and burrowing owl.

Mitigation Measure VEG-2.2: Avoid and Compensate for Adverse Effects on Sensitive Natural Communities

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-3.2: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Wetlands

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-3.3: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Non-Wetland Waters

This measure is described in Chapter 9, Section 9.4.

NEPA Conclusion

Construction of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 1 or 3 would have no adverse effect on western yellow-billed cuckoo. Construction of Alternative 1 or 3 would result in a substantial adverse effect on yellow-breasted chat, yellow warbler, and song sparrow. With implementation of Mitigation Measures WILD-1.21, WILD-1.22, VEG-2.2, VEG-3.2, and VEG-3.3, effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and there would be no adverse effect on western yellow-billed cuckoo, yellow-breasted chat, yellow warbler, or song sparrow.

Alternative 2

Modeled habitat for yellow-breasted chat, yellow warbler, and song sparrow is present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR East/Funks pipelines, TRR West, inundation area, I/O Works, dams, new and widened roadways, recreation areas, TC Canal intake, Dunnigan Pipeline, and Sacramento River discharge. Modeled habit for song sparrow is present at Funks Reservoir. Potential habitat is also present for all four bird species along the Sacramento River in the operations study area.

Construction

Alternative 2 would not result in any construction impacts on potential western yellow-billed cuckoo habitat. Construction of Alternative 2 would result in the permanent and temporary losses of modeled habitat for yellow-breasted chat, yellow warbler, and song sparrow (Table 10-2d) and potential destruction of nests or nest abandonment, which could cause injury or mortality of eggs or nestlings. Impacts would be similar to those for Alternatives 1 and 3 except that construction of South Road, TRR West, and the Sacramento River discharge under Alternative 2 would result in additional loss of suitable yellow-breasted chat, yellow warbler, and song sparrow habitat and permanent impacts on modeled habitat would be less under Alternative 2 because the inundation area would be smaller. Additional removal of potential habitat would also result in an increased potential for injury or mortality of eggs or individuals.

Operation

Potential impacts on yellow-breasted chat, yellow warbler, and song sparrow nesting and foraging activities from operation would be the same under Alternative 2 as described for Alternatives 1 and 3. Operation under Alternative 2 would have no impact on western yellow-billed cuckoo.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would have no adverse effect on western yellow-billed cuckoo. Construction of Alternative 2 would result in impacts similar to those for Alternatives 1 and 3 except that construction of South Road, TRR West, and the Sacramento River discharge would result in additional permanent loss of suitable yellow-breasted chat, yellow warbler, and song sparrow habitat, and the smaller reservoir footprint would reduce the amount of permanent habitat loss under Alternative 2. A net increase in the amount of modeled habitat removed would also increase the potential for destruction of nests or nest abandonment, which could cause injury or mortality of eggs or nestlings. Operation of Alternative 2 would result in the same impacts as those described for Alternatives 1 and 3. These impacts would be significant because Alternative 2 could reduce the local yellow-breasted chat, yellow warbler, and song sparrow populations through direct mortality and habitat loss. Implementation of Mitigation Measures WILD-1.21, WILD-1.22, VEG-2.2, VEG 3.2, and VEG-3.3 would reduce the level of impact to less than significant.

NEPA Conclusion

Construction of Alternative 2 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on these species. With implementation of Mitigation Measures WILD-1.21, WILD-1.22, VEG-2.2, VEG-3.2, and VEG-3.3, effects would be reduced to no adverse effect. Operation of Alternative 2 would result in the same effects as those described above for CEQA, and there would be no adverse effect on western yellow-billed cuckoo, yellow-breasted chat, yellow warbler, or song sparrow.

Impact WILD-1o: Bank Swallow

Alternatives 1 and 3

Modeled foraging habitat for bank swallow is present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR East Reservoir, TRR East/Funks pipelines, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, recreation areas, TC Canal intake and Dunnigan Pipeline. Potential bank swallow nesting habitat is present along the Sacramento River in the operations study area.

Construction

Construction of facilities under Alternatives 1 and 3 would result in the permanent and temporary losses of foraging habitat for bank swallow (Table 10-2d). Habitat loss would result from vegetation removal, conversion to unsuitable land cover types, and reservoir inundation.

Noise and vibration from operation of vehicles and equipment, and presence of construction crews could result in temporary disturbance of bank swallow foraging activities. Rock quarries and batch plants in the inundation area and dam and dike footprints, drill and blast activities for tunneling at the I/O Works site, and CIDH pile drilling for the bridge would result in additional temporary disturbance from noise and vibration in those areas.

Operation

Impacts from maintenance activities required for operation under Alternative 1 or 3 are expected to be minimal because maintenance activities would be conducted mostly in previously disturbed areas during daytime hours and using existing roadways. Noise and other disturbances from maintenance are not anticipated to affect foraging bank swallows.

Modeled foraging habitat is present at the recreation areas and near the reservoir, which would be used by visitors on a regular basis and would result in an increased human presence in these areas. Increased noise and activity in developed and undeveloped areas could cause bank swallow to avoid foraging in recreation areas or in suitable habitat near the reservoir.

The decrease in monthly average flow in the Sacramento River because of diversion would be approximately 2% under Alternative 1 or 3. The effects of the decreased flows on the geomorphic regime and geomorphic characteristics of the river are expected to be minimal. The overall volume of water and drainage pattern in the Sacramento River (and the downstream Yolo Bypass and Delta) would be similar to existing conditions. The minor changes that would result from diversions from the Sacramento River would not affect bank swallow nesting habitat along the river or downstream waterways.

CEQA Significance Determination and Mitigation Measures

Construction of Alternatives 1 and 3 could result in significant impacts on bank swallow from removal of suitable foraging habitat. Operation of Alternative 1 or 3 could result in disturbance of bank swallow foraging activities from human generated noise and disturbance at recreation areas and near the reservoir. Construction impacts would be significant because Alternative 1 or 3 could affect the local bank swallow population through loss of foraging habitat. Monitoring of the bank swallow population along the Sacramento River showed a 39% reduction in the number of burrows (nests) between 1986 and 2012 (Bank Swallow Technical Advisory Committee 2013:1). Implementation of Mitigation Measures VEG-2.2, VEG-3.2, and VEG-3.3 would reduce the level of impact for construction and operation to less than significant because impacts on sensitive natural communities in which bank swallow may forage would be compensated for through habitat restoration.

Mitigation Measure VEG-2.2: Avoid and Compensate for Adverse Effects on Sensitive Natural Communities

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-3.2: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Wetlands

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-3.3: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Non-Wetland Waters

This measure is described in Chapter 9, Section 9.4.

NEPA Conclusion

Construction of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 1 or 3 would result in a substantial adverse effect on bank swallow. With implementation of Mitigation Measures VEG-2.2, VEG-3.2, and VEG-3.3, effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and there would be no adverse effect on bank swallow.

Alternative 2

Modeled habitat for bank swallow is present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR/Funks pipelines, TRR West, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, recreation areas, TC Canal intake, Dunnigan Pipeline, and the Sacramento River discharge. Potential bank swallow nesting habitat is present along the Sacramento River in the operations study area.

Construction

Construction of Alternative 2 would result in the permanent and temporary losses of modeled foraging habitat for bank swallow (Table 10-2d). Impacts would be similar to those described for Alternatives 1 and 3 except that construction of South Road, TRR West, and the Sacramento River discharge under Alternative 2 would result in additional loss of suitable habitat and permanent impacts on potential habitat would be less under Alternative 2 because the inundation area would be smaller.

Operation

Potential effects on bank swallow from operation would be the same under Alternative 2 as described for Alternatives 1 and 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in impacts similar to those for Alternatives 1 and 3 except that construction of South Road, TRR West, and the Sacramento River discharge would result in additional permanent loss of foraging habitat, and the smaller reservoir footprint would reduce the amount of permanent habitat loss under Alternative 2. Operation of Alternative 2 would result in the same impacts as those described above for Alternatives 1 and 3 and there would be no adverse effect on bank swallow. Construction impacts would be significant because Alternative 2 could affect the local bank swallow population through loss of foraging habitat. Implementation of Mitigation Measures VEG-2.2, VEG 3.2, and VEG-3.3 would reduce the level of impact to less than significant.

NEPA Conclusion

Construction of Alternative 2 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on bank swallow. With implementation of Mitigation Measures VEG-2.2, VEG-3.2, and VEG-3.3, effects would be reduced to no adverse effect. Operation of Alternative 2 would result in the same effects as those described above for CEQA, and there would be no adverse effect on bank swallow.

Impact WILD-1p: Tricolored Blackbird

Alternatives 1 and 3

Modeled habitat for tricolored blackbird is present at the GCID Canal diversion, GCID Main Canal improvements, TRR East Reservoir, TRR East/Funks pipelines, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, recreation areas, TC Canal intake, and Dunnigan Pipeline.

Construction

Construction of Alternatives 1 and 3 would result in the permanent and temporary losses of nesting and foraging habitats for tricolored blackbird (Table 10-2d). Habitat loss would result from vegetation removal, conversion to unsuitable land cover types, and reservoir inundation. Clearing and grubbing, excavation, and other construction activities could result in destruction of nests or nest abandonment, which could cause injury or mortality of eggs or nestlings.

Nighttime construction lighting could temporarily disturb active nest sites if they are in the illuminated area. Noise and vibration from operation of vehicles and equipment, and presence of construction crews could result in temporary disturbance of active tricolored blackbird nests and foraging activities. Rock quarries and batch plants in the inundation area and dam and dike footprints, drill and blast activities for tunneling at the I/O Works site, and CIDH pile drilling for the bridge would result in additional temporary disturbance from noise and vibration in those areas.

Operation

Impacts from maintenance activities required for operation under Alternative 1 or 3 are expected to be minimal because maintenance activities would be conducted mostly in previously disturbed areas during daytime hours and using existing roadways. Suitable tricolored blackbird nesting habitat is not anticipated to be located near facilities that would be maintained, and noise and other disturbances from maintenance are not anticipated to affect tricolored blackbird nesting or foraging activities.

There is no modeled breeding habitat at the recreation areas. There are a few areas of modeled breeding habitat (freshwater marsh) along the perimeter of the reservoir footprint. These areas could be occasionally disturbed by people visiting the reservoir, but potential disturbance is expected to be minimal and would not result in impacts on tricolored blackbird, if nesting in the immediate vicinity. Increased noise and activity in developed and undeveloped areas would cause tricolored blackbird to avoid foraging or nesting in the recreation areas or in suitable habitat near the reservoir.

Safety nighttime lighting that would be installed at the TRR East Reservoir, Funks Reservoir, Sites Reservoir, bridge, dams, and CBD outlet have the potential to deter tricolored blackbirds from nesting in areas that are illuminated by these new sources of light. A BMP would be implemented to reduce operation impacts on nest sites by directing new facility lighting to reduce light spill and glare in surrounding areas.

CEQA Significance Determination and Mitigation Measures

Construction of Alternatives 1 and 3 could result in significant impacts on tricolored blackbird from removal of suitable habitat and potential loss or disturbance of active nests. Operation of Alternative 1 or 3 is not anticipated to result in impacts on tricolored blackbird because there is no modeled breeding habitat at recreation areas and limited modeled breeding habitat is present along the reservoir perimeter. Construction impacts would be significant because they could reduce the local tricolored blackbird population through direct mortality and habitat loss. Urban development, agricultural conversion, and harvesting of silage fields have caused a dramatic decline in the tricolored blackbird population from loss of suitable breeding and foraging habitats and loss of reproductive breeding efforts (U.S. Fish and Wildlife Service 2019:14, 28, 36–37). Implementation of Mitigation Measures WILD-1.21, WILD-1.22, VEG-2.2, VEG-3.2, and VEG-3.3 would reduce the level of impact to less than significant because vegetation would be removed during the nonbreeding season, surveys would be conducted to determine if tricolored blackbird is nesting in or near work areas, no-disturbance buffers would be established around active nest sites, and impacts on sensitive natural communities in which tricolored blackbird may nest or forage would be compensated for through habitat restoration and preservation.

Mitigation Measure WILD-1.21: Conduct Vegetation Removal during the Non-Breeding Season of Nesting Migratory Birds

This measure is described above for northern harrier and burrowing owl.

Mitigation Measure WILD-1.22: Conduct Preconstruction Surveys for Nesting Migratory Birds

This measure is described above for northern harrier and burrowing owl.

Mitigation Measure VEG-2.2: Avoid and Compensate for Adverse Effects on Sensitive Natural Communities

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-3.2: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Wetlands

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-3.3: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Non-Wetland Waters

This measure is described in Chapter 9, Section 9.4.

NEPA Conclusion

Construction of Alternatives 1 and 3 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternatives 1 and 3 would result in a substantial adverse effect on tricolored blackbird. With implementation of Mitigation Measures WILD-1.21, WILD-1.22, VEG-2.2, VEG-3.2, and VEG-3.3, effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 is not anticipated to result in effects on tricolored blackbird.

Alternative 2

Modeled habitat for tricolored blackbird is present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR/Funks pipelines, TRR West, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, recreation areas, Dunnigan Pipeline, TC Canal intake, and Sacramento River discharge.

Construction

Construction of Alternative 2 would result in the permanent and temporary losses of potential habitat for tricolored blackbird (Table 10-2d) and potential destruction of nests or nest abandonment, which could cause injury or mortality of eggs or nestlings. Impacts under Alternative 2 would be similar to those described for Alternatives 1 and 3 except that construction of South Road, TRR West, and the Sacramento River discharge under Alternative 2 would result in additional loss of modeled habitat and permanent impacts on modeled habitat would be less under Alternative 2 because the inundation area would be smaller. Additional

removal of potential habitat would result in an increased potential for injury or mortality of eggs or individuals.

Operation

Potential effects on tricolored blackbird from operation would be the same under Alternative 2 as described for Alternative 1 or 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in impacts similar to those for Alternatives 1 and 3 except that construction of South Road, TRR West, and the Sacramento River discharge would result in additional permanent loss of habitat, and the smaller reservoir footprint would reduce the amount of permanent habitat loss under Alternative 2. A net increase in the amount of habitat removed would also increase the potential for destruction of nests or nest abandonment, which could cause injury or mortality of eggs or nestlings. Operation of Alternative 2 would result in the same impacts as those described above for Alternative 1 or 3. Impacts from construction would be significant because they could reduce the local tricolored blackbird population through direct mortality and habitat loss. Implementation of Mitigation Measures WILD-1.21, WILD-1.22, VEG-2.2, VEG 3.2, and VEG-3.3 would reduce the level of impact to less than significant.

NEPA Conclusion

Construction of Alternative 2 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on tricolored blackbird. With implementation of Mitigation Measures WILD-1.21, WILD-1.22, VEG-2.2, VEG-3.2, and VEG-3.3, effects would be reduced to no adverse effect. Operation of Alternative 2 would result in the same effects as those described above for CEQA, and there would be no adverse effect on tricolored blackbird.

Mammals

Permanent and temporary impacts on modeled habitat for special-status mammals from Alternatives 1, 2, and 3 are shown in Table 10-2e.

Table 10-2e. Acreages of Permanent and Temporary Impacts on Modeled Habitat for Special-Status Mammals in the Study Area

	Alternatives 1 and 3 Permanent Impacts	Alternatives 1 and 3 Temporary Impacts	Alternative 2 Permanent Impacts	Alternative 2 Temporary Impacts
Pallid Bat and Long-eared Myotis	15,879	1,441	15,256	1,492
Townsend's Big-eared Bat and Silver-haired Bat	15,879	1,441	15,356	1,492

Western Red Bat and Hoary Bat	15,878	1,440	15,357	1,492
American Badger	14,171	984	13,733	940

Impact WILD-1q: Pallid Bat, Townsend's Big-eared Bat, Silver-haired Bat, Western Red Bat, Hoary Bat, Long-eared Myotis and Colonies of Non-special-status Roosting Bats

Alternatives 1 and 3

Modeled habitat for pallid bat (*Antrozous pallidus*), Townsend's big-eared bat (*Corynorhinus townsendii*), silver-haired bat (*Lasionycteris noctivagans*), western red bat (*Lasiurus blossevillii*), hoary bat (*Lasiurus cinereus*), long-eared myotis (*Myotis evotis*), and colonies of non-special-status roosting bats (referred to as special-status bats herein) is present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR East Reservoir, TRR East/Funks pipelines, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, recreation areas, TC Canal intake, and Dunnigan Pipeline. Potential habitat is also present along the Sacramento River in the operations study area.

Construction

Construction of Alternatives 1 and 3 would result in the permanent and temporary losses of modeled habitat for special-status bats (Table 10-2e). Habitat loss would result from vegetation removal, conversion to unsuitable land cover types, and reservoir inundation. Clearing and grubbing, excavation, and other construction activities could result in destruction of roost or roost abandonment, which could cause injury or mortality of individuals, including non-volant (i.e., non-flying) pups.

Removal of existing human-made structures and trees during construction could result in the permanent loss of roosting habitat for bats, including maternity, seasonal migration, and/or winter roosting habitats. Tree and structure removal during construction could also result in injury or mortality of bats, including non-volant pups, or eviction from roosts during the daytime when they would be disoriented and vulnerable to predation. Bats displaced from roost sites would have to compete with other bats for new roost locations.

Nighttime construction lighting could temporarily disturb bat foraging activities. Noise and vibration from operation of vehicles and equipment, and presence of construction crews could result in temporary disturbance of bats roosting near work areas. Rock quarries and batch plants in the inundation area and dam and dike footprints, drill and blast activities for tunneling at the I/O Works site, and CIDH pile drilling for the bridge would result in additional temporary disturbance of roosting bats from noise and vibration in those areas.

Operation

Impacts from maintenance activities required for operation under Alternative 1 or 3 are expected to be minimal because maintenance activities would be conducted mostly in previously disturbed areas during daytime hours and using existing roadways. Noise and vibration from vehicles and equipment, and presence of maintenance crews could disturb individuals if maintenance activities are near active roosts. These types of disturbances would be temporary and short term and are not anticipated to adversely affect special-status bats.

Modeled habitat is present at the recreation areas and near the reservoir, which would be used by visitors on a regular basis and would result in an increased human presence in these areas. Although most of the activity would be in the developed areas, there is potential for visitors to access undeveloped areas, which could increase proximity of visitors to roosting bats and disturb existing habitat. In addition, increased noise and activity in developed and undeveloped areas may cause bats to avoid foraging or roosting in the recreation areas or in suitable habitat near the reservoir. While these activities may disturb bats, they would not result in injury or mortality of individuals.

Safety nighttime lighting would be installed at the TRR East Reservoir, Funks Reservoir, Sites Reservoir, bridge, dams, recreation areas, TC Canal intake, and CBD outlet. New lighting could deter bats from using areas that are illuminated by these new sources of light, but lighting may also attract insects and increase foraging opportunities around the lights. A BMP for permanent lighting specifies that safety lighting would be shielded to minimize offsite light spill and glare and be screened and directed away from adjacent uses to the highest degree possible. This BMP would minimize the operational impacts of new lighting on special-status bats.

The completed reservoir would provide a new drinking water source and foraging habitat for bats. This would be a beneficial effect of the Project.

The decrease in monthly average flow in the Sacramento River because of diversion would be approximately 2% under Alternative 1 or 3. The effects of the decreased flows on the geomorphic regime and geomorphic characteristics of the river are expected to be minimal. The overall volume of water and drainage pattern in the Sacramento River (and the downstream Yolo Bypass and Delta) would be similar to existing conditions. The minor changes that would result from diversions from the Sacramento River would not affect trees that may provide roosting habitat for special-status bats along the river or downstream waterways.

Stone Corral and Funks Creeks would have increased flows that would range from 0 to 100 cfs, with larger pulse flows to emulate natural flood conditions, and lower flows in the drier months (e.g., summer). These flow increases would support the existing geomorphic functions and characteristics of each channel. While increased flows from bypass releases may result in minor increases in erosion and changes in sediment deposition, the changes are expected to be minimal and there would be no impacts on roosting habitat for special-status bats associated with the creeks.

CEQA Significance Determination and Mitigation Measures

Implementation of Alternative 1 or 3 would have the beneficial effects of providing a new drinking water source and foraging habitat for bats. Construction of Alternatives 1 and 3 would result in significant impacts on special-status bats from removal of suitable habitat and potential loss or disturbance of active roosts and displacement of bats from roost sites. Operation of Alternative 1 or 3 may result in disturbance of roosting or foraging bats but are not anticipated to result in injury or mortality or destruction of habitat. This impact would be less than significant. Impacts from construction would be significant because they could reduce the local populations of these special-status bats through direct mortality and habitat loss. Many bat species are rare, declining, or have unknown population sizes. Historical and ongoing challenges of bats include habitat loss, alteration, and disturbance; and new challenges include wind energy, climate change, and emerging diseases such as white-nose syndrome (U.S. Geological Survey n.d.). Implementation of Mitigation Measures WILD-1.30, WILD-1.31, WILD-1.32, VEG-2.2, VEG-3.2, VEG-4.1, and VEG-4.2 would reduce the level of impact to less than significant because surveys for special-status bats would be conducted, protective measures would be implemented, roosting habitat that is permanently lost would be replaced and protected onsite or at an offsite preservation area, impacts on oak woodland would be minimized, and impacts on sensitive natural communities in which special-status bats may roost or forage would be compensated for through habitat restoration and preservation.

Mitigation Measure WILD-1.30: Conduct Surveys and Implement Protection Measures for Special-Status Bat Species Prior to Building/Structure Demolition

Prior to building/structure demolition, the Authority will employ a qualified biologist (defined below) to conduct preconstruction surveys and implement protective measures for pallid bat, Townsend's big-eared bat, silver-haired bat, long-eared myotis, and other bats that roost in or on buildings and structures. At least 2 months prior to the demolition of the existing buildings and structures, qualified biologists will conduct an initial daytime survey to assess the buildings/structures for potential bat roosting habitat, and to look for bats and bat sign. The qualified biologists will have knowledge of the natural history of the species that may be present, have sufficient experience determining bat occupancy, and be familiar with bat survey techniques. The qualified biologist will examine both the inside and outside of the buildings/structures for potential roosting habitat, as well as routes of entry to the building and structures. Locations of any roosting bats, signs of bat use, and entry and exit points will be noted and mapped on a drawing of the buildings and structures. Roost sites will also be photographed as feasible. Depending on the results of the habitat assessment, the Authority will ensure the following steps will be taken:

- If the building and structures can be adequately assessed (i.e., sufficient areas of the buildings and structures can be examined) and no habitat or limited potential habitat for roosting bats is present and no signs of bat use are present, another survey of the

interior and exterior of the buildings/structures will be conducted by a qualified biologist within 24 hours of demolition.

- If moderate or high potential habitat for roosting bats is present but there are no signs of bat use, measures will be implemented under the guidance of the qualified biologists to exclude bats from using the buildings and structures as a roost site to the extent feasible given the conditions of the structures, such as sealing off entry points. Prior to installing exclusion measures, the qualified biologists will re-survey the buildings and structures to ensure that no bats are present. In addition, a preconstruction survey of the interior and exterior of the buildings and structures will be conducted within 24 hours of demolition to confirm that no bats are present.

If moderate or high potential habitat is present and bats or bat sign are observed, exclusion measures are not installed as described above, or the buildings or structures provide suitable habitat but cannot be adequately assessed, the Authority will implement the following protective measures:

- Prior to initiating demolition activities, follow-up surveys will be conducted to determine if bats are present. If CDFW requests that species be identified, a survey plan will be developed (number, timing, and type of surveys) by the qualified biologists and surveys using night vision goggles and active acoustic monitoring using full spectrum bat detectors will be conducted.
- The qualified biologist will develop a plan to discourage or exclude bat use of buildings/structures prior to demolition based on the timing of demolition, extent of bat sign or occupied habitat, and species present (if determined). The plan may include installing exclusion measures or using light or other means to deter bats from using the buildings and structures to roost. The plan will be submitted to CDFW for review and approval.
- A preconstruction survey of the interior and exterior of the building and structures will be conducted within 24 hours of demolition to confirm that no bats are present.

Depending on the species of bats present, size of the bat roost, and timing of the demolition, the Authority will implement the following additional protective measures as applicable:

- To avoid impacts on maternity colonies and/or hibernating bats, buildings/structures where bats are confirmed to be present will not be demolished during the maternity season (generally between April 1 and September 15) or the hibernation season (generally from November 1 to March 1). Removal of occupied roosting habitat will be conducted only following the maternity season and prior to hibernation, generally between September 15 and October 31, unless exclusionary devices are first installed. Other measures, such as using lights to deter bat roosting, may be used as developed by the qualified biologist and as approved by CDFW, if applicable.

- Installation of exclusion devices will be conducted only before maternity colonies establish (generally from March 1 to March 31) or after they disperse (generally September 15 to October 31) to prevent bats from occupying a roost site during demolition to the extent feasible. Exclusionary devices will be installed by or under the supervision of a qualified biologist.

Mitigation Measure WILD-1.31: Conduct Surveys and Implement Protection Measures for Special-Status Bat Species Prior to Tree Trimming and Removal

Prior to tree trimming or removal, the Authority will employ a qualified biologist to conduct pre-construction surveys and implement protective measures for pallid bat, Townsend's big-eared bat, silver-haired bat, western red bat, hoary bat, long-eared myotis, and other tree-roosting bats. Prior to initiating tree trimming or removal, a qualified biologist will examine the trees to be removed or trimmed to identify suitable bat roosting habitat. Because of the limited timeframe for tree removal (September 15 to October 31), the tree habitat assessment should be conducted early enough to provide information to inform tree removal planning. The biologists will identify high-quality habitat features (e.g., large tree cavities, basal hollows, loose or peeling bark, larger snags), and the area around these features will be searched for bats and bat sign. If the tree can be adequately assessed and no habitat for roosting bats is present, no further actions are necessary and tree removal or trimming may commence. Because signs of bat use are not easily found, and trees cannot be completely surveyed for bat roosts, the Authority will implement the following protective measures listed below for trees containing potential roosting habitat.

- Trimming or removal of trees with potentially suitable bat roosting habitat will be avoided during the maternity season (generally between April 1 and September 15) and the hibernation season (generally from November 1 to March 1).
- Removal of trees providing bat roosting habitat will be conducted only before maternity colonies establish (generally from March 1 to March 31) or after they disperse (generally September 15 to October 31).
- If a maternity roost is found, the roost will be protected until September 15 or until the qualified biologist has determined the roost is no longer active. Appropriate no-work buffers around the roost will be established under direction of the qualified biologist. Buffer distances may vary depending on the species and activities being conducted.
- Trimming and removal of trees (between September 15 and October 31) with suitable roosting habitat will be monitored by a qualified biologist. Tree trimming and removal will be conducted using a two-phase removal process conducted over two consecutive days. In the afternoon on the first day, limbs and branches will be removed using chainsaws only. Only branches or limbs without cavities, crevices, or deep bark fissures will be removed; branches and limbs with these features will be avoided. On the second day, the entire tree will be removed. The qualified biologist

will search through downed vegetation for injured or dead bats. Observation of injured or dead special-status bats will be reported to CDFW.

Mitigation Measure WILD-1.32: Compensate for Permanent Impacts on Occupied Roosting Habitat

The Authority will compensate for the permanent loss of occupied roosting habitat by constructing and/or installing suitable replacement habitat onsite or at an offsite preservation area. The roosting habitat design will be developed in coordination with and approved by CDFW. A monitoring plan will be prepared to ensure the replacement habitat is maintained and functions as intended. Annual reports will be submitted to CDFW to document compliance with monitoring requirements.

Mitigation Measure VEG-2.2: Avoid and Compensate for Adverse Effects on Sensitive Natural Communities

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-3.2: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Wetlands

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-4.1: Avoid and Minimize Potential Adverse Effects on Oak Woodlands During Construction

This measure is described in Chapter 9, Section 9.4.

Mitigation Measure VEG-4.2: Compensate for Adverse Effects on Oak Woodlands

This measure is described in Chapter 9, Section 9.4.

NEPA Conclusion

Construction of Alternatives 1 and 3 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternatives 1 and 3 would result in a substantial adverse effect on special-status bats. With implementation of Mitigation Measures WILD-1.30, WILD-1.31, WILD-1.32, VEG-2.2, VEG-3.2, VEG-4.1, and VEG-4.2, effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and there would be no adverse effect on special-status bats.

Alternative 2

Modeled habitat for special-status bats is present at the GCID Main Canal diversion, GCID Main Canal improvements, TRR East, TRR/Funks pipelines, TRR West, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, recreation areas, Dunnigan Pipeline, TC Canal intake, and the Sacramento River discharge. Potential habitat is also present along the Sacramento River in the operations study area.

Construction

Construction of Alternative 2 would result in the permanent and temporary losses of modeled habitat for special-status bats (Table 10-2e) and potential destruction of roosts or roost abandonment, which could cause injury or mortality of individuals or non-volant pups. Impacts would be similar to those described for Alternatives 1 and 3 except that construction of South Road, TRR West, and Sacramento River discharge under Alternative 2 would result in additional loss of modeled habitat and permanent impacts on modeled habitat would be less under Alternative 2 because the inundation area would be smaller. Additional removal of habitat would also result in an increased potential for injury or mortality of individuals.

Operation

Potential effects on special-status bats from operation would be the same under Alternative 2 as described for Alternative 1 or 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in impacts similar to those for Alternatives 1 and 3 except that construction of South Road, TRR West, and the Sacramento River discharge would result in additional permanent loss of suitable habitat, and the smaller reservoir footprint would reduce the amount of permanent habitat loss under Alternative 2. A net increase in the amount of suitable habitat removed would also increase the potential for destruction of roosts or roost abandonment, which could cause injury or mortality of individuals, including non-volant pups. These impacts would be significant because Alternative 2 could reduce the local special-status bat populations through direct mortality and habitat loss. Implementation of Mitigation Measures WILD-1.30, WILD-1.31, WILD-1.32, VEG-2.2, VEG-3.2, VEG-4.1, and VEG-4.2, would reduce the level of impact to less than significant. Operation under Alternative 2 would be the same as for Alternatives 1 and 3.

NEPA Conclusion

Construction of Alternative 2 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on special-status bats. With implementation of Mitigation Measures WILD-1.30, WILD-1.31, WILD-1.32, VEG-2.2, VEG-3.2, VEG-4.1, and VEG-4.2, effects would be reduced to no adverse effect. Operation of Alternative 2 would result

in the same effects as those described above for CEQA, and there would be no adverse effect on special-status bats.

Impact WILD-1r: American Badger

Alternatives 1 and 3

Modeled habitat for American badger is present at the GCID Main Canal improvements, TRR East, TRR East/Funks pipelines, Funks Reservoir, inundation area, dams, I/O Works, new and widened roadways, recreation areas, TC Canal intake, and Dunnigan Pipeline.

Construction

Construction of Alternatives 1 and 3 would result in the permanent and temporary losses of modeled habitat for American badger (Table 10-2e). Habitat loss would result from vegetation removal, conversion to unsuitable land cover types, and reservoir inundation. Clearing and grubbing, excavation, and other construction activities could result in the destruction of dens and mortality or injury of individuals from being crushed or buried by equipment. American badger could also be struck by vehicles and equipment traveling along access roads during construction.

Construction activities, including ongoing human presence in the inundation area, and roadway use, could result in disruption of breeding or foraging activities or other movements in individuals' home ranges. Noise and vibration created during operation of vehicles, equipment, and construction crews could result also in temporary disruption of foraging or breeding behaviors or alteration of movement patterns. Rock quarries and batch plants in the inundation area and dam and dikes footprints, drill and blast activities for tunneling at the I/O Works site, and CIDH pile drilling for the bridge would result in additional temporary disturbance from noise and vibration in those areas.

Operation

Impacts from maintenance activities required for operation under Alternative 1 or 3 are expected to be minimal because maintenance activities would be conducted mostly in previously disturbed areas during daytime hours and using existing roadways. American badgers are not anticipated to den near facilities that would be maintained, as they infrequently occupy developed areas (Williams 1986:66; Lay 2008:4), and noise and other disturbances from maintenance are not anticipated to affect denning American badgers. Use of rodenticides at the facilities could cause illness or mortality of American badger because they could feed on rodents that have ingested rodenticide.

New roadways could impede movement and increase the potential for American badger to be struck by vehicles of workers traveling to operations facilities or visitors traveling to recreation areas. Fencing along roadways could cause individuals to become trapped on roadways, resulting in additional risk of vehicle strikes. The presence of Sites Reservoir would also impede movement of American badger.

The recreation areas and reservoir would be used by a visitors on a regular basis, which would result in an increased human presence and noise in these areas. Although most of the activity would be in the developed areas, there is potential for visitors to access undeveloped areas, which could increase proximity of visitors to potential dens and disturb existing habitat. In addition, increased noise and activity in developed and undeveloped areas could cause American badger to avoid foraging or denning in the recreation areas or in suitable habitat near the reservoir.

Safety nighttime lighting would be installed at the TRR East, Funks Reservoir, Sites Reservoir, bridge, dams, recreation areas, TC Canal intake, and CBD outlet. Lighting could deter American badger from denning in areas and may affect foraging movements. A BMP for permanent lighting specifies that safety lighting would be shielded to minimize offsite light spill and glare and be screened and directed away from adjacent uses to the highest degree possible. This BMP would minimize the operational impacts of new lighting on American badger.

CEQA Significance Determination and Mitigation Measures

Construction of Alternatives 1 and 3 would result in significant impacts on American badger from removal of suitable habitat and potential loss or disturbance of active dens. Operation of Alternative 1 or 3 may result in disturbance of American badger if denning at or near recreation areas, and the use of rodenticides could cause illness, injury, or morality of individuals if rodenticides are ingested. These impacts would be significant because Alternative 1 or 3 could reduce the local American badger population through direct mortality and habitat loss. American badger was once common in California, but the population was reduced by as much as 90% in the early 1900s from trapping. Although the current population numbers are not known, this species is now considered uncommon and is threatened by habitat loss and fragmentation, vehicle strikes, trapping, predation, and depredation, including ingestion of rodenticide (Quinn 2008:108–109). Implementation of Mitigation Measures WILD-1.25, WILD-1.33, and VEG-2.2 would reduce the level of impact to less than significant because surveys would be conducted to determine if suitable or occupied dens are present in or near work areas, no-disturbance buffers would be established around active den sites, and impacts on sensitive natural communities in which American badger may den or forage would be compensated for through offsite habitat restoration and preservation.

Mitigation Measure WILD-1.25: Protect Special-status Wildlife from Rodenticide Use

This measure is described above for northern harrier and burrowing owl.

Mitigation Measure WILD-1.33: Implement Protective Measures to Avoid and Minimize Potential Impacts on American Badger

Where suitable habitat is present for American badger in and within 200 feet of work areas where ground disturbance will occur, the Authority will implement the following protective measures.

- The authority will retain qualified biologists (experienced with the identification of suitable badger dens) to conduct a preconstruction survey for active badger dens prior to temporary or permanent ground disturbance. The preconstruction survey will be conducted no less than 14 days and no more than 30 days before the beginning of ground disturbance. The biologists will conduct den searches by systematically walking transects through the area to be disturbed and a 200-foot buffer area. Transect distance should be based on the height of vegetation such that 100% visual coverage of the disturbance area is achieved. If a suitable or occupied den is found during the survey, the biologist will record the den dimensions, the shape of the den entrance, presence of tracks, scat, or prey remains, den occupancy (i.e., suitable, potentially occupied, or occupied), recent excavations at the den site, and the den location.
- To the maximum extent feasible, disturbance or destruction of suitable dens for American badger in temporarily impact areas will be avoided.
- Any occupied or potentially occupied American badger den will be avoided by establishing an exclusion zone 100 feet from the den entrance. If the den cannot be avoided, the Authority will contact CDFW for direction on additional steps to be taken.
- Unoccupied suitable dens that would be destroyed by construction may be removed by hand excavation by a biologist or under the supervision of a biologist; a mini excavator may be used to facilitate excavation of dens.

Mitigation Measure VEG-2.2: Avoid and Compensate for Adverse Effects on Sensitive Natural Communities

This measure is described in Chapter 9, Section 9.4.

NEPA Conclusion

Construction of Alternatives 1 and 3 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternatives 1 and 3 would result in a substantial adverse effect on American badger. With implementation of Mitigation Measures WILD-1.25, WILD-1.33, and VEG-2.2, effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 would result in the same effects as those described above for CEQA, and there would be no adverse effect on American badger.

Alternative 2

Modeled habitat for American badger is present at the GCID Main Canal improvements, TRR, TRR/Funks pipelines, TRR West, Funks Reservoir, inundation area, I/O Works, dams, new and widened roadways, recreation areas, TC Canal intake, and Dunnigan Pipeline.

Construction

Construction of Alternative 2 would result in the permanent and temporary losses of modeled habitat for American badger (Table 10-2e) and potential destruction of dens or den abandonment, which could cause injury or mortality of individuals. Impacts under Alternative 2 would similar to those described for Alternatives 1 and 3 except that construction of the new South Road and TRR West under Alternative 2 would result in additional loss of potential habitat and permanent impacts on potential habitat would be less under Alternative 2 because the inundation area would be smaller. Additional removal of potential habitat would also result in an increased potential for destruction of dens, which could cause injury or mortality of individuals.

Operation

Potential effects on American badger from operation would be similar under Alternative 2 as described for Alternative 1 or 3. Under Alternative 2, the length of new roadway would be substantially longer (more than 10 miles) than under Alternatives 1 and 3. Because additional roadway would be constructed under Alternative 2, the greater amount of roadway would impede movement over a larger area and increase the potential for American badger to be struck by vehicles of workers traveling to operations facilities or visitors traveling to recreation areas.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in impacts similar to those for Alternatives 1 and 3 except that construction of South Road and TRR West would result in additional permanent loss of suitable habitat, and the smaller reservoir footprint would reduce the amount of permanent habitat loss under Alternative 2. A net increase in the amount of suitable habitat removed would also increase the potential for destruction of dens or den abandonment, which could cause injury or mortality of individuals. Operation impacts under Alternative 2 would be similar to those under Alternative 1 or 3 except that the increased amount of roadway would impede movement over a larger area. These impacts would be significant because Alternative 2 could reduce the local American badger population through direct mortality and habitat loss. Implementation of Mitigation Measures WILD-1.25, WILD-1.33, and VEG-2.2 would reduce the level of impact to less than significant.

NEPA Conclusion

Construction of Alternative 2 would result in the same effects as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on American badger. With implementation of Mitigation Measures WILD-1.25, WILD-1.33, and VEG-2.2, effects would be reduced to no adverse effect. Operation of Alternative 2 would result in the same effects as those described above for CEQA, and there would be no adverse effect on American badger.

Impact WILD-2: Substantial interference with the movement of a native resident or migratory wildlife species or with established native resident or migratory wildlife corridors, or impediment of the use of native wildlife nursery sites

Suitable habitat is required for wildlife species to provide food, water, cover, and other elements for survival. Depending on the species, a variety of habitats may be used throughout the life cycle, including reproduction and dispersal. Local movement, migration, and dispersal patterns vary for different species, and may be an important part of individual and species survival. In California, development, including agriculture, urbanization, and transportation, has resulted in substantial habitat reduction and fragmentation that presents barriers to local movements and migration for many wildlife species. Development has also resulted in additional risk to wildlife when moving through these areas, including risk of vehicle strikes on roadways.

CDFW and the California Department of Transportation have identified existing habitat blocks and linkages within the state, as well as missing linkages, and developed strategies for preserving and enhancing wildlife linkages through the California Essential Habitat Connectivity Project (Spencer et al. 2010). Mapped natural landscape blocks are large areas of mostly intact and well-conserved natural areas, and essential connectivity areas are connections between these blocks that have been identified as high priority for maintaining and enhancing ecological connectivity. In the Central Valley region, the essential connectivity areas often connect existing reserves across lands with more roads, agriculture, and urbanization, which can constrain wildlife movements. According to California Essential Habitat Connectivity Project mapping, there are multiple natural landscape blocks, essential connectivity areas, small natural areas, core reserves and corridors, potential riparian linkages, and missing linkages in the study area.

Much of the study area is comprised of natural and agricultural land covers, and there is very little existing urban development to block wildlife movement except for roadways and irrigation infrastructure. As discussed under Impact WILD-1, there is potential habitat for multiple special-status species, including suitable habitats for foraging, reproduction, migration, and dispersal, in the areas affected by Project components. In addition, there is potential for non-listed wildlife to be in these areas, including deer, tule elk, mountain lions (*Puma concolor*), bobcats, foxes, raccoons, skunks, squirrels, raptors, birds, reptiles, and amphibians. These species may use the area for foraging, cover, breeding, and migration.

No Project

Under the No Project Alternative, new Project facilities would not be constructed or operated and there would be no temporary or permanent impacts on wildlife movement, wildlife corridors, or use of wildlife nursery sites.

Significance Determination

The No Project Alternative would not substantially interfere with the movement of a native resident or migratory wildlife species or with established native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites. There would be no impact.

Alternatives 1 and 3

Construction

As discussed under Impact WILD-1, construction of Alternatives 1 and 3 would result in the permanent and temporary losses of modeled habitat for special-status wildlife species, including breeding, foraging, migration, and dispersal habitats. Some of this habitat loss would be within existing natural landscape blocks and essential connectivity areas identified in the California Essential Habitat Connectivity Project mapping. Construction noise and activities and nighttime lighting could result in temporary disruption of wildlife movement by creating barriers or impediments to movement. Wildlife may adjust their typical foraging, migration and/or dispersal movements to avoid construction areas. These adjustments could result in increased energy expenditure or exposure to predation.

Temporary and permanent habitat loss would reduce availability or access to breeding/nursery sites in the study area, including breeding sites for aquatic invertebrates and amphibians, upland burrow and den sites for reptiles, raptors, and mammals, nesting sites for birds and raptors, and roosting sites for mammals. Construction activities, noise, vibration, and increased human presence could also cause wildlife to avoid existing breeding/nursery sites, impeding the use of these areas.

Operation

Sites Reservoir would be a new physical barrier for wildlife movement through the study area. Because the length of the reservoir would be nearly 13 miles from north to south and up to 4 miles from west to east, wildlife moving through the area would need to travel a greater distance around the reservoir to reach the other side. The reservoir would be constructed within several existing natural landscape blocks and essential connectivity areas identified in the California Essential Habitat Connectivity Project maps. Other facilities under Alternatives 1 and 3 would also fragment existing habitat blocks and linkages used by wildlife, which could impede or prevent use of these corridors.

Maintenance activities required for operation of Alternative 1 or 3 could result in wildlife being struck by vehicles and equipment traveling along access roads during operation. The presence of new facilities, fencing, noise, and presence of humans could cause wildlife to avoid the facilities and modify their movement paths, which could result in increased energy expenditure or exposure to predation.

Recreation areas would be used by visitors on a regular basis, which would result in an increased human presence in these areas. The increased proximity of visitors to natural areas could cause wildlife to modify their movement patterns to avoid these areas. and potential for disturbance and fragmentation of remaining habitat blocks and linkages of existing habitat. In addition, increased activity could result in reduced or avoidance of these areas by wildlife for movement or breeding.

Safety nighttime lighting would be installed at the TRR East, Funks Reservoir, Sites Reservoir, bridge, dams, recreation areas, TC Canal intake, and the CBD outlet. Lighting could cause wildlife to avoid using areas illuminated by these new sources of light or modify movement pathways to avoid the lighted areas, which could result in increased energy expenditure or exposure to predation. A BMP for permanent lighting specifies that safety lighting would be shielded to minimize offsite light spill and glare and be screened and directed away from adjacent uses to the highest degree possible. This BMP would minimize potential impacts from new lighting on wildlife movement.

New roadways would create physical barriers or impediments for some wildlife, including amphibians and reptiles, which may have a difficult time crossing the roadways. There are numerous waterways and wetlands in the study area, and new or larger roadways could disrupt existing connections between aquatic and upland habitats, and result in increased habitat fragmentation, which could affect seasonal movements of amphibians and reptiles. Roadways may deter some larger animals from moving through those areas, even if they are able to physically cross the roadways. In addition, some of the roadways may be fenced, which would create a greater impediment to large animals attempting to cross the road. New roadways would also increase the potential for wildlife to be struck by vehicles of workers traveling to operations facilities or visitors traveling to recreation areas, and the presence of fences could trap animals in the roadway and make them more prone to being struck by vehicles.

Maintenance activities and human activity at recreation areas could result in disturbance of active bird nests and bat roosting sites if the activities or disturbance are conducted during a sensitive period in the nesting process (e.g., when fledglings are just learning to fly) or are close to nests or roost sites. New lighting could deter birds from nesting in areas that are illuminated by these new sources of light. The BMP described above would minimize potential impacts from new lighting on nesting sites.

CEQA Significance Determination and Mitigation Measures

Construction of Alternatives 1 and 3 would create barriers to or impede wildlife movement within existing natural landscape blocks and essential connectivity areas. Fragmentation and loss of natural landscape blocks and essential connectivity areas would result in a significant impact on wildlife movement and wildlife corridors. Construction of Alternatives 1 and 3 would also result in removal or disturbance of nursery sites. Operation of Alternative 1 or 3 would result in increased human activity at facilities and recreation areas, additional vehicles on roadways, and fencing that would create barriers to or impede wildlife movement. These impediments would also result in a significant impact on wildlife movement. Implementation of Mitigation Measures discussed in Impact WILD-1 would reduce permanent and temporary construction impacts on nursery sites but they would not mitigate impacts on wildlife movement and the loss of habitat connectivity within existing habitat blocks. Implementation of Mitigation Measures WILD-2.1 and WILD-2.2 would reduce the impact on wildlife movement under operation of Alternatives 1 and 3 but it would not mitigate the substantial barrier created by Sites Reservoir. Impacts after mitigation would remain significant and unavoidable.

Mitigation Measure WILD-2.1: Design and Construct Wildlife Crossings for New Roadways at Suitable Locations

The Authority will employ a qualified wildlife biologist with expertise in wildlife crossing use and design to conduct a wildlife connectivity and crossing assessment and to determine where suitable wildlife crossing structures would be most effective along North Road, Sites Lodoga Road, and other roads as determined by the Authority and the wildlife biologist. Wildlife crossing structures will be designed and constructed at suitable locations to provide habitat connectivity and safe movement for an array of wildlife likely to use the Project area. To ensure that the assessment is inclusive of a variety of species a wildlife crossing species guild (WCG) approach will be used as detailed in Kintsch et al. 2015. This WCG approach will include ecological and behavioral needs of a variety of species inhabiting the Project area/region. Wildlife crossing locations and design will be determined based on WCG species inhabiting the Project area/region, habitat features, topography, and the future state of the Project area through a wildlife connectivity and crossing assessment.

Prior to final roadway design for the Project, a wildlife connectivity assessment will be conducted to assess existing and expected wildlife movement and habitat connectivity conditions, Project-related impact on connectivity and species movement, and identify appropriate wildlife crossing locations and designs. The assessment will include a landscape-scale and local (Project)-scale assessments. The assessment may use database research, field surveys, photo monitoring, GIS modeling, or a combination thereof to identify existing wildlife species in the Project area, determine how connectivity and species movement may be affected by the Project, and determine the appropriate locations and designs of wildlife crossings.

Wildlife crossings will be located at appropriate frequencies to accommodate a range of species expected to move through the area. For example, for small-bodied animals like amphibians, reptiles, and small mammals, where species habitat and movement needs are present, wildlife crossings may be located no more than 1,000 feet apart or as determined appropriate for specific target species. For medium- and large-bodied animals, such as bobcats, coyotes, tule elk, and deer, wildlife crossings may be located no more than 1 mile apart.

Wildlife crossings will be located where there is suitable habitat on both sides of the roadway. If feasible and depending on the size and ecological and behavioral needs of target species, vegetative cover will be provided near entrances to give animals security and reduce negative effects such lights and noise associated with the road. Suitable habitat and/or cover will also be provided in the crossing structure wherever feasible. This may be achieved by designing culverts to be high enough to allow light for plants to grow, installing rubble piles, stumps, or branches to provide cover for smaller animals in the crossings, and leaving earthen bottoms in crossing structures.

When possible, wildlife crossings will be located away from areas used or dominated by humans, including recreation areas, trails, and lighted areas to avoid reduced wildlife crossing movement function and to prevent human-wildlife conflict.

Wildlife crossings will be designed to optimally facilitate movement for multiple WCG species. When possible, proposed culverts will be designed to function as multi-use culverts, which are designed to ensure that they facilitate wildlife movement. Multi-use culvert crossings will be designed to be optimally accessible to wildlife movement and will also be designed to require minimal maintenance.

Wildlife fencing will be installed to direct wildlife towards crossings and prevent wildlife access to roadways and other areas they must be excluded from. Escape opportunities such as jump-out ramps, may be provided as appropriate in conjunction with fencing to allow animals to escape from the roadway.

Mitigation Measure WILD-2.2: Monitor and Maintain Wildlife Crossings

Because many wildlife species will avoid or be obstructed by structures with a substantial amount of debris or blockages, the Authority will employ a qualified wildlife crossing biologist to regularly monitor crossings and culverts and clear them or oversee the clearing of debris and other blockages. Vegetative cover will be maintained near entrances to provide cover and reduce negative effects such as artificial lighting and noise associated with the road. A monitoring and maintenance plan for wildlife crossings will be developed during design wildlife crossings (Mitigation Measure WILD-2.1) to document post-construction conditions, determine the frequency of monitoring and maintenance, performance standards, and reporting requirements.

NEPA Conclusion

Construction and operation of Alternatives 1 and 3 would result in the same effects as those described above for CEQA. Implementation of Mitigation Measures discussed in Impact WILD-1 would reduce permanent and temporary construction effects on nursery sites and implementation of Mitigation Measure WILD-2.1 and WILD-2.2 would reduce the effect on wildlife movement from operation but it would not mitigate the movement barrier created by Sites Reservoir. Construction and operation of Alternative 1 or 3 would result in a substantial adverse effect on wildlife movement and nursery sites.

Alternative 2

Construction

Construction of Alternative 2 would create barriers to or impede wildlife movement within existing habitat blocks and linkages and would remove or disturb nursery sites. Construction of Alternative 2 would result in similar impacts to Alternatives 1 and 3, except that Alternative 2 would include the construction of South Road, TRR West, and the Sacramento River discharge,

which would increase the extent of construction noise and activities that could disrupt or impede wildlife movement. Wildlife may adjust their typical foraging, migration and/or dispersal movements to avoid construction areas. These adjustments could result in increased energy expenditure or exposure to predation.

Operation

Operation of Alternative 2 would result in impacts similar to those for Alternative 1 or 3, except that the reservoir would be a smaller barrier to movement (yet still a barrier) and South Road would be a potential impediment to wildlife movement over a larger area and additional wildlife trying to cross a longer segment of road could be struck by vehicles.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would create barriers to or impede wildlife movement within existing natural landscape blocks and essential connectivity areas. Under Alternative 2, the length of new roadway would be substantially longer (more than 10 miles) than under Alternatives 1 and 3. Fragmentation and loss of natural landscape blocks and essential connectivity areas would result in a significant impact on wildlife movement and wildlife corridors. Construction of Alternative 2 would also result in removal or disturbance of nursery sites. Operation of Alternative 2 would result in increased human activity at facilities and recreation areas, additional vehicles on roadways, and fencing that would create barriers to or impede wildlife movement. These impediments would also result in a significant impact on wildlife movement. Implementation of Mitigation Measures discussed in Impact WILD-1 would reduce permanent and temporary impacts on nursery sites but they would not mitigate impacts on wildlife movement and the loss of natural landscape blocks and essential connectivity areas. Implementation of Mitigation Measure WILD-2.1 and WILD-2.2 would reduce the impact on wildlife movement from Alternative 2 but it would not mitigate the substantial barrier created by Sites Reservoir. Impacts after mitigation would remain significant and unavoidable

NEPA Conclusion

Construction and operation of Alternative 2 would result in the same effects as those described above for CEQA. Implementation of Mitigation Measures discussed in Impact WILD-1 would reduce permanent and temporary effects on nursery sites and implementation of Mitigation Measure WILD-2.1 and WILD-2.2 would reduce the effect on wildlife movement but it would not mitigate the movement barrier created by Sites Reservoir. Construction and operation of Alternative 2 would result in a substantial adverse effect on wildlife movement and nursery sites.

Impact WILD-3: Conflict with any local policies or ordinances protecting wildlife resources

Local policies and ordinances protecting wildlife resources that could pertain to the Project are described in Appendix 4A, Section 4A.6.3, *Local/Regional Policies and Regulations*.

No Project

Under the No Project Alternative, new Project facilities would not be constructed or operated and there would be no temporary or permanent impacts on wildlife resources that would potentially conflict with the goals and policies of the applicable county general plans for the protection of wildlife resources.

Significance Determination

The No Project Alternative would not conflict with any local policies or ordinances protecting wildlife resources. There would be no impact.

Alternatives 1, 2, and 3

Construction

As discussed under Impacts WILD-1 and WILD-2, construction of Alternatives 1, 2 or 3 could result in impacts on wildlife resources, which are protected under the Tehama County, Glenn County, Colusa County, and/or Yolo County General Plans. In Tehama County, work at the RBPP would not result in any impacts on wildlife resources. In Glenn County, construction of the GCID Main Canal diversion and GCID Canal improvements would result in permanent and temporary impacts on special-status wildlife species and their habitats. In Colusa County, construction of the TRR East, TRR/Funks pipelines, TRR West (Alternative 2), Funks Reservoir, Sites Reservoir and related facilities, and roadways would result in permanent and temporary impacts on special-status wildlife species, their habitats, habitat linkages, and wildlife corridors. In Yolo County, construction of the Dunnigan Pipeline, TC Canal intake, CBD outlet, and the Sacramento River discharge (Alternative 2) would result in permanent and temporary impacts on special-status wildlife species and their habitats.

Operation

As discussed under Impacts WILD-1 and WILD-2, operation of Alternative 1, 2, or 3 could result in impacts on special-status wildlife species during facility maintenance. In addition, lighting would be installed at several locations that could affect foraging and breeding activities and wildlife movements. Human activity at recreation areas could result in disturbance of breeding or foraging activities and wildlife movement. The reservoir would create a physical barrier to terrestrial wildlife movement and new roadways could impede movement and result in additional vehicle strikes.

In Tehama County, operation of the RBPP would not result in any impacts on special-status wildlife species. In Glenn County, operation of the GCID Main Canal diversion and GCID Canal improvements could result in periodic impacts on special-status wildlife during maintenance activities, but these impacts would mostly be temporary and short term. In Colusa County, operation of the TRR East, TRR East/Funks pipelines, TRR West (Alternative 2), Funks Reservoir, Sites Reservoir and related facilities, and roadways would result in impacts on

special-status wildlife species, their habitats, habitat linkages, and wildlife corridors. In Yolo County, operation of the Dunnigan Pipeline, TC Canal intake, CBD outlet, and the Sacramento River discharge (Alternative 2) could cause periodic impacts related to maintenance activities but impacts from maintenance activities would mostly be temporary and short term.

The decrease in monthly average flow in the Sacramento River because of diversions would be approximately 2% under Alternative 1 or 3. The effects of the decreased flows on the geomorphic regime and geomorphic characteristics of the river are expected to be minimal. The overall volume of water and drainage pattern in the Sacramento River (and the downstream Yolo Bypass and Delta) would be similar to existing conditions. The minor changes that would result from diversions from the Sacramento River would not affect special-status wildlife and their habitats.

Stone Corral and Funks Creeks would have increased flows that would range from 0 to 100 cfs, with larger pulse flows to emulate natural flood conditions, and lower flows in the drier months (e.g., summer). These flow increases would support the existing geomorphic functions and characteristics of each channel. While increased flows from bypass releases may result in minor increases in erosion and changes in sediment deposition, the changes are expected to be minimal and there would be no impacts on special-status wildlife or habitats associated with the creeks.

CEQA Significance Determination and Mitigation Measures

Construction and operation of Alternatives 1, 2 and 3 would conflict with policies and local ordinances protecting wildlife resources and would result in a significant impact. Implementation of mitigation measures discussed under Impacts WILD-1 and WILD-2 would require habitat assessments and focused surveys for special-status wildlife, and avoidance and minimization measures to reduce impacts on special-status wildlife and their habitats during construction and operation, replace permanently lost habitat, and reduce new impediments to wildlife movement through design, construction, monitoring, and maintenance of wildlife crossings at strategic locations. With implementation of these measures, Alternatives 1, 2, and 3 would not conflict with the goals and policies in the Tehama County, Glenn County, Colusa County, and Yolo County General Plans and impacts would be reduced to a less-than-significant level.

NEPA Conclusion

Construction and operation of Alternatives 1, 2, and 3 would result in the same effects as those described above for CEQA. Alternative 1, 2, or 3 would result in a substantial adverse effect on local policies and ordinances protecting wildlife resources but through implementation of mitigation measures, effects would be reduced to no adverse effect.

Impact WILD-4: Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan

The adopted plans that pertain to the study area are Yolo County Habitat Conservation Plan/Natural Community Conservation Plan (Yolo County HCP/NCCP) (Yolo Habitat Conservancy 2018) and the Yolo Bypass Wildlife Area Land Management Plan (Yolo Bypass Wildlife Area LMP) (California Department of Fish and Game 2008). These plans are described in Appendix 4A, Section 4A.6.3, *Local/Regional Policies and Regulations*. The Project facilities in the planning areas for these plans are the Dunnigan Pipeline, TC Canal intake, and CBD outlet (Alternatives 1 and 3), and the Sacramento River discharge (Alternative 2), which are in Yolo County. The Yolo Bypass is within the operations study area.

No Project

Under the No Project Alternative, no new Project facilities would be constructed or operated and there would be no temporary or permanent impacts on wildlife resources that would potentially conflict with the provisions of an adopted or approved local, state, or regional habitat conservation plan.

Significance Determination

The No Project Alternative would not conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan. There would be no impact.

Alternatives 1, 2, and 3

Construction

As discussed under Impacts WILD-1, WILD-2, and WILD-3, construction of the Dunnigan Pipeline, CBD outlet, and the Sacramento River discharge (Alternative 2) would result in impacts on special-status species, including valley elderberry longhorn beetle, western pond turtle, giant gartersnake, Swainson's hawk, white-tailed hawk, burrowing owl, bank swallow, and tricolored blackbird and their habitats, which are covered species in the Yolo County HCP/NCCP. There would be no construction in the Yolo Bypass area.

Operation

As discussed under Impacts WILD-1, WILD-2, and WILD-3, operation of Alternatives 1, 2, and 3 could result in impacts on special-status wildlife species during facility maintenance, including maintenance of the Dunnigan Pipeline, CBD outlet, and the Sacramento River discharge. Operational impacts associated with maintenance would mostly be temporary and short term. In addition, lighting would be installed at the TC Canal intake and the CBD outlet, which could

reduce the potential for some wildlife species to use existing habitat in these areas. Lighting overspill would be minimized through BMPs.

The decrease in monthly average flow in the Sacramento River because of diversions would be approximately 2% under Alternative 1 or 3 and from less than 1% to less than 2% under Alternative 2. The effects of the decreased flows on the geomorphic regime and geomorphic characteristics of the river are expected to be minimal. The overall volume of water and drainage pattern in the Sacramento River (and the downstream Yolo Bypass and Delta) would be similar to existing conditions. The minor changes that would result from diversions from the Sacramento River would not affect the Yolo Bypass.

CEQA Significance Determination and Mitigation Measures

Construction and operation of Alternative 1, 2, or 3 would not conflict with provisions of the Yolo Bypass Wildlife Area LMP but would conflict with provisions of the Yolo County HCP/NCCP. The conflict of Alternatives 1, 2, and 3 with the provisions of the Yolo County HCP/NCCP would be a significant impact. Implementation of mitigation measures discussed under Impact WILD-1 would avoid, minimize, and compensate for impacts on special-status wildlife included in the Yolo County HCP/NCCP. With implementation of these measures, Alternatives 1, 2, and 3 would not conflict with the provisions of the Yolo County HCP/NCCP.

NEPA Conclusion

Construction and operation of Alternatives 1, 2, and 3 would result in the same effects as those described above for CEQA. Alternatives 1, 2, and 3 would result in a substantial adverse effect from conflicting with provisions of the Yolo County HCP/NCCP, but through implementation of mitigation measures, effects would be reduced to no adverse effect.

10.5 References

10.5.1. Printed References

Yellow = citation found in text, but no matching reference in this section.

Ahl, J. S. B. 1991. Factors Affecting Contributions of the Tadpole Shrimp, Lepidurus Packardi, to Its Oversummering Egg Reserves. Hydrobiologia 212:137–143.

Agronomy Research and Information Center. 2021. Wildlife & Alfalfa A Natural Partnership. Regents of the University of California, Division of Agriculture and Natural Resources. Available: http://agric.ucdavis.edu/Wildlife_and_Alfalfa/#. Accessed: February 15, 2021.

Alvarez, J. A. 2004. Rana aurora draytonii (California Red-Legged Frog) Microhabitat. Herpetological Review 32(2):162–163.

Andres, B. A., and K. L. Stone. 2009. *Conservation Plan for the Mountain Plover* (Charadrius montanus), Version 1.0. Manomet Center for Conservation Sciences. Manomet, MA.

Anthony, R. G., R. L. Knight, G. T. Allen, B. R. McClelland, and J. L. Hodges. 1982. *Habitat Use by Nesting and Roosting Bald Eagles in the Pacific Northwest*. Transactions of the North American Wildlife and Natural Resources Conference 47:332–342.

Avian Power Line Interaction Committee. 2012. Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC. Washington, D.C.

Bank Swallow Technical Advisory Committee. 2013. Bank Swallow (*Riparia riparia*) Conservation Strategy for the Sacramento River Watershed, California. Version 1.0.

Barr, C.B. 1991. The Distribution, Habitat, and Status of the Valley Elderberry Longhorn Beetle Desmocerus californicus dimorphus Fisher (Insecta: Coleoptera: Cerambycidae). U.S. Fish and Wildlife Service; Sacramento, California. 134 pp.

Bechard, M. J., C. S. Houston, J. H. Saransola, and A. S. England. 2020. Swainson's Hawk (Buteo swainsoni), version 1.0. In *Birds of the World* (A. F. Poole, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.swahaw.01

Beedy, E. C., W. J. Hamilton, III, R. J. Meese, D. A. Airola, and P. Pyle. 2020. Tricolored Blackbird (Agelaius tricolor), version 1.0. In *Birds of the World* (P. G. Rodewald, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.tribla.01

Beedy, E.C. and W.J. Hamilton III. 1997. Tricolored Blackbird Status Update and Management Guidelines. Jones & Stokes Assoc. Inc., Sacramento CA, Rep. 97-099. Prepared for U. S. Fish and Wildlife Service, Sacramento CA, and California Department of Fish and Game, Sacramento, CA.

Brode, J. M., and R. B. Bury. 1984. The Importance of Riparian Systems to Amphibians and Reptiles. Pages 30–36 in R. E. Warner and K. M. Hendrix (eds.), California Riparian Systems Ecology, Conservation, and Productive Management. Berkeley: University of California Press.

Brown and Yip 2000

Buehler, D. A. 2020. Bald Eagle (*Haliaeetus leucocephalus*), version 1.0. In *Birds of the World* (A. F. Poole and F. B. Gill, Editors). Introduction, Habitat, Diet and Foraging, and Breeding. Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.baleag.01

California Department of Fish and Game. *Staff Report Regarding Mitigation for Impacts to Swainson's Hawk* (Buteo swainsoni) *in the Central Valley of California*. Sacramento, CA. November 1.

———. 1995. *Five-Year Status Review: Bank Swallow* (Riparia riparia). Prepared for the California Fish and Game Commission. Sacramento, California.

California Department of Fish and Game 1992

California Department of Fish and Game. 1994. Staff Report Regarding Mitigation for Impacts to Swainson's Hawk (Buteo swainsoni) in the Central Valley of California. Sacramento, CA. November 1.

California Department of Fish and Game 2008

California Department of Fish and Game. 1999a. California Wildlife Habitat Relationships System. Bald Eagle Life History Account. California Interagency Wildlife Task Group. October. Available: https://www.wildlife.ca.gov/Data/CWHR/Life-History-and-Range. Accessed: February 19, 2021.

California Department of Fish and Game. 1999b. California Wildlife Habitat Relationships System. Bank Swallow Life History Account. Life history accounts for species in the California Wildlife Habitat Relationships System were originally published in: Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer, and M. White, eds. 1988-1990. *California's Wildlife. Vol. I-III.* California Department of Fish and Game, Sacramento, California. Available: https://www.wildlife.ca.gov/Data/CWHR/Life-History-and-Range. Accessed: February 18, 2021.

California Department of Fish and Game. 2012. Staff Report on Burrowing Owl Mitigation. Sacramento, CA. Prepared by the State of California Natural Resources Agency Department of Fish and Game. Sacramento, CA.

California Department of Fish and Wildlife. 2016. *5 Year Status Report for Swainson's Hawk* (Buteo Swainsoni). Sacramento, CA. Prepared for the California Fish and Game Commission. Sacramento, CA

———. 2017. Survey and Monitoring Protocols and Guidelines, Bald Eagle Breeding Survey Instructions. Available: https://wildlife.ca.gov/Conservation/Survey-Protocols#377281284-birds. Accessed: March 24, 2021.

———.2021a. California Natural Diversity Database, RareFind 5, January. Search for special-status wildlife within 5 miles of the study area. Sacramento, CA.

———. 2021b. Guide to Wildlife Habitats of California. Available: https://wildlife.ca.gov/Data/CWHR/Wildlife-Habitats. Accessed: February 15, 2021.

———. 2021c. Special Animals List. Available: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406&inline. Last updated: February 2021.

———. 2021d. California Natural Diversity Database, RareFind 5, April. Search for California red-legged frog by county. Sacramento, CA.

———. 2021e. Golden Eagles in California. Available: https://wildlife.ca.gov/Conservation/Birds/Golden-Eagles. Accessed: April 23, 2021.

———. 2021f. Bald Eagles in California. Available: https://wildlife.ca.gov/Conservation/Birds/Bald-Eagle. Accessed on April 23, 2021.

California Department of Water Resources. 2000. North of Delta Offstream Storage Investigation Progress Report, Appendix B: Wetland Delineation and Field Studies Report. Draft. Prepared for Integrated Storage Investigations, CALFED Bay-Delta Program. April 2000.

California Partners in Flight. 2002. Version 2.0. *The oak woodland bird conservation plan: a strategy for protecting and managing oak woodland habitats and associated birds in California* (S. Zack, lead author). Point Reyes Bird Observatory, Stinson Beach, CA.

Cornell Lab of Ornithology. 2019. All About Birds. Last revised: 2019. Available: https://www.allaboutbirds.org/guide/White-tailed_Kite/. Accessed: March 26, 2021.

Cornell Lab of Ornithology 2021

Dixon, K. L., R. E. Dixon, and J. E. Dixon. 1957. Natural History of the White-tailed Kite in San Diego County, California. *Condor* 59:156–165. Driscoll, D. E. 2010. *Protocol for Golden Eagle Occupancy, Reproduction, and Prey Population Assessment.* American Eagle Research Institute, Apache Jct., AZ. 55pp.

Dunk, J. R. 2020. White-tailed Kite (Elanus leucurus), version 1.0. In *Birds of the World* (A. F. Poole and F. B. Gill, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.whtkit.01 Eng, L. L., D. Belk and C. H. Eriksen. 1990. Californian Anostraca: Distribution, Habitat, and Status. *Journal of Crustacean Biology* 10:247–277.

Erichsen, A. L., S. Smallwood, N. D. Ottum, and D. M. Fry. 1994. The White-tailed Kite: GIS Analysis of Habitat Selection in the Sacramento Valley, California with Implications for Conservation of Wildlife in Agricultural Landscapes. *Journal of Raptor Research* 28:46.

Erichsen, A. L., S. K. Smallwood, A. M. Commandatore, B. W. Wilson, and M. D. Fry. 1996. White-tailed Kite Movement and Nesting Patterns in an Agricultural Landscape. Pp. 165-176 in D. M. Bird, D. E. Varland, and J. J. Negro (eds.), *Raptors in Human Landscapes: Adaptations to Built and Cultivated Environments*. Academic Press, London.

Eriksen, C. H., and D. Belk. 1999. *Fairy Shrimps of California's Puddles, Pools, and Playas*. Mad River Press. Eureka, CA.

Estep, J. A. 1989. *Biology, Movements and Habitat Relationships of the Swainson's hawk in the Central Valley of California*, 1986-87. Report for the California Department of Fish and Game, Nongame Bird and Mammal Sec. Rep.

Fellers, G. M., A. Launer, G. Rathbun, S. Bobzien, J. Alvarez, D. Sterner, R. B. Seymour, and M. Westphal. 2001. Overwintering tadpoles in the California red-legged frog (Rana aurora draytonii). Herpetological Review 32 (3):156□157.

Garcia, D. 2009. Spatial and Temporal Patterns of the Bank Swallow on the Sacramento River. A Thesis Presented to the Faculty of California State University, Chico, Chico, CA.

Garrison, B. A. 1998. Bank Swallow (Riparia riparia). In The Riparian Bird Conservation Plan: A Strategy for Reversing the Decline of Riparian-Associated Birds in California. Available: http://www.prbo.org/calpif/htmldocs/species/riparian/bank_swallow_acct2.html. Accessed: February 23, 2021.

Girvetz, E. H., and S. E. Greco. 2009. Multi-Scale Predictive Habitat Suitability Modeling Based on Hierarchically Delineated Patches: An Example for Yellow-Billed Cuckoos Nesting in Riparian Forests, California, USA. Landscape Ecology. Vol. 24. pp. 1315–1329.

Halterman, M., M. J. Johnson, J. A. Holmes, and S. A. Laymon. 2015. A Natural History Summary and Survey Protocol for the Western Distinct Population Segment of the Yellow-Billed Cuckoo: U.S. Fish and Wildlife Techniques and Methods. 45 pp.

Helm, B. 1998. Biogeography of Eight Large Branchiopods Endemic to California. Pages 124–139 in C. W. Witham, E. T. Bauder, D. Belk, W. R. Ferrin, Jr., and R. Orduff (eds.),

Ecology, Conservation, and Management of Vernal Pool Ecosystems—Proceedings from a 1996 Conference. Sacramento, CA: California Native Plant Society.

Hughes, J. M. 2015. Yellow-billed Cuckoo (Coccyzus americanus), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/418

Hunt, W. G., R. E. Jackman, T. L. Hunt, D. E. Driscoll, and L. Culp. 1999. *A Population Study of Golden Eagles in the Altamont Pass Wind Resource Area; Population Trend Analysis 1994–1997*. Predatory Bird Research Group, University of California, Santa Cruz, CA, USA.

Jackman, R. E and J. M. Jenkins. 2004. *Protocol for Evaluating Bald Eagle Habitat and Populations in California*. Prepared for Prepared for: U.S. Fish and Wildlife Service Endangered Species Division, Sacramento, CA. Garcia and Associates, San Anselmo and Pacific Gas & Electric Company, San Ramon, CA.

Jackman, R. E., W. G. Hunt, J. M. Jenkins, and P. J. Detrich. 1999. Prey of Nesting Bald Eagles in Northern California. *Journal of Raptor Research* 33:87–96.

Jennings, M. R., and M. P. Hayes. 1985. Pre-1900 overharvest of California red-legged frogs (Rana aurora draytonii): the inducement for bullfrog (Rana catesbeiana) introduction. Herpetologica 41(1): 94–103.

Jennings, M. R., and M. P. Hayes. 1994. Amphibian and Reptile Species of Special Concern in California. Rancho Cordova, CA: California Department of Fish and Game, Inland Fisheries Division.

Johnsgard, P. A. 1990. *Hawks, Eagles and Falcons of North America: Biology and Natural History*. Washington and London: Smithsonian Institution Press.

Katzner, T. E., M. N. Kochert, K. Steenhof, C. L. McIntyre, E. H. Craig, and T. A. Miller. 2020. Golden Eagle (Aquila chrysaetos), version 2.0. In *Birds of the World* (P. G. Rodewald and B. K. Keeney, Editors). Introduction, Habitat, Diet and Foraging, and Breeding. Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.goleag.02

Kintsch, J., S. Jacobson, and P. Cramer. 2015. The Wildlife Crossing Guilds Decision Framework: A Behavior-based Approach to Designing Effective Wildlife Crossing Structures. Available: https://arc-solutions.org/wp-content/uploads/2021/03/08.-ICOET-WildlifeCrossingGuilds-paper.pdf

Lay, C. 2008. *The Status of the American Badger in the San Francisco Bay Area*. MS Thesis. San Jose State University. San Jose, CA.

Laymon, S. A. 1998. Yellow-billed Cuckoo (Coccycus americanus). In *The Riparian Bird Conservation Plan: A Strategy for Reversing the Decline of Riparian-associated Birds in California*. California Partners in Flight. http://www.prbo.org/calpif/htmldocs/riparian_v-2.html.

Lehman, R. N. 1979. *A Survey of Selected Habitat Features of 95 Bald Eagle Nest Sites in California.* October. Wildlife Management Branch Administrative Report 79-1. California Department of Fish and Game.

Mendelsohn, J. M. and F. M. Jaksic. 1989. Hunting behaviour of Black-shouldered Kites in the Americas, Europe and Australia. *Ostrich* 60:1–12.

Morey, S.R. 2005. Spea hammondii. In Lannoo, M.J. (Ed.).: *Amphibian Declines: The Conservation Status of United States Species*. University of California Press, Berkeley, pp.514-517.

Quinn, J. 2008. The Ecology of the American badger *Taxidea taxus* in California: Assessing Conservation Needs on Multiple Scales. PhD Thesis. University of California at Davis. Davis, CA.

Pagel, J.E., D.M. Whittington, and G.T. Allen. 2010. *Interim Golden Eagle Inventory and Monitoring Protocols; and Other Recommendations.* Division of Migratory Bird Management, U.S. Fish and Wildlife Service, Carlsbad, CA and Arlington, VA.

Pierson, E.D., W. E. Rainey, and C. Corben. 2006. *Distribution and Status of Western Red Bats* (Lasiurus blossevillii) *in California*. Sacramento, CA. Prepared for the State of California Resources Agency, Department of Fish and Game Habitat Conservation Planning Branch. Sacramento, CA.

Riparian Habitat Joint Venture. 2004. The Riparian Bird Conservation Plan: A Strategy for Reversing the Decline of Riparian-associated Birds in California. Version 2.0. California Partners in Flight. http://www.prbo.org/calpif/pdfs/riparian_v-2.pdf.

Rogers, D.C. 2001. Revision of the Neartic Lepidurus (Notostraca). Journal of Crustacean Biology 21:1002–1005.

Rosenberg, K. V., Ohmart, R. D., and Anderson, B. W., 1982. Community Organization of Riparian Breeding Birds: Response to an Annual Resource Peak. *Auk* 99:260–274.

Shuford, W. D. and T. Gardali (eds.). 2008. *California Bird Species of Special Concern: A Ranked Assessment of Species, Subspecies, and Distinct Populations of Birds of Immediate Conservation Concern in California*. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento, California.

Spencer, W.D., P. Beier, K. Penrod, K. Winters, C. Paulman, H. Rustigian-Romsos, J. Strittholt, M. Parisi, and A. Pettler. 2010. California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California. Prepared for California Department of Transportation, California Department of Fish and Game, and Federal Highways Administration. Sacramento, CA.

Stebbins, R. C. 2003. *A Field Guide to Western Reptiles and Amphibians*. 3rd edition. Boston, MA: Houghton Mifflin Company.

Storer, T. I. 1925. A synopsis of the Amphibia of California. *University of California Publications in Zoology* 27: 1–342.

Swainson's Hawk Technical Advisory Committee. 2000. *Recommended timing and methodology for Swainson's hawk nesting surveys in California's Central Valley*. May 31.

Swolgaard, C., K. Reeves, and D. Bell. 2008. Foraging by Swainson's Hawks in a Vineyard-dominated Landscape. *Journal of Raptor Research* 42(3):188–196. http://www.bioone.org/doi/abs/10.3356/JRR-07-15.1

Talley, T. S., D. Wright D, M. Holyoak. 2006. Assistance with the 5-Year Review of the Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*). United States Fish and Wildlife Service, Sacramento, CA.

Talley, T.S., E. Fleishman, M. Holyoak, D.D. Murphy, and A. Ballard. 2007. Rethinking a rare species conservation strategy in an urban landscape: The case of the valley elderberry longhorn beetle. Biological Conservation 135:21–32.

The Xerces Society for Invertebrate Conservation. 2018. *A Petition to the Crotch Bumble Bee (*Bombus crotchii*), Franklin's Bumble Bee (*Bombus franklini*), Suckley Cuckoo Bumble Bee (*Bombus suckleyi*), and Western Bumble Bee (*Bombus occidentalis occidentalis*) as Endangered under the California Endangered Species Act*. Prepared for the California Fish and Game Commission. Sacramento, CA.

U.S. Fish and Wildlife Service. 2021. IPaC Resource List for the project area. Obtained from the Information for Planning and Consultation (IPaC) website: https://ecos.fws.gov/ipac/ Accessed: February 12, 2021.

U.S. Fish and Wildlife Service. 1999. *Draft Recovery Plan for the Giant Garter Snake* (Thamnophis gigas). Portland, OR.

———. 2002. *Recovery Plan for the California Red-Legged Frog* (Rana aurora draytonii). Portland, OR.

———. 2005a. Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon. Available: < https://www.fws.gov/sacramento/es/Recovery-Planning/Vernal-Pool/>.

———. 2005b. *Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog*. August. Sacramento, CA: Ecological Services, Sacramento Field Office.

_____. 2006a. *Valley Elderberry Longhorn Beetle* (Desmocerus californicus dimorphus*) 5-Year Review*. September.

———. 2006b. *Giant Garter Snake (*Thamnophis gigas*). 5-Year Review: Summary and Evaluation*. U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Sacramento, California. September 2006

———. 2007a. Vernal Pool Fairy Shrimp (*Branchinecta lynchi*) 5-year Review: Summary and Evaluation. U.S. Fish and Wildlife Service Sacramento Fish and Wildlife Office Sacramento, California. September. Available: <https://www.fws.gov/cno/es/images/graphics/vpfs_5-yr%20review%20cno%20final%2027sept07.pdf >.

———. 2007b. Vernal Pool Tadpole Shrimp (*Lepidurus packardi*) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service Sacramento Fish and Wildlife Office Sacramento, California. September. Available: < https://www.fws.gov/cno/es/images/Graphics/VP%20Tadpole%20Shrimp_5%20yr%20review%20FINAL%20CNO%2027Sept07.pdf >.

———. 2012. Conservancy Fairy Shrimp (Branchinecta conservatio) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service Sacramento Fish and Wildlife Office Sacramento, California. June. Available: https://ecos.fws.gov/docs/five_year_review/doc4012.pdf.

———. 2015a. *Revised Draft Recovery Plan for Giant Garter Snake* (Thamnophis gigas). U.S. Fish and Wildlife Service, Pacific Southwest Region, Region 8. Sacramento, CA.

———. 2015b. *Survey Guidelines for the Listed Large Branchiopods.* May 31. U.S. Fish and Wildlife Service, Pacific Southwest Region, Region 8. Sacramento, CA.

———.2017a. Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle (Desmocerus californicus dimorphus). U.S. Fish and Wildlife Service; Sacramento, California. 28 pp. May 2017. https://www.fws.gov/sacramento/documents/VELB_Framework.pdf

———. 2017b. *Recovery Plan for the Giant Garter Snake* (Thamnophis gigas). U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California. vii + 71 pp

———. 2019. Species Assessment and Listing Priority Assignment Form for Yellow-billed Cuckoo (Coccyzus americanus). September 10, 2019.

———. 2019. *Species Status Assessment for the Tricolored Blackbird (Agelaius tricolor)*. Version 1.1. Sacramento, CA. Prepared by U.S. Fish and Wildlife Service Sacramento Field Office, Sacramento, CA.

———. 2020. Updated Eagle Nest Survey Guidance. Available: https://www.fws.gov/migratorybirds/pdf/management/EagleNestSurveyGuidanceUpdated.pdf. Accessed: March 24, 2021.

U. S. Geological Survey. N.D. Bat Research in California. Available: https://www.usgs.gov/centers/werc/science/bat-research-california?qt-science_center_objects=0#qt-science_center_objects. Accessed: April 1, 2021.

Williams, D. F. 1986. *Mammalian Species of Concern in California*. California Department of Fish and Game Report 86-1. California Department of Fish and Game, Sacramento, CA. 112 pages.

Yarnal, C. 2019. *Best Management Practices for the Conservation of Western Pond Turtle Populations in California*. Master Thesis. University of San Francisco. San Francisco, CA.

Yolo Habitat Conservancy. 2018. Yolo Habitat Conservation Plan/Natural Community Conservation Plan. Final. April 2018. Available: https://www.yolohabitatconservancy.org/documents. Accessed: February 5, 2021.

Zeiner, D. C., W. F. Laudenslayer, Jr., and K. E. Mayer (eds.). 1988. *California's Wildlife. Volume I: Amphibians and Reptiles*. California Statewide Wildlife Habitat Relationships System. Sacramento, CA: California Department of Fish and Game.

Zeiner, D. C., W. F. Laudenslayer, Jr., and K. E. Mayer (eds.). 1990a. *California's Wildlife. Volume II: Birds*. California Statewide Wildlife Habitat Relationships System. Sacramento, CA: California Department of Fish and Game.

Zeiner, D. C., W. F. Laudenslayer, Jr., and K. E. Mayer (eds.). 1990b. *California's Wildlife. Volume III: Mammals*. California Statewide Wildlife Habitat Relationships System. Sacramento, CA: California Department of Fish and Game.

Appendix 9B

Vegetation and Wetland Methods and Information

This document has not yet been reviewed by the Authority or Reclamation and does not represent the agencies input, positions, or policies. All content is subject to change.

Appendix 9B. Vegetation and Wetland Methods and Information

This appendix includes details of the land cover types in the study area, as defined in Appendix 9A, *Special-Status Plant Species,* including natural communities, wetlands, non-wetland waters, and unvegetated land cover types. Sources and methods used for preparing this information are also included. This appendix also includes a list of invasive plant species that are known to occur or are potentially present in the study area.

9B.1 Natural Communities and Other Land Cover Types

A total of 28 land cover types were mapped in the study area, as listed in Table 9B-1, which provides acreage estimates for each type (Figure 9B-1). Land cover in the study area is predominantly natural communities, and the most extensive natural community is annual grassland, with areas of savanna and blue oak woodlands becoming abundant to the west as elevations rise. Riparian vegetation and wetlands are present along parts of the major creeks including Antelope Creek, Funks Creek, Grapevine Creek, and Stone Corral Creek. Open water features in the study area include ephemeral, intermittent, and perennial streams; Funks Reservoir; GCID Main Canal; TC Canal; Salt Pond; unnamed canals and ditches; and ponds. Seasonal wetlands are located in annual grassland and in topographic lows where clay soils are present. To the east, agricultural areas containing rice and orchards are the most abundant land cover type.

9B.1.1. Sources of Information

The following sources were researched and used in preparation of the information presented in this appendix.

- 2017 Public Draft Environmental Impact Report/Environmental Impact Statement for the Sites Reservoir Project (2017 Draft EIR/EIS) (Sites Project Authority and U.S. Bureau of Reclamation 2017)
- Environmental Systems Research Institute (ESRI) World Imagery (Environmental Systems Research Institute 2019)
- California Natural Diversity Database (CNDDB) (California Department of Fish and Wildlife 2021a)
- California Native Plant Society, Rare Plant Program (California Native Plant Society 2020)
- Climate and precipitation data (Natural Resources Conservation Service 2020a, 2020b)
- Google Earth Pro aerial imagery from 1998–2018 (Google Earth 2021) and Street View images

- National Hydrography Dataset (U.S. Geological Survey 2016)
- National Wetlands Inventory Map (U.S. Fish and Wildlife Service 2020)
- North-of-Delta Offstream Storage Investigation Progress Report, Botanical Report (California Department of Water Resources 2000a)
- North-of-Delta Offstream Storage Investigation Progress Report, Appendix B: Wetland Delineation and Field Studies Report (California Department of Water Resources 2000b)
- Soil Survey Geographic Database mapping and soil map unit descriptions for Glenn and Colusa Counties (Natural Resources Conservation Service 2020c, 2020d)
- U.S. Geological Survey 7.5-minute topographic quadrangles that occur in the study area (U.S. Geological Survey 2020)
- Vernal Pool Distribution – California's Great Valley Dataset (Witham et al. 2014)

9B.1.2. Botanical Survey and Land Cover Mapping Methods

Botanical surveys were conducted in parts of the study area in 1998–1999 (California Department of Water Resources 2000a) and 2002–2003 (Sites Project Authority and U.S. Bureau of Reclamation 2017). Mapping of vegetation communities and other land cover types for the 2000–2001 surveys included the reservoir inundation area, survey corridors 500 feet wide for road relocation routes and 1,000 feet wide or more for conveyance route areas. For the 2002–2003 surveys, corridors were 1,500 feet wide for all features. These botanical surveys were conducted according to guidelines and protocols available at the time of the surveys from California Department of Fish and Game (Sites Project Authority and U.S. Bureau of Reclamation 2017).

ICF botanists/wetland specialists experienced in interpreting aerial imagery signatures of land cover and vegetation communities conducted the mapping of the study area evaluated in the RDEIR/SDEIS. The mapping entailed interpretation of high-resolution aerial imagery and review of other data sources, as listed above. The aerial images reviewed covered a range of dates (approximately 1998–2020), but use of recent imagery was emphasized, which allowed for interpretation of typical site conditions. Soil survey maps and supporting information were used to identify the soils' geomorphic setting, hydric status, and drainage characteristics.

All land cover types are described using California Wildlife Habitat Relationships (WHR) systems (California Department of Fish and Wildlife 2021b). The land cover type naming conventions previously developed for the 2017 Draft EIR/EIS were modified slightly for the RDEIR/SDEIS (Sites Project Authority and U.S. Bureau of Reclamation 2017).

Using ESRI ArcGIS 10.7 software, botanists/wetland specialists interpreted the most recent ortho-rectified imagery available (Environmental Systems Research Institute 2019), Google Earth aerial imagery from 1998 to 2020 (Google Earth 2021), and soil survey data to generate detailed land cover and preliminary wetland and non-wetland water mapping (Natural Resources Conservation Service 2020a). In general, a mapping scale of 1 inch = 100 feet (1:1,200) and an

approximate minimum mapping unit of 0.10 acre was used for aquatic resource features; refined mapping was achieved where detailed and discernable imagery was available.

9B.1.3. Land Cover Types Mapped in the Study Area

A total of 28 land cover types were mapped in the study area: 17 upland plant communities or land cover types and 11 wetland or non-wetland water types. Table 9B-1 below lists the acreages for all of these land cover types. Descriptions of the upland land cover types are provided in the following sections, and descriptions of the wetland/non-wetland water land cover types are presented in Section 9B.2.

Table 9B-1. Land Cover Types Mapped in the Study Area

Land Cover Type	Area (acres)
Annual Grassland	18,240.2
Barren	0.2
Blue Oak Woodland	1,046.0
Canal[a]	109.8
Chamise Chaparral	381.0
Developed	303.1
Disturbed	356.9
Ditch[a]	32.8
Ephemeral Stream[a]	38.3
Foothill Pine[b]	221.0
Forested Wetland[a]	14.1
Freshwater Marsh[a]	62.2
Hayfield	891.1
Intermittent Stream[a]	252.9
Managed Wetland[a]	48.2
Mixed Chaparral	44.7
Oak Savanna	1,543.3
Orchard	553.2
Ornamental Woodland	38.8
Perennial Stream[a]	44.1
Pond[a]	70.2
Reservoir[a]	223.4
Rice	1,256.7
Row Crops	192.0
Ruderal	233.6
Scrub-Shrub Wetland[a]	19.8
Seasonal Wetland[a]	509.3
Upland Riparian	157.3
Vineyard	3.1
Total[c]	**26,877.3**

[a] Wetland and non-wetland water types.

[b] Foothill pine occurs only in the Alternative 2 study area. All other types occur in all alternative study areas.

[c] Acreage totals may differ slightly due to rounding

9B.1.3.1. Upland Land Cover Types

Annual Grassland

The annual grassland community is the dominant land cover type in the study area. It is typically dominated by introduced (nonnative) annual grass species, such as bromes (*Bromus* spp.), wild oats (*Avena* spp.), barleys (*Hordeum* spp.), and ryegrasses (*Festuca* spp.), with a small proportion (less than 15% relative cover) of native perennial species. This vegetation community also supports areas of native herbaceous spring annuals, and native perennial bunchgrasses, such as hook three awn (*Aristida ternipes* ssp. *hamulosa*) or needlegrasses (*Stipa* spp.). Trees comprise less than 10% total cover, with occasional small groupings or individuals of valley oaks (*Quercus lobata*) or blue oaks (*Quercus douglasii*). Areas dominated by noxious weeds, such as yellow star thistle (*Centaurea solstitialis*), are common. The annual grassland vegetation community dominates valley bottomlands and rolling hills immediately adjacent to the valleys. It can make a slow transition into adjacent wooded areas by forming a mosaic, occurring as understory in oak savanna, or can transition abruptly to woodland. Seasonal wetlands and swales occurring over clay hardpans, or vernally moist saline or alkaline soils in annual grasslands on the valley floor, may support native floras that sometimes include special-status plant species (Sites Project Authority and U.S. Bureau of Reclamation 2017).

Annual grassland best fits with the description for the Annual Grassland (AGS) WHR habitat type (California Department of Fish and Wildlife 2021b).

Barren

The barren land cover type is characterized by an area where vegetation cannot grow. Barren was mapped in one location in the study area in a landslide on a hillslope where vegetation was not present. This area was associated with sharp changes in topography.

Barren best fits with the description for the Barren (BAR) WHR habitat type (California Department of Fish and Wildlife 2021b).

Blue Oak Woodland

The blue oak woodland vegetation community, dominated by blue oak, is the most common vegetation in the low foothills of the western portion of the study area. These woodlands vary from open grassy stands of blue oaks on south facing slopes and ridge tops to moderately to very dense stands of small blue oak trees mixed with interior live oak (*Quercus wislizeni*) on north facing slopes. In the low foothills, the woodlands can also include some chaparral species and/or an open overstory of sparsely scattered foothill pines (*Pinus sabiniana*). Special-status plant species are sometimes found in clay or crumbly shale soils where grasslands transition into woodlands, or where chaparral shrubs are present as a woodland understory. Weedy areas often contain localized infestations of Italian thistle (*Carduus pycnocephalus*) (Sites Project Authority and U.S. Bureau of Reclamation 2017).

Blue oak woodland best fits with the description for the Blue Oak Woodland (BOW) WHR habitat type (California Department of Fish and Wildlife 2021b).

Chamise Chaparral

The chamise chaparral community is uncommon in the study area and is concentrated along the South Road in the western portion where it is the dominant vegetation. This shrub community is dominated by chamise (*Adenostoma fasciculatum*) and in the study area, it appears to form a monotypic stand from aerial imagery views (Google Earth 2021). Oaks or foothill pines may be present in a sparse to open overstory, while the chamise usually forms a continuous canopy in a nearly pure stand (Sites Project Authority and U.S. Bureau of Reclamation 2017). The chamise may also mix with other native shrubs such as poison oak (*Toxicodendron diversilobum*) and manzanitas (*Arctostaphylos* spp.), and the herbaceous layer of this community is sparse and confined to patch margins (Sites Project Authority and U.S. Bureau of Reclamation 2017). The chamise chaparral occurs on hilltops and steep slopes at elevations from 1,400–1,800 feet.

Chamise chaparral best fits with the description for the Chamise-Redshank Chaparral (CRC) WHR habitat type (California Department of Fish and Wildlife 2021b).

Developed and Disturbed

Most of the study area is undeveloped and vegetated; however, there are some areas that are developed or disturbed. Developed areas are generally paved or covered with an impermeable substrate (i.e., asphalt, concrete). Paved roads make up a substantial portion of the developed land cover type in the study area. The main paved roads include Huffmaster Road, Sites Lodoga Road, Maxwell Sites Road, Road 69, and Road 68, which are all two-lane roads.

Disturbed areas are regularly compacted but still have a permeable surface. Smaller agricultural roads are present to the east and are mapped as developed when paved and as disturbed when unpaved. Other areas mapped as developed or disturbed include homesteads with associated outbuildings, canal banks, and buildings and structures associated with existing Project facilities.

Developed and disturbed land cover types best fit with the descriptions for the Urban (URB) or Barren (BAR) WHR habitat types (California Department of Fish and Wildlife 2021b).

Foothill Pine

Foothill pine occurs only in the western part of the study area along the South Road alignment. The overstory of this community is predominantly foothill pine, also known as gray pine. Understory layers appear to include mixed chaparral species (described below), and annual grassland. Blue oak is usually a co-dominant species with foothill pine, and occurs occasionally in the overstory, but is mostly absent from the woodlands mapped as foothill pine in the study area. Stands of foothill pine that were associated with intermittent streams (within 50 feet of the stream edge) were mapped as upland riparian, because these areas of woodland functioned as riparian habitat with respect to stream qualities and wildlife habitat. There are two areas on the north side of the South Road alignment that may qualify as a foothill pine-herbaceous community, which is a provisional sensitive natural community (California Department of Fish and Wildlife 2020).

Foothill pine best fits with the description for the Blue Oak-Foothill Pine (BOP) WHR habitat type (California Department of Fish and Wildlife 2021b).

Hayfield

The largest areas of hayfields in the study area are located on the Antelope Valley floor. Other smaller hayfields are located to the east in the Central Valley. The hayfields in the Antelope Valley are irrigated by a stream diversion system and they occur on poorly drained soil. In the absence of active cultivation, the hayfields would most likely revert to a seasonal wetland-ruderal complex. Alfalfa fields are included with this land cover type.

Hayfield best fits with the descriptions for the Irrigated Hayfield (IRH) or Dryland Grain & Seed Crops WHR habitat types (California Department of Fish and Wildlife 2021b).

Mixed Chaparral

No single shrub species dominates this mixed-shrub community, although manzanita can make up a substantial part of the species mix, along with wedgeleaf ceanothus (*Ceanothus cuneatus*), scrub oak (*Quercus berberidifolia*), poison oak, chamise, mountain mahogany (*Cercocarpus betuloides*), toyon (*Heteromeles arbutifolia*), and California juniper (*Juniperus californica*) (Sites Project Authority and U.S. Bureau of Reclamation 2017). Blue oaks and/or foothill pines can form a sparse to open canopy above a dense understory of mixed chaparral. Mixed chaparral is generally found in the western and southern portions of the study area at elevations ranging from 800–1,800 feet.

Mixed chaparral best fits with the description for the Mixed Chaparral (MCH) WHR habitat type (California Department of Fish and Wildlife 2021b).

Oak Savanna

Oak savanna in the study area is dominated by valley oak and blue oak and is characterized by large open canopies and a grassland understory. This land cover type can be found on gently sloping hills and occasionally on terraces and valley floors. Some of the oak savanna appears to be very disturbed by livestock and ranching activities that cause compacted soil and invasive weeds to populate. Weedy areas in oak savanna include localized patches of milk thistle (*Silybum marianum*), bull thistle (*Cirsium vulgare*), Italian thistle, or star thistles (*Centaurea* spp.) (Sites Project Authority and U.S. Bureau of Reclamation 2017). Oak savanna also includes small areas with only a single or a few trees.

Oak savanna best fits with the descriptions for the Valley Oak Woodland (VOW) or Blue Oak Woodland (BOW) WHR habitat types (California Department of Fish and Wildlife 2021b).

Orchard

Orchards in the study area are located east of Funks Reservoir on the Central Valley floor. Several of the orchards appear to have been planted in the past few years. The orchards are deciduous and appear to be almonds grown on a variety of clayey to loose alluvium derived soils.

Orchard best fits with the descriptions for the Deciduous Orchard (DOR) or Orchard-Vineyard WHR habitat types (California Department of Fish and Wildlife 2021b).

Ornamental Woodland

Ornamental woodlands in the study area are stands of nonnative trees that have been planted around buildings or agricultural lands. The largest area of ornamental woodland is in the portion of the study area that intersects with the city limits of Willows. Many of the trees in ornamental woodlands appear to be eucalyptus (*Eucalyptus* spp.).

Ornamental woodland best fits with the descriptions for the Eucalyptus (EUC) or Urban (URB) WHR habitat types (California Department of Fish and Wildlife 2021b).

Rice

Rice is the most dominant agricultural type in the easternmost portion of the study area. Rice is grown on flat terrain that has been leveled and contoured to accommodate flooding. Much of the rice grown in the region has been in production for over 20 years.

Rice best fits with the description for the Rice (RIC) WHR habitat type (California Department of Fish and Wildlife 2021b).

Row Crops

Row crops in the study area are present throughout the developed areas at lower elevations. Row crops are typically in rotation with other crops or fallow for part of the year and all appear to be irrigated.

Row crop best fits with the descriptions for the Irrigated Row and Field Crops (IRF) or Cropland WHR habitat types (California Department of Fish and Wildlife 2021b).

Ruderal

Ruderal refers to weedy or disturbed conditions including areas surrounding residences, out-buildings, and stockyards. These areas may also include nonnative, ornamental varieties of plants.

Ruderal best fits with the description for the Annual Grassland (AGS) WHR habitat type (California Department of Fish and Wildlife 2021b).

Upland Riparian

Upland riparian was mapped in the study area where the riparian trees appeared to be rooted above the ordinary high-water mark (OHWM) of streams, in contrast to the forested wetland type, which was mapped below the OHWM. Areas mapped as upland riparian comprise several different types of riparian communities, including valley foothill riparian (where no single species is dominant), Fremont cottonwood riparian, valley oak riparian, and willow riparian (Sites Project Authority and U.S. Bureau of Reclamation 2017). These riparian types can also support other native riparian tree, shrub, and vine species, such as naturalized black walnut (*Juglans hindsii*), mule fat (*Baccharis salicifolia*), and wild grape (*Vitis californica*). On the basis of available data and information, these communities were combined as upland riparian. Areas of primarily foothill pine and blue oak woodland were included as upland riparian where the trees in these woodlands occur within 50 feet of a perennial or intermittent stream.

Riparian vegetation in the study area is associated with intermittent and perennial stream corridors and floodplain terraces, although most of the riparian areas are narrow and degraded by cattle use. Many of the larger trees along the disturbed segments of creeks are nonnative, including walnut (*Juglans* spp.), fig (*Ficus carica*), and tree-of-heaven (*Ailanthus altissima*). Small stands of Fremont's cottonwood (*Populus fremontii*), valley oak, and willows (*Salix* spp.) occur as isolated patches throughout the study area (California Department of Water Resources 2000b). Elderberry shrubs (*Sambucus* spp.) also occur in stands that were not mapped as distinct vegetation communities (California Department of Water Resources 2000a). Well-developed, native riparian vegetation occurs in small remnant patches along foothill portions of the larger creeks in the study area. The largest concentration of riparian habitat is in the southern portion of the inundation area along Antelope Creek. Large stands of upland riparian also occur at the outlet of Funks Reservoir on Funks Creek and along the Sacramento River at the end of the Dunnigan Pipeline alignment.

Upland riparian best fits with the description for the Valley-Foothill Riparian (VFR) WHR habitat type (California Department of Fish and Wildlife 2021b).

Vineyard

Small portions of two individual vineyards are present in the study area. They are located to the north on the outer edges of the city of Willows, and to the south along the Dunnigan Pipeline alignment.

Vineyard best fits with the descriptions for the Vineyard (VIN) or Orchard-Vineyard WHR habitat types (California Department of Fish and Wildlife 2021b).

9B.1.4. Sensitive Natural Communities

Sensitive natural communities and natural communities of special concern are habitats considered sensitive because of their high species diversity, high productivity, unusual nature, limited distribution, or declining status. Local, state, and federal agencies consider these habitats important, and compensation for loss of sensitive natural communities is generally required by agencies. The CNDDB contains a list of rare natural communities throughout the state (California Department of Fish and Wildlife 2020). USFWS considers certain habitats, such as riparian communities, important to wildlife. The U.S. Army Corps of Engineers (USACE), U.S. Environmental Protection Agency (USEPA), and State Water Resources Control Board (State Water Board) regulate wetlands and non-wetland waters; therefore, these communities and land cover types are considered sensitive.

The designation of sensitive natural communities in CNDDB is based on the vegetation classification system in *A Manual of California Vegetation* (California manual) (California Native Plant Society 2021; California Native Plant Society 2020). The California manual classifies vegetation by Alliances, which are based on the dominant plant species present in a distinctive assemblage of plants (a plant community). The current land cover mapping was performed using aerial imagery interpretation, with consideration of the earlier field work conducted and discussed in previous reports (California Department of Water Resources 2000; Sites Project Authority and U.S. Bureau of Reclamation 2017). Field verification of current conditions in previously surveyed areas and unsurveyed parts of the study area would be required to confirm the existing natural communities and species compositions, which would allow

further identification of the correct alliances, and/or the more specific associations within alliances, as defined in the California manual. Table 9B-2 below provides a crosswalk between the mapped cover types and potential sensitive community types that could be associated with them. Natural communities with state and/or federal ranks of 1–3 are considered sensitive by California Department of Fish and Wildlife, and Table 9B-2 includes the rarity ranks of the sensitive community types with potential to occur in the study area. Table 9B-2 is not an exhaustive list of potential sensitive community types but includes the ones most likely to occur in the Project region.

Table 9B-2. Crosswalk of Land Cover Types and Potential Sensitive Natural Communities in the Study Area

Land Cover Type	Potential Sensitive Natural Communities[a]	Rarity Rank[b]
Annual grassland	California brome – blue wildrye prairie	G3 S3
	Gum plant patches	
	Needlegrass – melic grass	G2, G3 S2, S3
	grassland	G3 S3
	White-tip clover swales	G3? S3?
Foothill Pine	Foothill pine/herbaceous Association	Provisional Alliance
Forested Wetland	Fremont cottonwood forest and woodland	G4 S3
	Valley oak woodland and forest	G3 S3
	Goodding's willow – red willow riparian woodland and forest	G4 S3
Freshwater Marsh	Common spikerush and beaked spikerush marshes	GNR S2,S3
	Iris-leaf rush seeps	G2? S2?
	American bulrush marsh	G5 S3
Managed Wetland	Common spikerush and beaked spikerush marshes	GNR S2,S3
	Iris-leaf rush seeps	G2? S2?
	American bulrush marsh	G5 S3
Oak Savanna	Valley Oak Woodland and Forest	G3, S3
Scrub-Shrub Wetland	Button willow thickets	G5 S2
	Iris-leaf rush seeps	G2? S2?

Land Cover Type	Potential Sensitive Natural Communities[a]	Rarity Rank[b]
Seasonal Wetland	Alkali weed – salt grass playas and sinks	G2 S2
	Common spikerush and beaked spikerush marshes	GNR S2,S3
	Alkali heath marsh	G4 S3
	Iris-leaf rush seeps	G2? S2?
	Fremont's goldfields – salt grass alkaline vernal pools	G2 S2
	Fremont's goldfields – Downingia vernal pools	G2 S2
	Smooth goldfields vernal pool bottoms	G2 S2
	Fremont's tidy-tips – blow wives vernal pools	G3 S3
	White-tip clover swales	G3? S3?
Upland Riparian	Fremont cottonwood forest and woodland	G4 S3
	Goodding's willow – red willow riparian woodland and forest	G4 S3
	California rose briar patches	G3 S3

[a] California Department of Fish and Wildlife 2020

[b] Rarity Ranks (G = full natural ranges within and outside California; S = within California)
G2: Imperiled – At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3: Vulnerable – At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
G4: Apparently Secure – Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5: Secure – Common; widespread and abundant.
GNR: not rated
S2: Imperiled – Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state.
S3: Vulnerable – vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
Provisional: types for which there are fewer than 10 stands sampled, but which are expected to prove to be more widespread.
? - inexact numeric rank because of insufficient samples over the full expected range of the type, but existing information points to this rank.

9B.2 Wetlands and Non-Wetland Waters

The wetlands and non-wetland waters in the study area that are described in this section are features potentially subject to federal and state regulations. These features were identified and mapped using the sources of information and methods discussed below, and their preliminary

acreages are presented in Section 9B.2.3.The Cowardin classification (Cowardin et al. 1979) is provided for wetland and non-wetland water land cover types.

9B.2.1. Sources of Information

Mapping of wetlands and non-wetland waters in parts of the study area was prepared for an earlier project (North-of-Delta Offstream Storage Investigation [NODOS]). Wetlands and non-wetland waters were evaluated in the inundation area in 1998 and 1999 (California Department of Water Resources 2000b) and in Project facility locations such as the recreation areas, road relocations, and Funks Reservoir in 2001 and 2002 (Sites Project Authority and U.S. Bureau of Reclamation 2017). The results of these mapping efforts and the resources listed in Section 9B.1 were reviewed as part of the delineation mapping process to obtain information on wetlands and non-wetland water features in the study area.

9B.2.2. Methods

All mapping of the delineation of aquatic resources was conducted through the interpretation of high-resolution aerial imagery and other data sources (i.e., desktop delineation). Additional refining of the mapping may be developed in coordination with agencies during the permitting process. The aquatic resources map and delineation report information would be submitted as part of the applications to the USACE and State Water Board for Project permits.

9B.2.2.1. Wetland Delineation Methods

As part of the land cover mapping, ICF botanists/wetland specialists performed a desktop delineation of wetlands using the information and data sources listed in Section 9B.1. In particular, the Google Earth aerial images were inspected for signatures that could be indicative of soil saturation, flooding or ponding, or relative wetness and shifts in vegetation type and cover. Where available, the Street View images of areas having the above characteristics were viewed to identify microtopographic and vegetative characteristics of a given area. Soil survey data was reviewed to identify locations of soil map units that contain a subsurface restrictive layer, are subject to frequent, prolonged flooding or ponding, or have a shallow, seasonal high-water table. Wetlands that occur entirely within natural watercourse features and that support persistent hydrophytic vegetation with a cover of 30% or more were mapped within the OHWM.

9B.2.2.2. Non-Wetland Water Delineation Methods

ICF botanists/wetland specialists performed a desktop delineation of non-wetland waters by using the information and data sources in Section 9B.1. In particular, the Google Earth aerial images were used to identify where water lines or flow patterns end and vegetation begins. Channel incision and abrupt breaks in slope (sometimes indicated by shadows and seen in the elevation profile of a channel in Google Earth) were also used as a basis for identifying the OHWM. Where available, Google Earth Street View images were used to help determine the OHWM line on banks, as viewed from bridges. Culverts hydrologically connecting non-wetland waters were mapped where visible from aerial or street-view images. However, non-wetland waters were mapped as continuous features where the water feature flows under bridges. Non-wetland waters that have a consistent width were mapped as line features and attributed with their average width. Non-wetland waters wider than 40 feet, or those with an irregular boundary,

were mapped as polygons. Upland riparian and forested wetland boundaries along non-wetland waters were mapped to the landward drip line of the tree canopy.

9B.2.3. Wetlands and Non-Wetland Waters Mapped in the Study Area

The five wetland types (forested wetland, freshwater marsh, managed wetland, scrub-shrub wetland, and seasonal wetland) and six non-wetland waters types (canal/ditch, pond, reservoir, ephemeral stream, intermittent stream, and perennial stream) identified in the study area are described below. The acreages for each of these types, presented in Tables 9B-3 and 9B-4, are preliminary and may be overestimates, particularly for seasonal wetlands, as the delineation of wetlands and non-wetland waters has not been reviewed with field surveys or subjected to jurisdictional review by the applicable federal and state regulatory agencies. These acreages will likely be adjusted in the future when the study area can be accessed and when the permitting process is underway.

Table 9B-3. Wetlands Mapped in the Study Area

Wetland Type	Acreage
Forested wetland	14.13
Freshwater marsh	62.20
Managed wetland	48.16
Scrub-shrub wetland	19.79
Seasonal wetland	509.24
Total Wetlands	**653.52**

Table 9B-4. Non-Wetland Waters Mapped in the Study Area

Non-Wetland Water Type	Acreage
Canal	109.8
Ditch	32.8
Pond	70.15
Reservoir	223.37
Ephemeral stream	39.95
Intermittent stream	193.58
Perennial stream (Riverine)	100.38
Total Non-Wetland Waters	**769.92**

9B.2.3.1. Wetland Types

Forested Wetland

Forested wetlands are vegetation communities of trees that grow below the typical flood level of a stream (the OHWM), which would provide the community with wetland hydrology. Forested wetlands were mapped within one segment of Willow Creek (northeast of Willows) and segments of Antelope Creek, Stone Corral Creek, Grapevine Creek, Funks Creek, unnamed

intermittent streams that are tributary to these creeks, as well as at the edge of a pond southwest of Funks Reservoir. Tree species in forested wetlands may include riparian trees, such as Fremont's cottonwood and species of willows (*Salix* spp.), associated with herbaceous species, such as cattails (*Typha* spp.), bulrushes (*Schoenoplectus* spp.), sedges (*Carex* spp.), rushes (*Juncus* spp.), and other marsh and herbaceous wetland species. Areas in streams that appeared to support low-growing and shrubby vegetation were mapped as scrub-shrub wetlands (described below). Forested wetlands are assumed to have hydric soil due to their location within watercourses.

Forested wetland best fits with the description for the Valley Foothill Riparian (VFR) WHR habitat type (California Department of Fish and Wildlife 2021b) and the Forested, Lotic, Riparian Cowardin types (Cowardin et al. 1979).

Freshwater Marsh

Freshwater marsh occurs at the saturated edges of riparian vegetation, ponds (including Salt Pond), seasonal wetlands, Funks Reservoir, Stone Corral Creek, the GCID Main Canal near the Sacramento River at the Red Bluff Pumping Plant, and unnamed intermittent streams. Freshwater marsh can also occur within unmaintained irrigation ditches and agricultural field edges; however, most of these areas are regularly maintained and marsh was, therefore, not mapped in most ditches. Freshwater marsh in the study area supports emergent wetland species, such as hard-stemmed tule (*Schoenoplectus acutus*), California bulrush (*S. californicus*) and narrowleaf cattail (*Typha angustifolia*) (California Department of Water Resources 2000b), sedges (*Carex* spp.), spikerushes (*Eleocharis* spp.), and patchy willow shrubs (*Salix* spp.), which are wetland species (Sites Project Authority and U.S. Bureau of Reclamation 2017). Wetland hydrology and hydric (wetland) soils are present in these freshwater marshes because of the proximity to a perennial to semi-perennial watercourse.

Freshwater marsh best fits with the description for the Fresh Emergent Wetland (FEW) WHR habitat type (California Department of Fish and Wildlife 2021b) and the Emergent, Palustrine Cowardin type (Cowardin et al. 1979).

Managed Wetland

Managed wetlands in the study area include created wetlands in a mitigation area on the west side of the Colusa Basin Drain. These areas may support emergent wetland vegetation, with species similar to that of freshwater marsh or seasonal wetland communities.

Managed wetland best fits with the descriptions for the Fresh Emergent Wetland (FEW) and Lacustrine (LAC) WHR habitat types (California Department of Fish and Wildlife 2021b) and the Lacustrine or Emergent, Palustrine Cowardin types (Cowardin et al. 1979).

Scrub-Shrub Wetland

Similar to the mapping described above for forested wetland, scrub-shrub wetland was mapped in the study area where stands of small trees and shrubs occurred below the OHWM of unnamed intermittent streams; Willow Creek and Grapevine Creek (intermittent streams); perennial streams, including Sacramento River, Stone Corral Creek, Antelope Creek, and Funks Creek; Funks Reservoir; edges of ponds; and irrigation and drainage ditches with enough water supply to support woody vegetation. Scrub-shrub wetlands support low-growing woody species,

including riparian tree saplings, willows, and may support freshwater marsh species in the understory.

Scrub-shrub wetland best fits with the description for the Valley Foothill Riparian (VFR) WHR habitat type (California Department of Fish and Wildlife 2021b) and the Scrub-Shrub, Lotic, Riparian (for streams) or Scrub-Shrub, Lentic, Riparian (for ponds and reservoir) Cowardin types (Cowardin et al. 1979).

Seasonal Wetland

Seasonal wetlands occur throughout the study area and account for most of the potentially jurisdictional wetlands identified in the inundation area. These wetlands occur in isolated depressions in annual grassland, as well as in association with other wetlands and non-wetland waters, such as freshwater marsh, ponds, and streams. Seasonal wetlands are inundated by surface water or saturated by groundwater during the winter and spring months, becoming dry by early summer and are strongly associated with low-lying areas of clay or clay loam soils, in particular the soils with seasonally fluctuating water tables and that are poorly drained with slow permeability. Dominant plant species include spikerush (*Eleocharis macrostachya*), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), and dock (*Rumex* spp). (California Department of Water Resources 2000b).

Some of the seasonal wetlands mapped in the study area would be considered vernal pools, because they have higher species diversity and support native or obligate-wetland species, such as coyote thistle (*Eryngium castrense*), popcorn flower (*Plagiobothrys* ssp.), and hyssop loosestrife (*Lythrum hyssopifolium*). The pools along the northeastern edge of the inundation area tended to be larger in size and higher in plant species diversity. (California Department of Water Resources 2000b)

Some seasonal wetlands northwest of Funks Reservoir are alkali wetlands. Alkaline soils are present in this area. Alkali wetlands support many of the same species as those in freshwater marsh or seasonal wetlands (e.g., spikerushes, rushes), but also support alkali- and saline-tolerant species, dominated by saltgrass (*Distichlis spicata*), with associated species such as sickle grass (*Parapholis incurva*), alkali heath (*Frankenia salina*), alkali weed (*Cressa truxillensis*), and alkali bulrush (*Bolboschoenus maritimus*). (California Department of Water Resources 2000b).

Seasonal wetland best fits with the description for the Lacustrine (LAC) WHR habitat type (California Department of Fish and Wildlife 2021b) and the Emergent, Palustrine Cowardin type (Cowardin et al. 1979).

9B.2.3.2. Non-Wetland Waters Types

Canal and Ditch

Canals and ditches occur throughout the lower elevation parts of the study area in agricultural areas. There are three large named canals in the study area that transport water throughout the agricultural areas west of the Sacramento River: TC Canal, GCID Main Canal, and CBD.

For the purposes of mapping land cover in the study area, canals were defined as earth- or concrete-lined constructed channels more than 15 feet wide that are used for irrigation. Ditches

were defined as earth-lined, constructed channels less than 15 feet wide that are used for irrigation or drainage, including roadside drainage. In general, the mapped canals and ditches are relatively permanent features subject to ongoing maintenance, including vegetation removal. However, a few vegetated segments of ditches that support scrub-shrub wetland species were mapped separately as scrub-shrub wetland because the vegetation did not appear to be maintained.

Canal and ditch land cover types best fit with the description for the Riverine (RIV) WHR habitat type (California Department of Fish and Wildlife 2021b) and the Perennial, Riverine or Intermittent, Riverine Cowardin type, although vegetated areas could be classified as Emergent, Palustrine (Cowardin et al. 1979).

Ephemeral Stream

Ephemeral streams occur throughout the Antelope Valley and the surrounding hills. These unnamed features only convey flows from rainfall events. They may dry out between rainfall events, and generally remain dry during summer and early fall. Most of the ephemeral streams in the study area are 1–3 feet wide at the OHWM; however, several are between 4–12 feet wide. These streams are unvegetated or may support non-wetland vegetation. Trees growing at the edges of ephemeral streams were not mapped as riparian because they are not dependent on the streamflow as a water supply.

Ephemeral stream best fits with the description for the Riverine (RIV) WHR habitat type (California Department of Fish and Wildlife 2021b) and the description for the Intermittent, Riverine Cowardin type (Cowardin et al. 1979).

Intermittent Stream

There are numerous intermittent streams in the study area, including Willow Creek, Stone Corral Creek, Lurline Creek, Grapevine Creek, Wilson Creek, tributaries to these creeks, and many unnamed streams. Segments of Hunters Creek, Funks Creek, and Antelope Creek also have intermittent flows. Intermittent streams are features that receive flow from precipitation and other surface and subsurface sources. They have the most water flow during the wet season and may contain pools that remain inundated into late summer. Intermittent streams are generally wider than the ephemeral streams in the study area, and most of them are 6–15 feet wide. A few have broader floodplains within the OHWM and are up to 24 feet wide. Intermittent streams may flow into or out of ponds created by impoundments in streams. While most of the intermittent stream segments in the study area are unvegetated, some areas support wetland types mapped in the study area, including forested wetland, freshwater marsh, scrub-shrub wetland, and seasonal wetland. Upland riparian communities are also mapped along intermittent streams. Additional information on the intermittent streams is provided in Chapter 5, *Surface Water Resources.*

Intermittent stream best fits with the description for the Riverine (RIV) WHR habitat type (California Department of Fish and Wildlife 2021b) and the description for the Intermittent, Riverine Cowardin type (Cowardin et al. 1979).

Perennial Stream

Several streams in the study area carry water year-round and are considered perennial streams, including Sacramento River at the Red Bluff Pumping Plant and the end of the Dunnigan

Pipeline; Hunters Creek, including a realigned segment and several tributaries that carry water from the GCID Main Canal through areas of rice fields; Stone Corral Creek, downstream of the confluence with Antelope Creek; most of Antelope Creek; and most of Funks Creek. Part of the perennial stream mapped at the Red Bluff Pumping Plant includes a fish ladder that connects to the Sacramento River. With the exception of the Sacramento River, the widths of the perennial streams in the study area range from 6 feet up to 170 feet wide at the OHWM. The parts of the Sacramento River in the study area include only the west bank, not the entire width of the river. Perennial streams support limited stands of forested wetland and scrub-shrub wetland. Riparian uplands communities are also associated with perennial streams. Additional details of study area perennial streams are provided in Chapter 5, *Surface Water Resources.*

Perennial stream best fits with the description for the Riverine (RIV) WHR habitat type (California Department of Fish and Wildlife 2021b) and the description for the Upper Perennial, Riverine and Lower Perennial, Riverine Cowardin types (Cowardin et al. 1979).

Pond

Numerous ponds occur in the study area in the inundation area and in the surrounding hills, as well as one detention basin in the Dunnigan Pipeline alignment. Ponds are generally open-water features, including stock ponds created by small dams on ephemeral or intermittent streams or by stream diversions into basins. Ponds may also be naturally formed at the head or confluence of streams and in isolated depressions. The mapped pond boundaries were based on the location of the high-water line observable in aerial imagery. Some ponds are inundated only during the rainy season and dry during summer months. Although the areas mapped as ponds are unvegetated, they sometimes support a fringe of freshwater marsh along the margins or abut larger patches of freshwater marsh, riparian vegetation, and/or seasonal wetlands. Salt Pond is a pond that supports seasonal alkali wetlands formed by warm salt springs that occur upslope of the pond (Sites Project Authority and U.S. Bureau of Reclamation 2017).

Pond best fits with the description for the Lacustrine (LAC) WHR habitat type (California Department of Fish and Wildlife 2021b) and the description for the Palustrine Cowardin type (Cowardin et al. 1979).

Reservoir

The study area includes this landcover type only at Funks Reservoir. The reservoir is created by a dam on Funks Creek but is filled mainly from the TC Canal. Funks Creek is the primary stream upstream and downstream of the reservoir; however, several ephemeral streams and an unnamed intermittent stream also drain to the west side of the reservoir. The reservoir is surrounded by a fringe of freshwater marsh, small areas of scrub-shrub wetland, and seasonal wetlands associated with the streams that flow into the reservoir. The area outside of the reservoir and abutting wetlands is annual grassland.

Reservoir best fits with the Lacustrine (LAC) WHR habitat type (California Department of Fish and Wildlife 2021b) and the description for the Lacustrine Cowardin type (Cowardin et al. 1979).

9B.3 Invasive Plant Species

Table 9B-5 lists the invasive plant species that have been observed in the study area or are documented from Glenn or Colusa Counties and occur in land cover types similar to those in the study area (California Invasive Plant Council 2021, California Department of Food and Agriculture 2021).

Table 9B-5. Invasive Plant Species Known or Likely to Occur in the Study Area

Common Name Scientific Name	CDFA List[a]	Cal-IPC Rating[b]	Habitat
Acroptilon repens Russian knapweed	B	Moderate	Disturbed areas; Elevation: <1,900 m
Aegilops cylindrica[c] Jointed goatgrass	B	Watch	Disturbed dry sites, cultivated fields; Elevation: <1,500 m
Aegilops triuncialis[c] Barbed goatgrass	B	High	Disturbed sites, cultivated fields, roadsides; Elevation: <1,000 m
Agrostis avenacea Pacific bentgrass	–	Limited	Open, often disturbed places; Elevation: <300 m
Ailanthus altissima[c] Tree of heaven	C	Moderate	Disturbed urban areas, waste places, riparian areas, grasslands; Elevation: <1,250 m
Arundo donax[c] Giant reed	B	High	Moist places, seeps, ditch banks; Elevation: <500 m
Atriplex semibaccata Australian saltbush	–	Moderate	Disturbed areas, scrub, woodland; Elevation: <1,000 m
Avena fatua[c] Wild oats	–	Moderate	Disturbed sites; Elevation: <2,400 m
Bassia hyssopifolia Fivehorn smotherweed	–	Limited	Disturbed sites, fields, roadsides; Elevation: <1,200 m
Bellardia trixago Mediterranean lineseed	–	Limited	Disturbed grassland; Elevation: 710 m
Brassica nigra[c] Black mustard	–	Moderate	Disturbed areas, fields; Elevation: <1,500 m
Bromus diandrus[c] Ripgut brome	–	Moderate	Open, disturbed areas; Elevation: < 2170 m
Bromus hordeaceus[c] Soft chess	–	Limited	Fields, disturbed areas; Elevation: <1,000 (2,560) m
Bromus madritensis ssp. *rubens*[c] Red brome	–	High	Open, disturbed places; Elevation:<2,200 m
Carduus acanthoides Spiny plumeless thistle	A	Limited	Disturbed areas, roadsides; Elevation: <3,050 m

Common Name Scientific Name	CDFA List[a]	Cal-IPC Rating[b]	Habitat
Carduus pycnocephalus[c] Italian thistle	C	Moderate	Roadsides, pastures, waste areas; Elevation: <1,200 m
Cenchrus longispinus Mat sandbur	B	Watch	Disturbed areas; Elevation: <1,500 m
Centaurea calcitrapa[c] Purple star thistle	B	Moderate	Pastures, disturbed places; Elevation: generally <1,000 m
Centaurea diffusa Diffuse knapweed	A	Moderate	Fields, roadsides, open woodland; Elevation: <2,300 m
Centaurea melitensis[c] Tocalote	C	Moderate	Disturbed fields, open woods; Elevation: <2,200 m
Centaurea solstitialis[c] Yellow star-thistle	C	High	Pastures, roadsides, disturbed grassland or woodland; Elevation: <1,300 m
Centaurea stoebe ssp. *micranthos* Spotted knapweed	A	High	Disturbed areas; Elevation:<2,600 m
Cirsium vulgare[c] Bull thistle	C	Moderate	Disturbed places; Elevation: <2,300 m
Conium maculatum Poison hemlock	–	Moderate	Moist, disturbed places; Elevation: <1,000 m
Cotula coronopifolia[c] Brass buttons	–	Limited	Saline and freshwater marshes, mud flats; Elevation: <1,200 m
Cynara cardunculus Cardoon	B	Moderate	Not available
Cynodon dactylon[c] Bermuda grass	D	Moderate	Disturbed sites; Elevation: <900 m
Cynosurus echinatus[c] Hedgehog dogtail grass	–	Moderate	Open, disturbed sites; Elevation < 1000 m
Dipsacus fullonum Wild teasel	–	Moderate	Roadsides, pastures, fields, sometimes moist sites; Elevation: <1,700 m
Dittrichia graveolens Stinkwort	B	Moderate	Disturbed areas; Elevation: <700 m
Elymus caput-medusae[c] Medusahead	C	High	Disturbed areas; Elevation: <2,000 m
Erodium cicutarium[c] Coastal heron's bill	–	Limited	Open, disturbed sites, grassland, scrub; Elevation: <2,000 m
Festuca myuros[c] Rattail sixweeks grass	–	Moderate	Generally open places, sandy soils; Elevation: <2,000 m
Festuca perennis[c] Italian rye grass	–	Moderate	Dry to moist disturbed sites, abandoned fields; Elevation: <1,000 m

Common Name Scientific Name	CDFA List[a]	Cal-IPC Rating[b]	Habitat
Geranium dissectum[c] Cutleaf geranium	–	Limited	Open, disturbed sites; Elevation: <1,300 m
Helminthotheca echioides[c] Bristly ox-tongue	–	Limited	Disturbed areas; Elevation: <1,050 m
Hordeum murinum[c] Wall barley	–	Moderate	Moist, generally disturbed sites Elevation: -60—1,900 m
Hypochaeris radicata[c] Rough cat's-ear	–	Moderate	Disturbed areas; Elevation: <500 m
Isatis tinctoria Dyers woad	B	Moderate	Disturbed areas, pastures; Elevation: 100—2,200 m.
Lepidium appelianum Hairy whitetop	–	Limited	Saline soils, fields; Elevation: 400—2,400 m
Lepidium chalepense Lens-podded hoary cress	B	Moderate	Disturbed areas, pastures, fields, riverbanks; Elevation: 300—4,200 m
Lepidium latifolium Broad-leaved peppergrass	–	High	Pastures, disturbed areas, fields, grassland, saline meadows, streambanks, sagebrush scrub, pinyon/juniper woodland, edge of marshes; Elevation: <2,500 m
Ludwigia hexapetala Six petal water primrose	C	High	Lake margins, wetlands; Elevation: <300 m.
Lythrum hyssopifolia[c] Hyssop loosestrife	–	Moderate	Marshes, drying pond margins, disturbed ground; Elevation: <1,600 m
Medicago polymorpha[c] California bur-clover	–	Limited	Disturbed grasslands; Elevation: <1,500 m
Mentha pulegium Pennyroyal	–	Moderate	Moist areas, ditches; Elevation: <1,000 m
Mesembryanthemum nodiflorum Small flowered iceplant	–	Limited	Coastal bluffs, margins of saline wetlands; Elevation: <100 m
Myriophyllum spicatum Water milfoil	C	High	Ditches, lake margins; Elevation: <2,080 m
Nicotiana glauca[c] Tree tobacco	–	Moderate	Open disturbed sites; Elevation: <1,100 m
Olea europaea Olive	–	Limited	Disturbed areas, developed;
Phalaris aquatica Harding grass	–	Moderate	Disturbed areas, roadsides; Elevation: <1,700 m
Plantago lanceolata[c] Ribwort	–	Limited	Disturbed areas; Elevation: <1,600 m; Elevation:

Common Name Scientific Name	CDFA List[a]	Cal-IPC Rating[b]	Habitat
Polypogon monspeliensis[c] Annual beard grass	–	Limited	Moist places, along streams; Elevation: <2100 m
Potamogeton crispus[c] Crispate-leaved pondweed	–	Moderate	Shallow water, ponds, reservoirs, streams; Elevation: <2,100 m
Rubus armeniacus[c] Himalayan blackberry	–	High	Disturbed moist areas, roadsides; Elevation: <1,600 m
Rumex crispus[c] Curly dock	–	Limited	Disturbed places; Elevation: <2,700 m
Salsola tragus Russian thistle	C	Limited	Disturbed places; Elevation: <2,800 m
Silybum marianum[c] Milk thistle	–	Limited	Roadsides, ditches, pastures, disturbed places; Elevation: <500 m
Tamarix parviflora Tamarisk	B	High	Washes, streambanks, ditches; Elevation: <800 m
Tamarix ramosissima Salt Cedar	B	High	Washes, streambanks, ditches; Elevation: <800 m
Tribulus terrestris Puncturevine	C	Limited	Roadsides, railways, vacant lots, dry, disturbed areas; Elevation: <100 m
Verbena bonariensis[c] Purple top vervain	–	Watch	Disturbed, often wet places, fields; Elevation: <200 m

[a] California Department of Food and Agriculture List of Noxious Weeds (California Department of Food and Agriculture 2021):
- List A - Most invasive wildland pest plants - eradication, containment, or other holding action at the State-county level
- List B - Includes species less widespread and more difficult to contain - eradication, containment, control, or other holding action at the discretion of the Commissioner
- List C - Weeds that are so widespread that the agency does not endorse State- or county-funded eradication except in nurseries

[b] California Invasive Plant Council (California Invasive Plant Council 2021) California Invasive Plant Inventory:
- H = High: invasive species with most severe wildland ecological impacts, widespread
- M = Moderate: invasive species with substantial wildland impacts; local to widespread
- L = Low: invasive species with minor wildland ecological impacts; limited distribution, although may be locally problematic
- D = Evaluated, but not listed, due to low ecological impacts

[c] Observed during surveys in the study area.

Note: m = meter(s)

9B.4 References Cited

California Department of Fish and Wildlife. 2020. *California Sensitive Natural Communities.* Last revised: September 9, 2020. Available: https://www.wildlife.ca.gov/Data/VegCAMP/Natural-Communities. Accessed: January 13, 2021.

California Department of Fish and Wildlife. 2021a. California Natural Diversity Database, RareFind 5, January 13, 2021 [43 Quadrangles: Balls Ferry, Bend, Bird Valley, Black Butte Dam, Dunnigan, Eldorado Bend, Foster Island, Fruto NE, Gerber, Gilmore Peak, Glenn, Hamilton City, Hough Springs, Kirkville, Kirkwood, Knights Landing, Leesville, Lodoga, Logandale, Los Molinos, Manor Slough, Maxwell, Meridian, Moulton Weir, Nord, Ord Ferry, Orland, Panther Spring, Princeton, Rail Canyon, Red Bank, Red Bluff East, Red Bluff West, Sites, Stone Valley, Sutter Causeway, Taylor Monument, Tuscan Springs, West of Gerber, Wildwood School, Williams, Willows, Zamora]. Available: https://apps.wildlife.ca.gov/rarefind/view/RareFind.aspx.

California Department of Fish and Wildlife. 2021b. Guide to Wildlife Habitats of California. Available: https://wildlife.ca.gov/Data/CWHR/Wildlife-Habitats. Accessed: January 13, 2021.

California Department of Food and Agriculture. 2021. *Encycloweedia.* Available: <https://www.cdfa.ca.gov/plant/IPC/encycloweedia/weedinfo/winfo_table-sciname.html>. Accessed: January 8, 2021.

California Department of Water Resources. 2000a. North of Delta Offstream Storage Investigation Progress Report. January 4, 2000.

_____. 2000b. North of Delta Offstream Storage Investigation Progress Report, Appendix B: Wetland Delineation and Field Studies Report. Draft. Prepared for Integrated Storage Investigations, CALFED Bay-Delta Program. April 2000.

California Native Plant Society, Rare Plant Program. 2020. Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39). Website http://www.rareplants.cnps.org [accessed 16 December 2020].

California Native Plant Society. 2021. *A Manual of California Vegetation Online.* Available: https://vegetation.cnps.org/keys. Accessed: February 11, 2021.

California Invasive Plant Council (Cal-IPC). 2021. Inventory of Invasive Plant Species of California. Last revised: Feb. 1, 2017. Available: https://www.cal-ipc.org/plants/inventory/. Accessed: January 8, 2021.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. Available: https://www.nrc.gov/docs/ML1801/ML18019A904.pdf.

Environmental Systems Research Institute. 2019. *ESRI's World Imagery Map*. 11/03/2019. Retrieved from https://services.arcgisonline.com/ArcGIS/rest/services/World_Imagery/MapServer

Google Earth. 2021. Map showing Project Boundaries in Glenn and Colusa Counties. Google Earth, earth.google.com/web/.

Natural Resources Conservation Service. 2020a. Climate Data for Colusa, California. Available: http://agacis.rcc-acis.org/?fips=06011 and http://agacis.rcc-acis.org/?fips=06021. Accessed December 10, 2020.

Natural Resources Conservation Service. 2020b. Climate Data for Stony Gorge, California. Available: http://agacis.rcc-acis.org/?fips=06011 and http://agacis.rcc-acis.org/?fips=06021. Accessed December 10, 2020.

Natural Resources Conservation Service. 2020c. *Official Soil Series Descriptions*. Available: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/geo/?cid=nrcs142p2_053587. Accessed: multiple days in September through December 2020.

Natural Resources Conservation Service. 2020d. *Soil Survey Geographic (SSURGO) Database for Colusa and Glenn Counties, California* [Online]. U.S. Department of Agriculture. Available: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx. Accessed: October 21, 2020.

Sites Project Authority and U.S. Bureau of Reclamation. 2017. *Sites Reservoir Project Draft Environmental Impact Report/Environmental Impact Statement*. August 2017. Available: https://sitesproject.org/resources/environmental-review/draft-environmental-impact-report-environmental-impact-statement/.

U.S. Fish and Wildlife Service. 2020. *National Wetlands Inventory,* Wetlands Online Mapper. Division of Habitat and Resource Conservation. Arlington, VA. October 01, 2020. Available: https://www.fws.gov/wetlands/data/Mapper.html Accessed: XX.

U.S. Geological Survey. 2020. 7.5-minute Topological Map for the Balls Ferry, Bend, Bird Valley, Black Butte Dam, Dunnigan, Eldorado Bend, Foster Island, Fruto NE, Gerber, Gilmore Peak, Glenn, Hamilton City, Hough Springs, Kirkville, Kirkwood, Knights Landing, Leesville, Lodoga, Logandale, Los Molinos, Manor Slough, Maxwell, Meridian, Moulton Weir, Nord, Ord Ferry, Orland, Panther Spring, Princeton, Rail Canyon, Red Bank, Red Bluff East, Red Bluff West, Sites, Stone Valley, Sutter Causeway, Taylor Monument, Tuscan Springs, West of Gerber, Wildwood School, Williams, Willows, Zamora Quadrangles. Reston, VA: U.S. Department of the Interior

U.S. Geological Survey. 2016. National Hydrography Dataset (NHD) Downloadable Data Collection Harvest Source. https://www.usgs.gov/core-science-systems/ngp/national-hydrography/national-hydrography-dataset?qt-science_support_page_related_con=0#qt-science_support_page_related_con

Witham, C. W., R. F. Holland, and J. Vollmar. 2014. Vernal Pool Distribution – California's Great Valley - 2012 [ds1070]. Publication date 2014-08. Sacramento, CA.