

CEQA Conclusion

Direct and indirect impacts to non-wetland waters of the United States (open water), wetland waters of the United States (freshwater emergent wetland and freshwater emergent marsh), and CDFW riparian areas (freshwater marsh, freshwater emergent wetland, and riparian forest/woodland), and RWQCB jurisdictional areas resulting from construction of Alternative 4 would be **significant** because these activities would result in direct removal, filling, or hydrological interruption, which would result in the permanent reduction in acreage or function of these areas. During operations and maintenance, there would be **no impact**.

Implementation of Mitigation Measures MM-TERR-2, MM-TERR-3, MM-TERR-5, MM-TERR-6, MM-TERR-11, MM-WQ-1, and MM-WQ-2 would reduce construction impacts to USACE, RWQCB, and CDFW jurisdictional areas to **less than significant**.

9.3.3.5.10 Impact TERR-10: Potential Interference with Movement of Native Resident or Migratory Wildlife Species

Construction, operation, and maintenance effects of Alternative 4 on the movement of native resident or migratory wildlife species would be the same as those described for Alternative 1.

The analysis of the potential significance of construction, operations, and maintenance effects of Alternative 4 on the movement of native resident or migratory wildlife species is the same as that for Alternative 3.

CEQA Conclusion

Impacts on wildlife movement resulting from construction of Alternative 4 would be **less than significant** because although construction could interfere with movement of native resident or migratory wildlife species, construction activities are not anticipated to substantially interfere with the movement of these species as they could move to nearby, unaffected habitat. During operations and maintenance, there would be **no impact**.

9.3.3.5.11 Impact TERR-11: Conflict with Provisions of an Adopted HCP/NCCP or Other Approved Local, Regional, or State Habitat Conservation Plan

The analysis of the potential conflict of Alternative 4 with provisions of adopted or other approved habitat conservation plans would be the same as that for Alternative 3.

CEQA Conclusion

Alternative 4 is consistent with the provisions of the Draft Yolo HCP/NCCP. Therefore, there would be **no impact** resulting from conflicts with this HCP/NCCP.

9.3.3.6 Alternative 5: Central Multiple Gated Notches

Alternative 5, Central Multiple Gated Notches, would improve the entrainment of fish through using multiple gates and intake channels so that the deeper gate could allow more flow to enter the bypass when the river is at lower elevations. Flows would move to other gates when the river is higher to control inflows. Alternative 5 incorporates multiple gated notches in the central location on the existing Fremont Weir that would allow combined flows of up to 3,400 cfs. See Section 2.8 for more details on the alternative features. Alternative 5 has the same general alignment as Alternative 2; therefore, impact comparisons are made to Alternative 2.

Implementation of Alternative 5 would result in direct and indirect construction effects on habitat for State- and Federally listed wildlife species, including valley elderberry longhorn beetle, giant garter snake, western pond turtle, Least Bell's Vireo, Swainson's Hawk, Western Yellow-Billed Cuckoo, Bank Swallow, special-status plant species (including woolly rose-mallow, northern California black walnut, bristly sedge, Peruvian dodder, Delta tulle pea, Sanford's arrowhead, Suisun Marsh aster, heartscale, San Joaquin spearscale, Heckard's pepper grass, California alkali grass, and saline clover), special-status bird species (including birds protected under the MBTA), and other special-status wildlife species (including bats and American badger). It would also result in direct and indirect construction effects on sensitive vegetation communities, including areas potentially subject to USACE and CDFW jurisdiction.

The change in the average number of wet days within the Yolo Bypass under Alternative 5 would be very similar to that described for Alternative 1. Within Tule Ranch, Alternative 5 would have slightly more area experiencing one to two weeks of additional wet days compared to Alternative 1.

Vegetation community impacts for Alternative 5 are shown in Table 9-6 and on Figures 9-10a and 9-10b. Preliminary impacts associated with the Tule Canal Floodplain improvements are provided in Section 9.3.3.6.14.



Figure 9-10a. Alternative 5 Construction Impacts to Vegetation Communities

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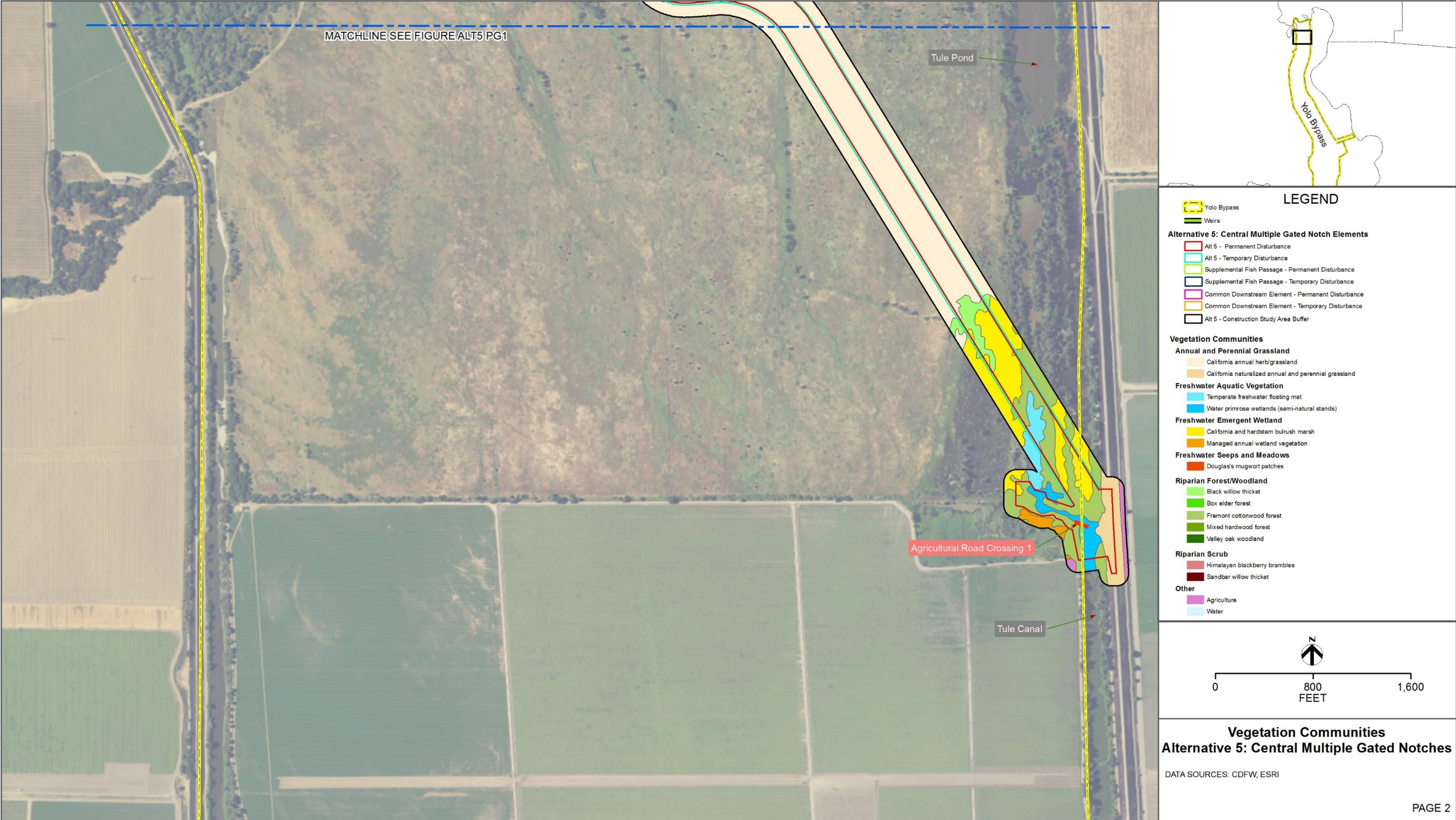


Figure 9-10b. Alternative 5 Construction Impacts to Vegetation Communities

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9.3.3.6.1 Impact TERR-1: Potential Mortality or Loss of Habitat for Special-Status Plant Species

Alternative 5 contains suitable habitat for the same special-status plant species as Alternative 2, including seven species with the potential to occur in riparian habitat (woolly rose-mallow, northern California black walnut, bristly sedge, Peruvian dodder, Delta tule pea, Sanford's arrowhead, and Suisun Marsh aster) and six species with the potential to occur in alkaline grasslands present along portions of the central transport channel (heartscale, San Joaquin spearscale, Heckard's pepper grass, California alkali grass, and saline clover). California annual herb/grassland and California naturalized annual and perennial grasslands with alkaline soils that occur along the central transport channel were not included in the 2014 and 2015 survey areas (soils map provided in Appendix H6). Alternative 5 would have a greater construction-related permanent impact to suitable or occupied habitat for special-status plant species than Alternative 2 but would have a similar temporary impact.

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 5 on special-status species and their habitat is the same as that for Alternative 2.

The operations and maintenance effects of Alternative 5 would be the same as those described for Alternative 2.

CEQA Conclusion

If heartscale, San Joaquin spearscale, Heckard's pepper grass, California alkali grass, and saline clover are present in the alkaline grasslands of the Project area, impacts would be **significant** because construction of Alternative 5 could result in substantial loss of, affect the long-term survival of, or permanently reduce the acreage and quality of suitable habitat for special status plant species through direct effects resulting from construction or indirect effects from construction or maintenance resulting from the introduction or spread of invasive plant species. During operations, impacts would be **less than significant** because the Project is not anticipated to result in substantial mortality or loss of habitat for special-status plant species, which are tolerant of moist soils and have evolved in an area that is subject to regular inundation.

Implementation of Mitigation Measures MM-TERR-1 and MM-TERR-19 would reduce construction and maintenance impacts to special-status species and their habitat to **less than significant**.

9.3.3.6.2 Impact TERR-2: Potential Disturbance or Mortality of Valley Elderberry Longhorn Beetle and Loss of Its Habitat (Elderberry Shrubs)

Based on 2014 surveys, the construction disturbance area for Alternative 5, including construction, staging, and spoils areas, does not contain any elderberry shrubs, which are the host plant for valley elderberry longhorn beetle. However, the 2014 surveys did not cover the entirety of the Alternative 5 study area. The closest known elderberry shrub is in riparian habitat approximately 660 feet from the supplemental fish passage structure. The fish passage structure itself would occupy an area consisting entirely of non-riparian habitat (California naturalized annual and perennial grassland and open water; see Figures 9-1 and 9-10a).

If elderberry shrubs are found during pre-construction surveys, construction of Alternative 5 could result in direct effects on the valley elderberry longhorn beetle through removal of its host plant and surrounding habitat although impacts cannot be quantified at this time. In addition, construction of Alternative 5 could result in indirect effects on this species such as from construction-generated dust, root damage, or soil compaction.

The analysis of the potential significance of construction-related direct and indirect effects and maintenance effects of Alternative 5 on valley elderberry longhorn beetle and its elderberry host plant is the same as that for Alternative 2.

The analysis of operations effects of Alternative 5 on valley elderberry longhorn beetle and its elderberry host plant would be the same as that described for Alternative 2.

CEQA Conclusion

If elderberry shrubs are found during pre-construction surveys, potential disturbance or mortality of valley elderberry longhorn beetle and loss of its habitat would be **significant**. Maintenance impacts would be **significant** if elderberry shrubs that become established in the channels are not removed before they provide habitat for valley elderberry longhorn beetle. Operations impacts would be **less than significant** because the limited increase in the average number of wet days under Alternative 3 is not likely to lead to a type conversion of habitat that would prevent reproduction and growth of elderberry shrubs.

Implementation of Mitigation Measures MM-TERR-2 through MM-TERR-11 would reduce construction and maintenance impacts to valley elderberry longhorn beetle and its elderberry host plant to **less than significant**.

9.3.3.6.3 Impact TERR-3: Potential Disturbance or Mortality of and Loss of Suitable Habitat for Giant Garter Snake

Construction of Alternative 5 would result in temporary impacts to 0.6 acre and permanent impacts to 7.5 acres of suitable giant garter snake aquatic habitat (Table 9-8). In addition, construction of Alternative 5 would result in temporary disturbance to 0.6 acre and permanent impacts to 8.6 acres of suitable giant garter snake upland habitat. Alternative 5 would impact the least amount of suitable giant garter snake aquatic and upland habitats of all alternatives. Alternative 5 would impact 7.8 fewer acres of suitable giant garter snake aquatic habitat than Alternative 2 (8.1 acres for Alternative 5 versus 15.9 acres for Alternative 2) and 15.4 fewer acres of upland habitat (9.2 acres for Alternative 5 versus 24.6 acres for Alternative 2). By aligning the downstream channel to the cross canal and Agricultural Road Crossing 1, impacts to Tule Pond would be avoided.

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 5 on giant garter snake and its suitable aquatic and upland habitat is the same as that for Alternative 2, with the exception that Alternative 5 would not result in the partial draining of Tule Pond.

The operations and maintenance effects of Alternative 5 on giant garter snake and its suitable aquatic and upland habitat would be the same as those described for Alternative 4.

CEQA Conclusion

Direct or indirect impacts to giant garter snake resulting from construction and maintenance of Alternative 5 would be **significant** because these activities could result in the mortality or injury of individuals and a reduction in the quantity and quality of suitable giant garter snake habitat. During operations, impacts would be **less than significant**.

Implementation of Mitigation Measures MM-TERR-2 through MM-TERR-6, MM-TERR-11 through MM-TERR-14, MM-WQ-1, and MM-WQ-2 would reduce the impacts of project construction, operations, and maintenance to giant garter snake and its suitable aquatic and upland habitat to **less than significant**.

9.3.3.6.4 Impact TERR-4: Potential Disturbance or Mortality of and Loss of Suitable Habitat for Western Pond Turtle

Construction of Alternative 5 would result in temporary impacts to 0.5 acre and permanent impacts to 4.9 acres of suitable western pond turtle aquatic habitat. In addition, construction of Alternative 5 would result in temporary disturbance to 27.2 acres and permanent impacts to 83.5 acres of suitable western pond turtle upland habitat. Alternative 5 would impact 5.5 fewer acres of suitable western pond turtle aquatic habitat than Alternative 2 (5.4 acres for Alternative 5 versus 10.9 acres for Alternative 2) but would impact 18.1 more acres of suitable western pond turtle upland habitat (110.7 acres for Alternative 5 versus 92.6 acres for Alternative 2).

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 5 on western pond turtle and its suitable habitat is the same as that for Alternative 2, with the exception that Alternative 5 would not result in the partial draining of Tule Pond.

The operations and maintenance effects of Alternative 5 on western pond turtle and its suitable habitat would be the same as those described for the other alternatives.

CEQA Conclusion

Direct and indirect impacts to western pond turtle resulting from construction and maintenance of Alternative 5 would be **significant** because these activities could result in the mortality or injury of individuals and a reduction in the quantity and quality of suitable western pond turtle aquatic habitat and upland habitat. During operations, there would be **no impact**.

Implementation of Mitigation Measures MM-TERR-2 through MM-TERR-6, MM-TERR-11, MM-TERR-15, MM-WQ-1, and MM-WQ-2 would reduce construction and maintenance impacts to western pond turtle and its suitable habitat to **less than significant**.

9.3.3.6.5 Impact TERR-5: Potential Disturbance or Mortality of Nesting Bird Species and Removal of Suitable Nesting and Foraging Habitat

Construction effects of Alternative 5 on State- and/or Federally listed bird species, including Swainson's Hawk, Least Bell's Vireo, Western Yellow-Billed Cuckoo, and Bank Swallow, and on other special-status bird species that are known or have the potential to occur in the construction study area, including bird species protected by the MBTA, would include temporary impacts to 27.9 acres of suitable nesting and foraging habitat and permanent impacts to 96.3 acres of suitable nesting and foraging habitat for these species (Table 9-6). Alternative 5

would temporarily impact 0.8 more acres than Alternative 2 (27.9 acres for Alternative 5 versus 27.1 acres for Alternative 2) and permanently impact 21.8 more acres (96.3 acres for Alternative 5 versus 74.5 acres for Alternative 2) of suitable nesting and foraging habitat. Impacts to riparian habitat (black willow thicket, Fremont cottonwood forest, and valley oak woodland) would be considered long-term temporary impacts because it would take more than one year to establish dominant tree vegetation, which would represent a temporal loss of habitat for special-status nesting birds.

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 5 on nesting bird species and their suitable nesting and foraging habitat is the same as that for Alternative 2.

The operations and maintenance effects of Alternative 5 on nesting bird species and their suitable nesting and foraging habitat would be the same as those described for Alternative 2.

CEQA Conclusion

Direct and indirect impacts on nesting bird species resulting from construction and maintenance of Alternative 5 would be **significant** because these activities could result in the mortality, injury, or disturbance of individuals or eggs and a reduction in the quantity and quality of suitable nesting and foraging habitat. Under operations, impacts would be **less than significant**.

Implementation of Mitigation Measures MM-TERR-2 through MM-TERR-6, MM-TERR-11, and MM-TERR-16 would reduce construction and maintenance impacts to nesting bird species and their suitable nesting and foraging habitat to **less than significant**.

9.3.3.6.6 Impact TERR-6: Potential Disturbance, Injury, or Mortality of Special-Status Tree-Roosting Bats and Removal of Roosting Habitat

Construction effects of Alternative 5 on special-status bat species, including pallid bats and western red bats, would include temporary impacts to 7.2 acres of suitable riparian habitat and 20.0 acres of suitable grassland and open-water roosting and foraging habitat. In addition, construction effects would include the loss of 11.9 acres of suitable riparian habitat and conversion of 76.6 acres of suitable grassland and open-water foraging habitat to primarily open-water habitat that is still suitable for foraging (Table 9-6). Alternative 5 would temporarily impact 1.1 fewer acres of suitable roosting and foraging habitat than Alternative 2 (27.2 acres for Alternative 5 versus 28.3 acres for Alternative 2) and permanently impact 16.9 more acres of suitable roosting and foraging habitat than Alternative 2 (88.5 acres for Alternative 5 versus 71.6 acres for Alternative 2). Impacts to riparian habitat (black willow thicket, Fremont cottonwood forest, and valley oak woodland) would be considered long-term temporary impacts because it would take more than one year to establish dominant tree vegetation, which would represent a temporal loss of habitat for special-status tree-roosting bats.

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 5 on special-status bat species and their suitable roosting habitat is the same as that for Alternative 2.

The operations and maintenance effects of Alternative 5 on special-status bat species and their suitable roosting habitat would be the same as those described for Alternative 2.

CEQA Conclusion

Direct and indirect impacts to special-status tree-roosting bats, including pallid bats and western red bats, resulting from construction and maintenance of Alternative 5 would be **significant** because these activities could result in the mortality, injury, or disturbance of individuals and a reduction in the quantity and quality of suitable or occupied habitat. During operations, there would be **no impact**.

Implementation of Mitigation Measures MM-TERR-2 through MM-TERR-6, MM-TERR-11, and MM-TERR-17 would reduce construction and maintenance impacts to special-status bat species and their suitable roosting habitat to **less than significant**.

9.3.3.6.7 Impact TERR-7: Potential Disturbance or Mortality of American Badger and Loss of Its Habitat

Construction effects of Alternative 5 on suitable American badger foraging and denning habitat would include temporary impacts to 20.0 acres and permanent impacts to 71.6 acres of potentially suitable grassland habitat (Table 9-6). Alternative 5 would temporarily impact 0.8 acre less than Alternative 2 (20.0 acres for Alternative 5 versus 20.8 acres for Alternative 2) but would permanently impact 22.3 more acres than Alternative 2 (71.6 acres for Alternative 5 versus 49.3 acres for Alternative 2) of suitable foraging and denning habitat for American badger.

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 5 on American badger and its suitable foraging and denning habitat is the same as that for Alternative 2.

The operations and maintenance effects of Alternative 5 on American badger and its suitable foraging and denning habitat would be the same as those described for Alternative 2.

CEQA Conclusion

Direct and indirect impacts to American badger resulting from construction of Alternative 5 would be **significant** because construction activities could result in injury or mortality. During operations and maintenance, there would be **no impact**.

Implementation of Mitigation Measures MM-TERR-2 through MM-TERR-6 and MM-TERR-18 would reduce construction impacts to American badger and its suitable foraging and denning habitat to **less than significant**.

9.3.3.6.8 Impact TERR-8: Potential Loss of Sensitive Natural Communities

Construction effects of Alternative 5 on sensitive natural communities would include temporary impacts to 7.7 acres and permanent impacts to 16.8 acres of California hardstem and bulrush marsh, black willow thickets, Fremont cottonwood forest, and valley oak woodland (Table 9-6). Alternative 5 would temporarily impact 0.1 more acre of sensitive natural communities than Alternative 2 (7.7 acres for Alternative 5 versus 7.6 acres for Alternative 2) but would permanently impact 9.0 fewer acres than Alternative 2 (16.8 acres for Alternative 5 versus 25.8 acres for Alternative 2) of sensitive natural communities.

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 5 on sensitive natural communities is the same as that for Alternative 2.

The operations and maintenance effects of Alternative 5 would be the same as those described for Alternative 2.

CEQA Conclusion

Direct and indirect impacts to sensitive natural communities, including freshwater marsh, riparian forest, and riparian woodland, resulting from construction of Alternative 5 would be **significant** because these activities could conflict with the implementation of general and/or conservation plan policies related to the protection of terrestrial biological resources. During operations and maintenance, there would be **no impact**.

Implementation of Mitigation Measures MM-TERR-2, MM-TERR-3, MM-TERR-5, MM-TERR-6, MM-TERR-11, MM-WQ-1, and MM-WQ-2 would reduce construction impacts to sensitive natural communities to **less than significant**.

9.3.3.6.9 Impact TERR-9: Potential Effects on USACE, CDFW, and RWQCB Jurisdictional Wetlands, Waters, and Riparian Areas

Impacts to potential USACE and CDFW jurisdiction resulting from construction of Alternative 5 are shown on Figures 9-11a and 9-11b. Construction effects of Alternative 5 would include temporary impacts to 0.6 acre of potential USACE wetlands and 1.1 acres of potential non-wetland waters of the United States and permanent impacts to 7.5 acres of potential USACE wetlands and 5.0 acres of potential non-wetland waters of the United States. In addition, construction of Alternative 5 would result in temporary impacts to 7.9 acres of potential CDFW riparian habitat and 1.1 acres of potential CDFW unvegetated streambed and permanent impacts to 19.7 acres of potential CDFW riparian habitat and 5.0 acres of potential CDFW unvegetated streambed (Tables 9-9 and 9-10).

Compared to Alternative 2, Alternative 5 would temporarily impact 2.4 fewer acres of USACE jurisdiction (1.7 acres for Alternative 5 versus 4.1 acres for Alternative 2) and 1.3 fewer acres of CDFW jurisdiction (9.0 acres for Alternative 5 versus 10.3 acres for Alternative 2). In addition, Alternative 5 would permanently impact 6.6 fewer acres of USACE jurisdiction (12.5 acres for Alternative 5 versus 19.1 acres for Alternative 2) and 11.2 fewer acres of CDFW jurisdiction (24.7 acres for Alternative 5 versus 35.9 acres for Alternative 2).

The analysis of the potential significance of construction- and operations-related direct and indirect effects of Alternative 5 on potential USACE, CDFW, and RWQCB jurisdictional areas is the same as that for Alternative 2.

The operations and maintenance effects of Alternative 5 on potential USACE, CDFW, and RWQCB jurisdictional areas would be the same as those described for Alternative 2.



Figure 9-11a. Alternative 5 Construction Impacts to Potential USACE and CDFW Jurisdictional Areas

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Figure 9-11b. Alternative 5 Construction Impacts to Potential USACE and CDFW Jurisdictional Areas

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CEQA Conclusion

Direct and indirect impacts to non-wetland waters of the United States (open water), wetland waters of the United States (freshwater emergent wetland and freshwater emergent marsh), CDFW riparian areas (freshwater marsh, freshwater emergent wetland, and riparian forest/woodland), and RWQCB jurisdictional areas resulting from construction of Alternative 5 would be **significant** because these activities would result in direct removal, filling, or hydrological interruption, which would result in the permanent reduction in acreage or function of these areas. During operations and maintenance, there would be **no impact**.

Implementation of Mitigation Measures MM-TERR-2, MM-TERR-3, MM-TERR-5, MM-TERR-6, MM-TERR-11, MM-WQ-1, and MM-WQ-2 would reduce construction impacts to USACE, RWQCB, and CDFW jurisdictional areas to **less than significant**.

9.3.3.6.10 Impact TERR-10: Potential Interference with Movement of Native Resident or Migratory Wildlife Species

Construction, operation, and maintenance effects of Alternative 5 on the movement of native resident or migratory wildlife species would be the same as those described for Alternative 2.

The analysis of the potential significance of construction, operations, and maintenance effects of Alternative 5 on the movement of native resident or migratory wildlife species is the same as that for Alternative 2.

CEQA Conclusion

Impacts on wildlife movement resulting from construction of Alternative 5 would be **less than significant** because, although construction could interfere with movement of native resident or migratory wildlife species, construction activities are not anticipated to substantially interfere with the movement of these species as they could move to nearby, unaffected habitat. During operations and maintenance, there would be **no impact**.

9.3.3.6.11 Impact TERR-11: Conflict with Provisions of an Adopted HCP/NCCP or Other Approved Local, Regional, or State Habitat Conservation Plan

The analysis of the potential conflict of Alternative 5 with provisions of adopted or other approved habitat conservation plans would be the same as that for Alternative 2.

CEQA Conclusion

Alternative 5 is consistent with the provisions of the Draft Yolo HCP/NCCP. Therefore, there would be **no impact** resulting from conflicts with this HCP/NCCP.

9.3.3.6.12 Impact TERR-12: Potential Effects of Tule Canal Floodplain Improvements (Program Level)

As described in Section 2.8.1.7, Alternative 5 would include floodplain improvements along Tule Canal, just north of I-80. These improvements would not be constructed at the same time as

the remaining facilities. They would not be necessary for the project-level components to function but would enhance the performance of the overall alternative. They are included at a program level of detail to consider all the potential impacts and benefits of Alternative 5. Subsequent consideration of environmental impacts would be necessary before construction could begin.

The floodplain improvements would develop a series of secondary channels that connect to Tule Canal north of I-80 (see Figure 2-18 in Chapter 2, *Description of Alternatives*). These channels would increase inundation and available fish rearing habitat in the surrounding areas, which are currently managed as wetland habitat for waterfowl. The floodplain improvement channels would have a 30-foot bottom width with 3:1 side slopes (horizontal to vertical). An operable weir in Tule Canal would help increase the water surface elevation upstream and move water into these channels. These improvements also include a bypass channel around the weir with a 10-foot bottom width and 3:1 side slopes (horizontal to vertical). The bypass channel would be about 2,100 feet long and convey up to 300 cfs. These channels would increase inundation in the surrounding areas, which are currently managed as wetland habitat for waterfowl.

Preliminary vegetation community impacts resulting from construction of the Tule Canal floodplain improvements based on a 10 percent design are shown in Table 9-11.

Table 9-11. Tule Canal Floodplain Improvements Construction Impacts (Alternative 5)

Vegetation Community	Impact (acres)
Annual and Perennial Grassland	0.3
California naturalized annual and perennial grassland	0.3
Freshwater Emergent Wetland	324.9
Managed annual wetland vegetation	324.9
Riparian Forest/Woodland	3.9
Black willow thicket	2.7
Fremont cottonwood forest	1.2
Other	54.8
Agriculture	54.8
Open water	<0.1
Total	383.9

Implementation of Tule Canal floodplain improvements would have the potential to adversely impact known occupied habitat for giant garter snake and Swainson's Hawk and suitable habitat for special-status plant species, western pond turtle, special-status bird species (including Tricolored Blackbird, Western Yellow-billed Cuckoo, and Song Sparrow), special-status bats, sensitive natural communities, and areas subject to USACE, CDFW, and RWQCB jurisdiction (identified above in impacts TERR-1, TERR-3, TERR-4, TERR-5, TERR-6, TERR-8 and TERR-9).

CEQA Conclusion

Direct and indirect impacts resulting from construction of the Tule Canal floodplain improvements would be **significant** because these activities could result in adverse effects on species and associated suitable habitats. In addition, impacts from operations and maintenance would be **significant**.

Implementation of Mitigation Measures MM-TERR-2 through MM-TERR-19, MM-WQ-1, and MM-WQ-2 would reduce construction, operations, and maintenance impacts resulting from construction of the Tule Canal floodplain improvements to **less than significant**.

9.3.3.7 Alternative 6: West Side Large Gated Notch

Alternative 6, West Side Large Gated Notch, is a large notch in the western location that would allow flows up to 12,000 cfs. It was designed with the goal of entraining more fish while allowing more flow into the bypass when the Sacramento River is at lower elevations. See Section 2.9 for more details on the alternative features. Alternative 6 has the same general alignment as Alternatives 3 and 4; therefore, impact comparisons are made to Alternative 3.

Implementation of Alternative 6 would result in direct and indirect construction effects on habitat for State- and Federally listed wildlife species, including valley elderberry longhorn beetle, giant garter snake, western pond turtle, Swainson's Hawk, Western Yellow-Billed Cuckoo, Bank Swallow, special-status plant species (including woolly rose-mallow, northern California black walnut, bristly sedge, Peruvian dodder, Delta tule pea, Sanford's arrowhead, Suisun Marsh aster, heartscale, San Joaquin spearscale, Heckard's pepper grass, California alkali grass, and saline clover), special-status bird species (including birds protected under the MBTA), and other special-status wildlife species (including bats and American badger). It would also result in direct and indirect construction effects on sensitive vegetation communities, including areas potentially subject to USACE and CDFW jurisdiction.

Alternative 6 would result in an overall reduced number of wet days of up to three weeks within the Yolo Bypass (with localized areas experiencing an increased number of wet days of up to four weeks) versus one week overall for Alternative 3 (see Figures 13-29 and 13-30 in Chapter 13, *Recreation*). Within the Tule Ranch Unit of the YBWA, which provides habitat for special-status plant and wildlife species, there would be an increase from one day up to three additional weeks of wet days in the western part of Tule Ranch to two to three additional weeks of wet days in the eastern part of Tule Ranch (see Figure 13-6 in Chapter 13, *Recreation*). This represents up to an additional week of inundation compared to Alternative 3 at Tule Ranch.

Vegetation community impacts for Alternative 6 are shown in Table 9-6 and on Figures 9-12a and 9-12b.

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Figure 9-12a. Alternative 6 Construction Impacts to Vegetation Communities

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Figure 9-12b. Alternative 6 Construction Impacts to Vegetation Communities

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9.3.3.7.1 Impact TERR-1: Potential Mortality or Loss of Habitat for Special-Status Plant Species

Alternative 6 would have a similar construction-related temporary impact to suitable or occupied habitat for special-status plant species as Alternative 3 and would have the second-highest permanent impact after Alternative 5. The footprint of Alternative 6 contains suitable habitat for the same special-status plant species as Alternative 3, including seven species with the potential to occur in marsh and riparian habitat (woolly rose-mallow, northern California black walnut, bristly sedge, Peruvian dodder, Delta tule pea, Sanford's arrowhead, and Suisun Marsh aster) and six species with the potential to occur in alkaline grasslands present along portions of the western transport channel (heartscale, San Joaquin spearscale, Heckard's pepper grass, California alkali grass, and saline clover).

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 6 on special-status species and their habitat is the same as that for Alternative 3.

The increase in the frequency and duration of inundation could result in operations effects on suitable habitat for special-status plant species although the effects are not expected to be substantial. The maintenance effects of Alternative 6 would be the same as those described for Alternative 3.

CEQA Conclusion

If heartscale, San Joaquin spearscale, Heckard's pepper grass, California alkali grass, and saline clover are present in the alkaline grasslands of the Project area, impacts would be **significant** because construction and maintenance of Alternative 6 could result in substantial loss of, affect the long-term survival of, or permanently reduce the acreage and quality of suitable habitat for special status plant species through direct effects resulting from construction or operations or indirect effects from construction or maintenance resulting from the introduction or spread of invasive plant species. During operations, impacts would be **less than significant** because the Project is not anticipated to result in substantial mortality or loss of habitat for special-status plant species, which are tolerant of moist soils and have evolved in an area that is subject to regular inundation.

Implementation of Mitigation Measures MM-TERR-1 and MM-TERR-19 would reduce construction and maintenance impacts to special-status species and their habitat to **less than significant**.

9.3.3.7.2 Impact TERR-2: Potential Disturbance or Mortality of Valley Elderberry Longhorn Beetle and Loss of Its Habitat (Elderberry Shrubs)

Based on 2014 surveys, the construction disturbance area for Alternative 6, including construction, staging, and spoils areas, contains two elderberry shrubs, which are the host plant for valley elderberry longhorn beetle. One of these shrubs is located within California native annual and perennial grassland (non-riparian). The other is in Fremont cottonwood forest (riparian). An additional elderberry shrub is in California native annual and perennial grassland outside the construction footprint, but within the study area, for this alternative. In addition, the

2014 survey area did not cover the entirety of the Alternative 6 study area along the transport channel, and this unsurveyed area could include elderberry shrubs.

Construction of Alternative 6 would result in permanent effects on two elderberry shrubs and temporary effects on one elderberry shrub. In addition, construction of Alternative 6 would result in permanent effects on 2.7 acres (0.9 acre more than Alternative 3) and temporary effects on 1.2 acres (0.1 acre less than Alternative 3) of known suitable valley elderberry longhorn beetle habitat (Table 9-7). The analysis of the potential significance of construction-related direct and indirect effects and maintenance effects of Alternative 6 on valley elderberry longhorn beetle and its elderberry host plant is the same as that for Alternative 3.

Because elderberry shrubs are intolerant of prolonged inundation (Rayburn 2017), the three- to four-week increase in inundation during operations of Alternative 6 could result in operations effects on valley elderberry longhorn beetle and its elderberry host plant if such plants are present within the increased inundation areas.

CEQA Conclusion

Construction impacts to valley elderberry longhorn beetle and its habitat would be **significant** because construction of Alternative 6 would result in permanent effects on two elderberry shrubs, temporary effects on one elderberry shrub, and permanent effects on 2.7 acres and temporary effects on 1.2 acres of suitable valley elderberry longhorn beetle habitat. Maintenance impacts would be **significant** if elderberry shrubs that become established in the channels are not removed before they provide habitat for valley elderberry longhorn beetle. Under operations, impacts to elderberry shrubs could be **significant** if such shrubs are present in areas that experience prolonged inundation sufficient to cause their mortality.

Implementation of Mitigation Measures MM-TERR-2 through MM-TERR-11 would reduce construction, maintenance, and operations impacts to valley elderberry longhorn beetle and its elderberry host plant to **less than significant**.

9.3.3.7.3 Impact TERR-3: Potential Disturbance or Mortality of and Loss of Suitable Habitat for Giant Garter Snake

Construction of Alternative 6 would result in temporary impacts to 3.0 acres and permanent impacts to 12.3 acres of suitable giant garter snake aquatic habitat (Table 9-8). In addition, construction of Alternative 6 would result in temporary disturbance to 17.1 acres and permanent impacts to 16.5 acres of suitable giant garter snake upland habitat. Alternative 6 would impact two acres less of suitable giant garter snake aquatic habitat than Alternative 3 (15.3 acres for Alternative 6 versus 17.3 acres for Alternative 3) and two acres more of suitable upland habitat than Alternative 3 (33.6 acres for Alternative 6 versus 31.6 acres for Alternative 3).

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 6 on giant garter snake and its suitable aquatic and upland habitat is the same as that for Alternative 3.

The operations and maintenance effects of Alternative 6 on giant garter snake and its suitable aquatic and upland habitat would be the same as those described for Alternative 3.

CEQA Conclusion

Direct or indirect impacts to giant garter snake resulting from construction and maintenance of Alternative 6 would be **significant** because these activities could result in the mortality or injury of individuals and a reduction in the quantity and quality of suitable giant garter snake habitat. During operations, impacts would be **less than significant**.

Implementation of Mitigation Measures MM-TERR-2 through MM-TERR-6, MM-TERR-11 through MM-TERR-14, MM-WQ-1, and MM-WQ-2 would reduce the impacts of project construction, operations, and maintenance to giant garter snake and its suitable aquatic and upland habitat to **less than significant**.

9.3.3.7.4 Impact TERR-4: Potential Disturbance or Mortality of and Loss of Suitable Habitat for Western Pond Turtle

Construction of Alternative 6 would result in temporary impacts to 2.0 acres and permanent impacts to 10.5 acres of suitable western pond turtle aquatic habitat. In addition, construction of Alternative 6 would result in temporary disturbance to 28.7 acres and permanent impacts to 87.0 acres of suitable western pond turtle upland habitat. Alternative 6 would impact 0.3 more acre of suitable aquatic western pond turtle habitat than Alternative 3 (12.5 acres for Alternative 6 versus 12.2 acres for Alternative 3) and 24.4 more acres of suitable upland western pond turtle habitat than Alternative 3 (115.7 acres for Alternative 6 versus 91.3 acres for Alternative 3).

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 6 on western pond turtle and its suitable habitat is the same as that for Alternative 3.

The operations and maintenance effects of Alternative 6 on western pond turtle and its suitable habitat would be the same as those described for Alternative 3.

CEQA Conclusion

Direct and indirect impacts to western pond turtle resulting from construction and maintenance of Alternative 6 would be **significant** because these activities could result in the mortality or injury of individuals and a reduction in the quantity and quality of suitable western pond turtle aquatic habitat and upland habitat. During operations, there would be **no impact**.

Implementation of Mitigation Measures MM-TERR-2 through MM-TERR-6, MM-TERR-11, MM-TERR-15, MM-WQ-1, and MM-WQ-2 would reduce construction, operations, and maintenance impacts to western pond turtle and its suitable habitat to **less than significant**.

9.3.3.7.5 Impact TERR-5: Potential Disturbance or Mortality of Nesting Bird Species and Removal of Suitable Nesting and Foraging Habitat

Construction effects of Alternative 6 on State- and/or Federally listed bird species, including Swainson's Hawk, Least Bell's Vireo, Western Yellow-Billed Cuckoo, and Bank Swallow, and on other special-status bird species that are known or have the potential to occur in the construction study area, including bird species protected by the MBTA, would include temporary impacts to 33.8 acres of suitable nesting and foraging habitat and permanent impacts to 108.7 acres of suitable nesting and foraging habitat for these species (Table 9-6). Alternative 6 would temporarily impact 0.5 more acre than Alternative 3 (33.8 acres for Alternative 6 versus

33.3 acres for Alternative 3) and would permanently impact 27.0 more acres than Alternative 3 (108.7 acres for Alternative 6 versus 81.7 acres for Alternative 3) of suitable nesting and foraging habitat. Impacts to riparian habitat (black willow thicket, box elder forest, Fremont cottonwood forest, and valley oak woodland) would be considered long-term temporary impacts because it would take more than one year to establish dominant tree vegetation, which would represent a temporal loss of habitat for special-status nesting birds.

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 6 on nesting bird species and their suitable nesting and foraging habitat is the same as that for Alternative 3.

The operations and maintenance effects of Alternative 6 on nesting bird species and their suitable nesting and foraging habitat would be the same as those described for Alternative 3.

CEQA Conclusion

Direct and indirect impacts on nesting bird species resulting from construction and maintenance of Alternative 6 would be **significant** because these activities could result in the mortality, injury, or disturbance of individuals or eggs and a reduction in the quantity and quality of suitable nesting and foraging habitat. Under operations, impacts would be **less than significant**.

Implementation of Mitigation Measures MM-TERR-2 through MM-TERR-6, MM-TERR-11, and MM-TERR-16 would reduce construction and maintenance impacts to nesting bird species and their suitable nesting and foraging habitat to **less than significant**.

9.3.3.7.6 Impact TERR-6: Potential Disturbance, Injury, or Mortality of Special-Status Tree-Roosting Bats and Removal of Roosting Habitat

Construction effects of Alternative 6 on special-status bat species, including pallid bat and western red bat, would include temporary impacts to 8.1 acres of suitable riparian habitat and 22.0 acres of suitable grassland and open-water roosting and foraging habitat. In addition, construction effects would include the permanent loss of 26.8 acres of suitable riparian habitat and conversion of 61.6 acres of suitable grassland and open-water foraging habitat to primarily open-water habitat that is still suitable for foraging (Table 9-6). Alternative 6 would temporarily impact 0.9 more acre of suitable roosting and foraging habitat than Alternative 3 (30.1 acres for Alternative 6 versus 29.2 acres for Alternative 3) and permanently impact 24.7 more acres of suitable roosting and foraging habitat than Alternative 3 (88.4 acres for Alternative 6 versus 63.7 acres for Alternative 3). Impacts to riparian habitat (black willow thicket, box elder forest, Fremont cottonwood forest, and valley oak woodland) would be considered long-term temporary impacts because it would take more than one year to establish dominant tree vegetation, which would represent a temporal loss of habitat for special-status tree-roosting bats.

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 6 on special-status bat species and their suitable roosting habitat is the same as that for Alternative 3.

The operations and maintenance effects of Alternative 6 on special-status bat species and their suitable roosting habitat would be the same as those described for Alternative 3.

CEQA Conclusion

Direct and indirect impacts to special-status tree-roosting bats, including pallid bats and western red bats, resulting from construction and maintenance of Alternative 6 would be **significant** because these activities could result in the mortality, injury, or disturbance of individuals and a reduction in the quantity and quality of suitable or occupied habitat. During operations, there would be **no impact**.

Implementation of Mitigation Measures MM-TERR-2 through MM-TERR-6, MM-TERR-11, and MM-TERR-17 would reduce construction and maintenance impacts to special-status bat species and their suitable roosting habitat to **less than significant**.

9.3.3.7.7 Impact TERR-7: Potential Disturbance or Mortality of American Badger and Loss of Its Habitat

Construction effects of Alternative 6 on suitable American badger foraging and denning habitat would include temporary impacts to 20.6 acres and permanent impacts to 60.2 acres of potentially suitable grassland habitat (Table 9-6). Alternative 6 would temporarily impact 1.0 more acre than Alternative 3 (20.6 acres for Alternative 6 versus 19.6 acres for Alternative 3) and permanently impact 17.4 more acres than Alternative 3 (60.2 acres for Alternative 6 versus 42.8 acres for Alternative 3) of suitable foraging and denning habitat for American badger.

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 6 on American badger and its suitable foraging and denning habitat is the same as that for Alternative 3.

The operations and maintenance effects of Alternative 6 on American badger and its suitable foraging and denning habitat would be the same as those described for Alternative 3.

CEQA Conclusion

Direct and indirect impacts to American badger resulting from construction of Alternative 6 would be **significant** because construction activities could result in injury or mortality. During operations and maintenance, there would be **no impact**.

Implementation of Mitigation Measures MM-TERR-2 through MM-TERR-6 and MM-TERR-18 would reduce construction impacts to American badger and its suitable foraging and denning habitat to **less than significant**.

9.3.3.7.8 Impact TERR-8: Potential Loss of Sensitive Natural Communities

Construction effects of Alternative 6 on sensitive natural communities would include temporary impacts to 9.7 acres and permanent impacts to 36.3 acres of California hardstem and bulrush marsh, black willow thickets, box elder forest, Fremont cottonwood forest, and valley oak woodland (Table 9-6). Alternative 6 would temporarily impact 0.7 acre less than Alternative 3 (9.7 acres for Alternative 6 versus 10.4 acres for Alternative 3) and permanently impact 7.0 more acres than Alternative 3 (36.3 acres for Alternative 6 versus 29.3 acres for Alternative 3) of sensitive natural communities.

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 6 on sensitive natural communities is the same as that for Alternative 3.

The operations and maintenance effects of Alternative 6 would be the same as those described for Alternative 3.

CEQA Conclusion

Direct and indirect impacts to sensitive natural communities, including freshwater marsh, riparian forest, and riparian woodland, resulting from construction of Alternative 6 would be **significant** because these activities could conflict with the implementation of general and/or conservation plan policies related to the protection of terrestrial biological resources. During operations and maintenance, there would be **no impact**.

Implementation of Mitigation Measures MM-TERR-2, MM-TERR-3, MM-TERR-5, MM-TERR-6, MM-TERR-11, MM-WQ-1, and MM-WQ-2 would reduce construction impacts to sensitive natural communities to **less than significant**.

9.3.3.7.9 Impact TERR-9: Potential Effects on USACE, CDFW, and RWQCB Jurisdictional Areas

Impacts to potential USACE and CDFW jurisdiction resulting from construction of Alternative 6 are shown on Figures 9-13a and 9-13b. Construction effects of Alternative 6 would include temporary impacts to about 2.9 acres of potential USACE wetlands and 1.5 acres of potential non-wetland waters of the United States and permanent impacts to about 14.8 acres of potential USACE wetland and 1.4 acres of potential non-wetland waters of the United States. In addition, construction of Alternative 6 would result in temporary impacts to about 10.9 acres of potential CDFW riparian habitat and 1.5 acres of potential CDFW unvegetated streambed and permanent impacts to about 41.5 acres of potential CDFW riparian habitat and 1.4 acres of potential CDFW unvegetated streambed (Table 9-9 and Table 9-10). Alternative 6 would have the lowest total acreage of impacts to USACE wetland waters of the United States although they would be similar to the impacts from Alternative 3. Compared to Alternative 3, Alternative 6 would temporarily impact 0.4 acre more of USACE jurisdiction (4.4 acres for Alternative 6 versus 4.0 acres for Alternative 3) and 0.4 acre fewer of CDFW jurisdiction (12.4 acres for Alternative 6 versus 12.8 acres for Alternative 3). In addition, Alternative 6 would permanently impact 1.3 more acres of USACE jurisdiction (16.2 acres for Alternative 6 versus 14.9 acres for Alternative 3) and 7.9 more acres of CDFW jurisdiction (42.9 acres for Alternative 6 versus 35.0 acres for Alternative 3).

The analysis of the potential significance of construction and operations direct and indirect effects of Alternative 6 on potential USACE, CDFW, and RWQCB jurisdictional areas is the same as that for Alternative 3.

The operations and maintenance effects of Alternative 6 on potential USACE, CDFW, and RWQCB jurisdictional areas would be the same as those described for Alternative 3.



Figure 9-13a. Alternative 6 Construction Impacts to Potential USACE and CDFW Jurisdictional Areas

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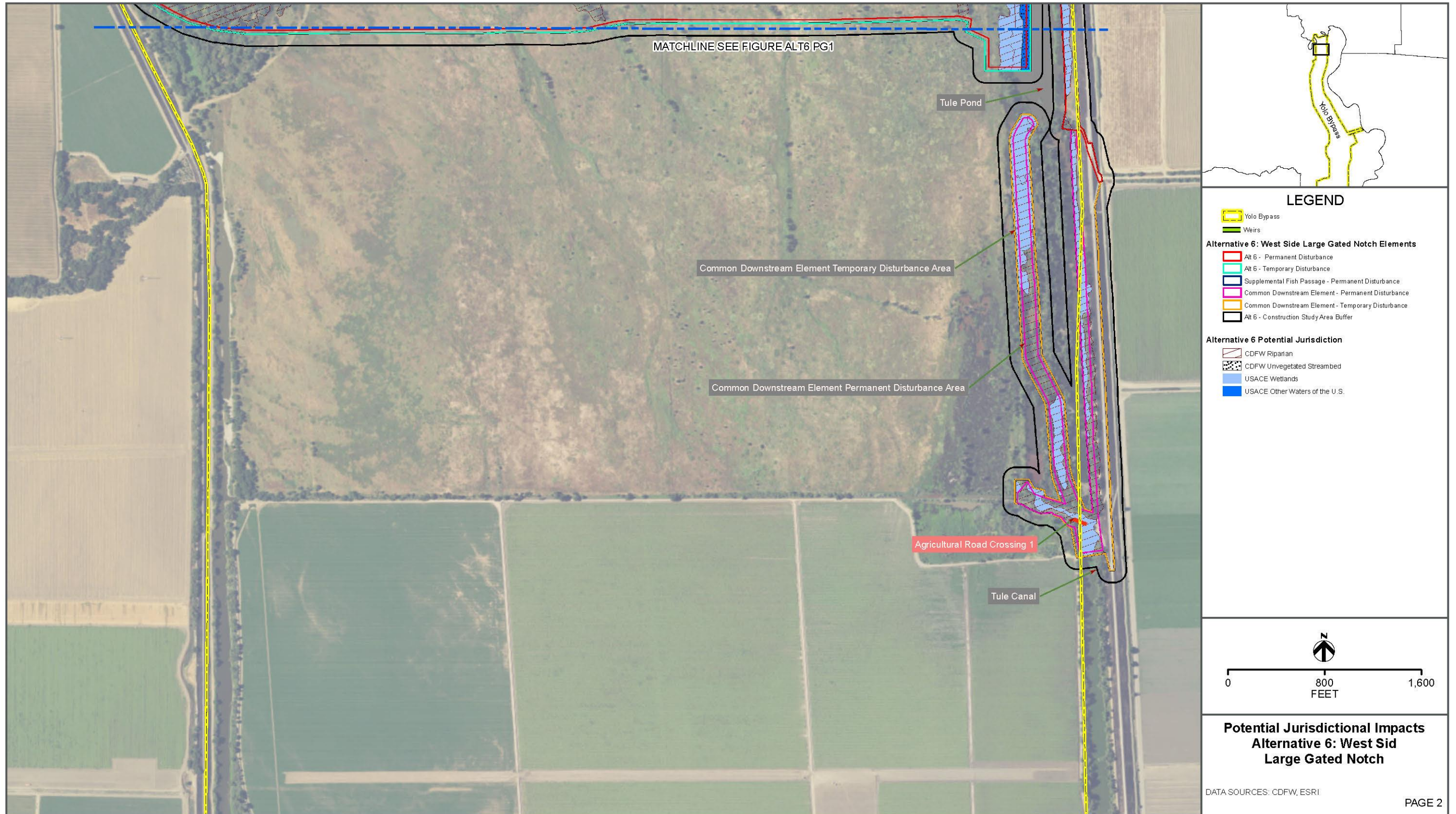


Figure 9-13b. Alternative 6 Construction Impacts to Potential USACE and CDFW Jurisdictional Areas

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CEQA Conclusion

Direct and indirect impacts to non-wetland waters of the United States (open water), wetland waters of the United States (freshwater emergent wetland and freshwater emergent marsh), CDFW riparian areas (freshwater marsh, freshwater emergent wetland, and riparian forest/woodland), and RWQCB jurisdictional areas resulting from construction of Alternative 6 would be **significant** because these activities would result in direct removal, filling, or hydrological interruption, which would result in the permanent reduction in acreage or function of these areas. During operations and maintenance, there would be **no impact**.

Implementation of Mitigation Measures MM-TERR-2, MM-TERR-3, MM-TERR-5, MM-TERR-6, MM-TERR-11, MM-WQ-1, and MM-WQ-2 would reduce construction impacts to USACE, RWQCB, and CDFW jurisdiction to **less than significant**.

9.3.3.7.10 Impact TERR-10: Potential Interference with Movement of Native Resident or Migratory Wildlife Species

The construction, operations, and maintenance effects of Alternative 6 on the movement of native resident or migratory wildlife species would be the same as those described for Alternative 3.

The analysis of the potential significance of construction, operations, and maintenance effects of Alternative 6 on the movement of native resident or migratory wildlife species is the same as that for Alternative 3.

CEQA Conclusion

Impacts on wildlife movement resulting from construction of Alternative 6 would be **less than significant** because although construction could interfere with movement of native resident or migratory wildlife species, construction activities are not anticipated to substantially interfere with the movement of these species as they could move to nearby, unaffected habitat. During operations and maintenance, there would be **no impact**.

9.3.3.7.11 Impact TERR-11: Conflict with Provisions of an Adopted HCP/NCCP or Other Approved Local, Regional, or State Habitat Conservation Plan

The analysis of the potential conflict of Alternative 6 with provisions of adopted or other approved habitat conservation plans is the same as that for Alternative 3.

CEQA Conclusion

Alternative 6 is consistent with the provisions of the Draft Yolo HCP/NCCP. Therefore, there would be **no impact** resulting from conflicts with this HCP/NCCP.

9.3.4 Summary of Impacts

Table 9-12 summarizes the identified impacts to vegetation, wetlands, and wildlife resources in the study area.

Table 9-12. Summary of Construction, Operations, and Maintenance Impacts and Mitigation Measures – Vegetation, Wetlands, and Wildlife Resources

Impact	Alternative	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Impact TERR-1: Potential Mortality or Loss of Habitat for Special-Status Plant Species	No Action	NI	—	NI
	1	S (C, M), LTS (0)	MM-TERR-1	LTS
	2, 3, 4, 5, 6	S (C, M), LTS (0)	MM-TERR-1, 19	LTS
Impact TERR-2: Potential Disturbance or Mortality of Valley Elderberry Longhorn Beetle and Loss of Its Habitat (Elderberry Shrubs)	No Action	NI	—	NI
	1, 2, 3, 4, 5	S (C, M), LTS (O)	MM-TERR-2-11	LTS
	6	S (C, O, M)	MM-TERR-2-11	LTS
Impact TERR-3: Potential Disturbance or Mortality of and Loss of Suitable Habitat for Giant Garter Snake	No Action	NI	—	NI
	All Action Alternatives	S (C, M), LTS (O)	MM-TERR-2-6, 11-14; WQ-1, 2	LTS
Impact TERR-4: Potential Disturbance or Mortality of and Loss of Suitable Habitat for Western Pond Turtle	No Action	NI	—	NI
	1, 2, 3, 4, 6	S (C, M), NI (O)	MM-TERR-2-6, 11, 15; WQ-1, 2	LTS
	5	S (C, M), NI (O)	MM-TERR-2-6, 11, 15; WQ-1, 2	LTS
Impact TERR-5: Potential Disturbance or Mortality of Nesting Bird Species and Removal of Suitable Nesting and Foraging Habitat	No Action	NI	—	NI
	All Action Alternatives	S (C, M), LTS (O)	MM-TERR-2-6, 11, 16	LTS

Impact	Alternative	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Impact TERR-6: Potential Disturbance, Injury, or Mortality of Special-Status Tree-Roosting Bats and Removal of Roosting Habitat	No Action	NI	—	NI
	All Action Alternatives	S (C, M), NI (O)	MM-TERR-2-6, 11, 17	LTS
Impact TERR-7: Potential Disturbance or Mortality of American Badger and Loss of Its Habitat	No Action	NI	—	NI
	All Action Alternatives	S (C), NI (O, M)	MM-TERR-2-6, 18	LTS
Impact TERR-8: Potential Loss of Sensitive Natural Communities	No Action	NI	—	NI
	All Action Alternatives	S (C), NI (O, M)	MM-TERR-2, 3, 5, 6, 11; WQ-1, 2	LTS
Impact TERR-9: Potential Effects on USACE, CDFW, and RWQCB Jurisdictional Areas	No Action	NI	—	NI
	All Action Alternatives	S (C), NI (O, M)	MM-TERR-2, 3, 5, 6, 11; WQ-1, 2	LTS
Impact TERR-10: Potential Interference with Movement of Native Resident or Migratory Wildlife Species	No Action	NI	—	NI
	All Action Alternatives	LTS (C), NI (O, M)	—	LTS
Impact TERR-11: Conflict with Provisions of an Adopted HCP/NCCP or Other Approved Local, Regional, or State Habitat Conservation Plan	No Action	NI	—	NI
	All Action Alternatives	NI	—	NI
Impact TERR-12: Potential Effects of Tule Canal Floodplain Improvements (Program Level)	No Action	NI	—	NI
	1, 2, 3, 4, 5 (Project), 6	NA	—	NI
	5 (Program)	S (C, O, M)	MM-TERR-2-19; WQ-1, 2	LTS

Key: C = construction; LTS = less than significant; NA = not applicable; NI = no impact; M = maintenance; O = operations; S = significant

9.4 Cumulative Impacts Analysis

This section describes the cumulative impacts analysis for vegetation, wetlands, and wildlife resources. Section 3.3, *Cumulative Impacts*, presents an overview of the cumulative impacts analysis, including the methodology and the projects, plans, and programs considered in the cumulative impacts analysis.

9.4.1 Methodology

This evaluation of cumulative impacts considers the effects of the Project and how they might combine with the effects of other past, present, and future projects or actions to create significant impacts on vegetation, wetlands, and wildlife resources. The area of analysis for these cumulative impacts includes both the Yolo Bypass area and the larger Sacramento River system. The timeframe for this cumulative impact analysis includes the past, present, and probable future projects producing related or cumulative impacts that have been identified in the area of analysis.

This cumulative impact analysis uses the project analysis approach described in detail in Section 3.3, *Cumulative Impacts*.

9.4.2 Cumulative Impacts

Several related and reasonably foreseeable projects and actions could result in impacts to vegetation, wetlands, and wildlife resources in the Project area. Given that the Project would not result in a permanent loss of oak woodland, wetland, non-wetland waters, or streambed, the Lead Agencies do not anticipate that the Project would contribute to cumulative impacts to these resources.

However, there might be a net loss of riparian habitats that Federally and State-listed avian species, special-status bats, and nesting birds could use, including black willow thickets, box elder forest, Fremont cottonwood forest, mixed hardwood forest, and sandbar willow thickets. Additionally, there could be a net loss of suitable breeding habitat for the Federally and State-listed giant garter snake. Therefore, the Project could contribute to a cumulative indirect impact due to the loss of these habitats and temporal effects while habitat mitigation becomes established.

The Lower Elkhorn Basin Levee Setback Project, American River Common Features Project, and Sacramento River Bank Protection Project could result in a net loss of similar habitats during a similar timeframe as the Project. However, all three federal projects would require consultation under ESA and would implement their own mitigation measures to ensure minimal impacts to Federally listed species and their associated habitats. Additionally, the Yolo HCP/NCCP and the Yolo Conservation Plan, scheduled for adoption in 2018, provide a framework for establishing meaningful mitigation for the local species of concern, including giant garter snake.

Finally, several of the local projects being analyzed serve to improve aquatic functions associated with surface waters in the region. The cumulative benefit of these projects, including the Liberty Island Conservation Bank, the Lower Putah Creek 2 North America Wetlands Conservation Act Project, the Lower Yolo Restoration Project, the North Delta Flood Control

and Ecosystem Restoration Project, the Liberty Island Conservation Bank, California EcoRestore projects, the Cache Slough Area Restoration at Prospect Island, and the Prospect Island Tidal Habitat Restoration Project would also serve, at least in part, to offset the loss of certain habitat functions associated with the projects described above.

Therefore, the cumulative indirect loss of wildlife habitat, in both the long and short term, would be **significant. After implementation of mitigation and after considering the Project in the context of several local restoration projects, the cumulative impacts to vegetation, wetlands, and wildlife resources would not be cumulatively considerable.**

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10 Cultural and Paleontological Resources

Cultural resources are defined in this chapter as prehistoric and historic archaeological sites, architectural/built-environment resources (e.g., levees, weirs, and buildings), and places important to Native Americans and other ethnic groups, generally 50 years old or older regardless of their significance. For purposes of the California Environmental Quality Act (CEQA), the cultural resources section also includes paleontological resources (e.g., fossilized plant and animal remains and impressions of past plants, animals, or other organisms) that must be taken into account for potential project-related impacts. Cultural resources are “human” related, whereas paleontological resources are “non-human” evidence of life.

This chapter assesses potential impacts of the action alternatives on Historic Properties and Historical Resources and identifies mitigation measures to reduce or eliminate impacts on those resources in the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project (Project) area (see Chapter 2, *Description of Alternatives*, for a description of the Project area; the Project area is also identified as the area of potential effects [APE] for Section 106 of the National Historic Preservation Act compliance).

This chapter first provides a description of the environmental setting and affected environment as it pertains to the types of cultural resources that occur in the APE, including a subsection that describes the potential to encounter previously unidentified, buried archaeological resources. This chapter describes the regulatory framework that governs Historic Properties and Historical Resources and gives an overview of the methods used to identify the kind and density of cultural resources in the Project area (i.e., the Yolo Bypass). This chapter provides an analysis of anticipated impacts associated with Project alternatives and, where appropriate, provides mitigation measures for resource impacts. Lastly, this chapter includes a qualitative analysis of cumulative effects as they relate to cultural resources.

10.1 Environmental Setting / Affected Environment

10.1.1 Inventory Methods and Results

This section discusses the methods and results of cultural resources investigations conducted for the Project. Professional archaeological staff conducted the investigations between 2014 and May 2017. All individuals who participated in cultural resources investigations meet the Secretary of the Interior’s Standards and Guidelines for Professional Qualifications in archaeology and/or history. The investigations included records searches of the California Historical Resources Information System (CHRIS) between 2014 and 2017 to identify recorded cultural resources; field checking the resources identified in the records searches; pedestrian surveys of portions of the APE to look for and record new resources found within the APE; historic map and literature research; a geoarchaeological assessment and sensitivity analysis of the northern part of the APE to determine the potential for buried archaeological sites; a search of the sacred lands database maintained by the Native American Heritage Commission (NAHC); and consultation with Native American contacts provided by the NAHC.

10.1.1.1 Literature and Records Search

10.1.1.1.1 California Historical Resources Information System (CHRIS)

Four record searches were conducted between September 2014 and May 2017 to provide complete coverage of the entire APE. The CHRIS was queried at the Northeastern Information Center (NEIC) at California State University, Chico (NEIC File No. H14-8) and the Northwest Information Center (NWIC) at Sonoma State University (NWIC File No.'s 14-0246, 14-1147, and 16-1695). These searches included coverage extending to a half-mile radius around the Project APE.

In addition to the archaeological site location maps maintained at the NEIC and NWIC, the following documents were reviewed:

- California Inventory of Historical Resources (1976)
- Office of Historic Preservation Directory of Properties in the Historic Property Data File for Yolo and Sutter Counties (2012)
- Office of Historic Preservation Archeological Determinations of Eligibility, Yolo and Sutter Counties (2012)

10.1.1.1.2 Additional Records and Online Sources

The literature search included looking at historic-era maps, searching through California Department of Water Resources (DWR) project files, United States Army Corps of Engineers (USACE) operations and maintenance manuals, and internet searches. The internet searches included the General Land Office survey maps at the Bureau of Land Management; the United States Geological Survey (USGS) historical map collection; California Geological Survey maps; Historicaerials.com; the Yolo County Archives; the Online Archive of California; and the Library of Congress.

10.1.1.1.3 Historical Societies

In addition to the CHRIS, DWR files, and online records searches, the Yolo and Sacramento County Historical Societies were contacted on May 2, 2016, for any information they have on historical resources in the APE; neither organization responded.

10.1.1.2 Literature and Records Search Results

10.1.1.2.1 Previous and Current Surveys within the APE

The NEIC and NWIC record searches conducted for this Project identified five previous surveys that have occurred within the Project area (Bakic and Maniery 1998; Pierce 2017; and Pierce 2017). The records searches and review of DWR's files also identified 10 surveys completed within the half-mile buffer surrounding the APE (Eghermann and Hatoff 2002; Pierce 2017; Jackson 1986; Marvin and Davis-King 1995; Peak 2000; ICF 2014). DWR also conducted field studies in the APE between 2014 and 2017 (Nadolski 2014; Nolte 2015; Pierce 2017; Scher 2016 as cited in Pierce 2017).

10.1.1.2.2 Previously Recorded Resources in and Near the APE

The records searches identified 12 previously recorded cultural resources in or within a half-mile radius of the Project APE (Table 10-1). The three resources identified within the APE are a grove of valley oak trees (P-57-000132H), a segment of the Yolo Bypass west levee (P-57-000519), and the Reclamation District (RD) 1600 Tule Canal (P-57-000414). The trees and canal are not eligible for listing on the California Register of Historical Resources (CRHR) or the National Register of Historic Places (NRHP), but the levee is being treated as eligible for listing on both registers.

Table 10-1. Resources Previously Recorded within a Half Mile of the APE

Primary No.	Resource type	In APE	Outside APE	CRHR Eligibility	NRHP Eligibility
P-51-000008	Prehistoric	-	X	Unevaluated	Unevaluated
P-51-000152	Historic house foundations	-	X	Recommended ineligible in site record	Recommended ineligible in site record
P-57-000044	Prehistoric	-	X	Unevaluated	Unevaluated
P-57-000132	Trees/natural vegetation	X	X	Not Eligible	Not Eligible
P-57-000195	Sacramento Northern Electric (SNE) railroad route, element of district	-	X	Unevaluated	Unevaluated
P-57-000414	RD 1600 Tule Canal	X	X	Potentially Eligible	Potentially Eligible
P-57-000415	Pump house	-	X	Unevaluated	Unevaluated
P-57-000416	Water control/culvert	-	X	Not Eligible	Not Eligible
P-57-000519	Levee Unit 127	X	X	Treated as Eligible	Treated as Eligible
P-57-000521	Irrigation ditches	-	X	Unevaluated	Unevaluated
P-57-000594	Cache Creek north levee	-	X	Unevaluated	Unevaluated
P-57-000777	SNE trestle, element of district	-	X	Unevaluated	Unevaluated

Key: APE = Area of Potential Effects; CRHR = California Register of Historical Resources; NRHP = National Register of Historic Places; RD = Reclamation District

The literature and records search further indicated an archaeological site with human remains had been identified but not formally recorded on California Department of Parks and Recreation (DPR) 523 Forms; the site is located inside the Fremont Weir Wildlife Area (FWWA). The Fremont Weir was recognized as a potential historical resource, but had not been formally recorded. The site with reported human remains was determined to be outside of the APE and half-mile buffer. The Fremont Weir is within the Project APE.

No potential archaeological or historic built resources were identified from the review of the additional records and online sources, ethnographic sites, or other tribal interests identified within the APE or half-mile buffer during the literature and records search. Also, neither the Yolo nor the Sacramento County Historical societies responded to DWR's request for information on potential historical resources within the APE or surrounding half-mile buffer.

10.1.1.2.3 Paleontological Resources

The background research revealed that the fossil bearing Pleistocene Modesto formation may be present within the Lower Sacramento River floodplain. The Pleistocene Modesto formation consists of alluvial terraces and fans dating between 9,000 and 75,000 years ago. There are no documented fossiliferous materials in the APE.

10.1.1.3 Field Survey Methods

10.1.1.3.1 Pedestrian Survey

Field surveys were conducted in 2014 (Nadolski 2014), 2015 (Nolte 2015), 2016 (Scher 2016 as cited in Pierce 2017), and 2017 (Pierce 2017) to relocate and ground-verify previously recorded archaeological and historic built resources (i.e., look for accurate site boundaries, site conditions, etc.), and to identify any unrecorded resources potentially located within the APE. A variety of field methods were employed during the studies to accomplish these goals. Methods included parallel and meandering pedestrian transects with variable spacing, and examination of sections of the existing passage prior to conducting a geotechnical survey. In heavily vegetated areas between the Sacramento River and Fremont Weir, and along the Tule Canal, hoes were used to scrape the grass at 10- to 20-meter-wide intervals to expose the ground surface. Special attention was paid to examining the cut bank of the Sacramento River during low water conditions for evidence of buried artifacts or other cultural materials. Pedestrian surveys were generally restricted to the Fremont Weir Wildlife Area and near the areas described above. Additional surveys were not conducted due to access restrictions; however, it should be noted that based upon the surveys conducted the archaeologists noted that large parts of the APE are highly disturbed in the Yolo Bypass and that the areas sensitive for the presence of buried archaeological deposits are near the Sacramento River which were surveyed. The APE under consideration includes areas that would be altered due to the construction of infrastructure and ancillary features as well as areas that may be subject to changed inundation conditions. The area surveyed for cultural resources is probably less than five percent when compared to this very large study area.

Newly discovered and previously documented resources were recorded on appropriate DPR forms, or existing records updated as deemed necessary based on the field observations.

10.1.1.3.2 Geoarchaeological Testing

The area immediately surrounding the northern end of the Yolo Bypass portion of the Project, near the cities of Woodland and West Sacramento, was found to be generally sensitive for buried archaeological sites; a geoarchaeological test was conducted in July 2016 (Scher 2016 as cited in Pierce 2017). The goal of the test was to determine if buried resources were present near the proposed Fremont Weir fish passage channel and to determine the sensitivity of the landform for

buried archaeological sites. Tribal monitors from both the Yocha Dehe Wintun Nation and United Auburn Indian Community of the Auburn Rancheria were invited to be present during testing, but only Mr. Laverne Bill, a monitor from the Yocha Dehe Wintun Nation, was present during the ground-disturbing activities.

Trenches were excavated along the sides of the channel. The channel bottom was mapped as waters of the United States and could not be excavated without a permit. This led to trenching along the sides of the channel to the depth that the proposed Fremont Weir fish passage would reach. Additional geoarchaeological testing is being conducted in October 2017. Surveys will be conducted at the headworks structures and supplemental fish passage for different alternative locations.

10.1.1.4 Field Survey Results

The 2014 to 2017 cultural resources studies identified 23 archaeological sites and historic built resources. These sites include the 12 previously identified sites and 11 newly discovered resources.

The 2014 pedestrian surface survey confirmed that large parts of the Project area experienced previous ground disturbance (i.e., sediment removal, excavation of borrow areas, and excavation for construction of Tule Canal and Fremont Weir), and that the survey area is sensitive for the presence of buried deposits of cultural resources. The sensitivity of the area for buried deposits of cultural resources was confirmed by the identification of three buried prehistoric sites, DWR-FW-1, DWR-FW-2, and DWR-FW-3, within the 2014 survey area.

10.1.1.4.1 Archaeological Sites

Seven of the 23 resources identified in the APE are archaeological sites. These include four prehistoric, two historic, and one multicomponent (i.e., contains both prehistoric and historic materials) sites, as listed in Table 10-2. Historic archaeological site P-57-000132, the only resource identified within the APE, is described in the following.

Table 10-2. Archaeological Sites in the APE and Half-Mile Radius

Primary No.	Site Type	In APE	In Half-Mile Radius	NRHP Status
P-51-000008	Prehistoric	-	X	Unevaluated
P-51-000152	Historic house foundations	-	X	Recommended ineligible in site record
P-57-000044	Prehistoric/Historic	-	X	Unevaluated
P-57-000132	Trees/natural vegetation	X	X	Not eligible; determined not a cultural resource
DWR-FW-1	Prehistoric	-	X	Unevaluated; (record being drafted)
DWR-FW-2	Prehistoric	-	X	Unevaluated; (record being drafted)
DWR-FW-3	Prehistoric	-	X	Unevaluated; (record being drafted)

Key: APE = Area of Potential Effects; NRHP = National Register of Historic Places

Valley Oak Grove 10 (P-57-000132; YOL-HRI-1/037)

Historic archaeological site P-57-000132 is the Valley Oak Grove 10 site mapped and recorded as pure valley oaks, Grove 10 in 1986 on a historic resource inventory (HRI) form by Kathleen Les. The trees are considered to be natural resources and not cultural resources. Therefore, the site is not considered to be eligible for listing on the NRHP.

10.1.1.4.2 Historic Built Environment Resources

Of the 23 cultural resources identified in the APE and half-mile buffer, most are historic built resources. Of these, five are located within the APE, as shown in Table 10-3 and described in the following:

Table 10-3. Historic Built Environment Resources within the APE and Half-Mile Radius

Primary No.	Site Type	In APE	In Half-Mile Radius	NRHP Status
P-57-000195	SNE railroad route, element of district	-	X	Status unknown
P-57-000414	RD 1600 Tule Canal	X	X	Not eligible
P-57-000415	Pump house	-	X	Status unknown
P-57-000416	Tule Canal culvert control structure	X	X	Not eligible; destroyed
P-57-000519	Yolo Bypass Levee Unit 127	-	X	Treated as eligible
P-57-000521	Irrigation ditches	-	X	Unevaluated
P-57-000594	Cache Creek north levee	-	X	Status unknown
P-57-000777	SNE trestle, element of district	-	X	Status unknown
P-57-001117	Historic Fremont Weir	X	-	Treated as eligible to potential Sacramento River Flood Control Project (SRFCP) historic district
P-57-001118	East Yolo Bypass Levee/ Reclamation District 1600 Levee	X	-	Treated as eligible to potential SRFCP historic district
P-57-001272	SNE District	-	X	Status unknown
DWR-FW-4	Historic structure	-	X	Unevaluated; (record being drafted)
DWR-FW-5	Agricultural ditch	-	X	Status unknown
None	Swampland District 18 Tule Canal	X	-	Recommended not eligible (record being drafted)
None	SRFCP unit 122	-	X	Eligible as contributor; drafting record
None	Possible siphon from Agricultural Canal 1 through YB east levee to RD 1600	-	X	Recommended not eligible (record being drafted)
None	Historic district: SRFCP Levees and Features			Treated as a historic district

Key: APE = Area of Potential Effects; NRHP = National Register of Historic Places; SNE = Sacramento Northern Electric; RD = Reclamation District; YB = Yolo Bypass

Note: Treated = The NRHP status of treated as eligible or treated as a historic district assumes these resources are eligible for listing on the NRHP and will be managed as if eligible individually or as a historic district.

RD 1600 Tule Canal (P-57-000414)

It was named Tule Canal because that is the name it had on the modern USGS map. The levee was constructed using dredgers and a team of men. The Sacramento Union (1916) described RD 1600 as, “practically it is the last of 150,000 acres in the Sacramento Valley to be reclaimed.” Originally, the canal would have run over six miles from the Sacramento River to the southern terminus of the west levee of RD 1600 at Old River Road and the Sacramento Northern Railroad tracks. Its northern extent, for about 1.5 miles, was filled in with spoils from excavating Fremont Weir in 1923 and 1924. Agricultural Crossings 2 and 3 cross the canal road.

This segment named Tule Canal on the USGS map is not the Tule Canal that was built by Swampland District No. 18 (SD 18) in 1864 or the later modifications to that canal. This canal was probably mistakenly named that because a small section on its southern end appears to overlap or share the same alignment as the SD 18 Tule Canal. The section mapped as the Tule Canal where Agricultural Road Crossings 2 and 3 are located is not part of the 1864 or post-1900 SD 18 Tule Canal. The site record for P-57-000414 was updated during Project studies to correct the mistaken identity of this canal and rename the resource RD 1600 Tule Canal to distinguish it from the SD 18 Tule Canal.

Pierce (2017:32) evaluated the RD 1600 Tule Canal as not eligible for listing on the NRHP or the CRHR. The RD 1600 levee became a part of the Sacramento River Flood Control Project (SRFCP) between 1933 and 1952; however, the canal was a byproduct of earlier construction in 1914 through 1916 and is not part of the SRFCP. The canal does not fulfill a flood control or drainage function for the SRFCP system. The canal does not possess any of the characteristics required to be eligible for listing on the NRHP through criteria A through D nor does it meet criteria 1 through 4 of CEQA. Concurrence on this evaluation is pending the State Historic Preservation Office (SHPO).

Tule Canal Culvert and Control Structure (P-57-000416)

When this location was visited on August 28, 2015, by DWR archaeologists, the corrugated metal culvert was found to have been replaced by a modern pre-cast concrete culvert and the control structure had been removed and discarded at the side of the canal (Nolte 2015). The resource no longer retains integrity. Therefore, the Tule Canal culvert and control structure (P-57-000416) is no longer a resource requiring consideration or management.

Historic Fremont Weir (P-57-001117)

Fremont Weir was designed by USACE, built by the Utah Construction Company, and completed January 31, 1924, for a reported cost of \$800,000. The weir is a 1.8-mile-long concrete structure with a concrete stilling basin and granite block riprap. The weir has a concrete walled earth-fill section dividing it into two parts where the old river channel was, and has concrete abutments at each end at the intersection with the levees.

Pierce (2017:30-31) evaluated the Fremont Weir as not eligible for listing on the NRHP or CRHR individually because the weir was not intended to function on its own, separately from the SRFCP system. By itself, the weir lacks characteristics that would qualify it under the NRHP or CRHR criteria of significance. However, based on the design, construction, and integrity of the weir as part of the larger system, Pierce (2017) evaluated the weir as a significant contributor to

the SRFCP system, should the SRFCP ever be determined a historic district. As a result, the Fremont Weir is being managed as if it is eligible for listing on the NRHP under Criterion A, for its association with flood control in the Sacramento River basin. This evaluation is currently pending SHPO concurrence.

Yolo Bypass East Levee/Reclamation District 1600 Levee (P-57-001118)

The levees of RD 1600 were built over time by local interests between 1861 and 1916-1917. SD 18 began building a levee along the Yolo County side of the Sacramento River from Knights Landing south 78 miles, but did not complete the project. RD 1600 was created by a special act of the State Legislature and approved May 26, 1913 (Bontee 1930).

Pierce (2017:31-32) evaluated the SRFCP levee Unit 123 as eligible for listing on the NRHP and CRHR only as part of a larger system, with more than 1,000 miles of levees and five weirs, as a contributing element should the SRFCP become a historic district. Therefore, the East levee of the Yolo Bypass (SRFCP levee Unit 123) will be managed as a historic property and historical resource for purposes of the Project.

Swampland District 18 Tule Canal

Emigrants from the Midwest who settled the lands around Putah Creek in the late 1860s and early 1870s recognized the area's rich wheat-growing and habitation capabilities. However, flooding in 1867 and 1868 brought the realization that successful agricultural pursuits would require the farmers to manage the swampland, overflows, and winter flood waters that defined their land. Motivated by the potential to earn great wealth from wheat crops, the farmers of SD 18 worked to reclaim the Putah Sink using Chinese laborers. They began constructing and reconstructing levees and canals that would eventually result in the diversion and/or control of the floodwaters, and which would create additional farmland. The SD 18 Tule Canal is a result of these reclamation efforts.

The SD 18 Tule Canal is being recommended as not eligible for listing on the NRHP or CRHR.

10.1.1.4.3 Geoarchaeological Testing Results

During geoarchaeological testing in 2016 (Scher 2016 as cited in Pierce 2017), subsurface archaeological materials were not encountered at the Fremont Weir fish passage channel. The soils exposed during the trenching indicated that the area flooded regularly and would not have been suitable for habitation (e.g., Native American village sites). Using geographic information system (GIS) coordinates and previous survey maps for the FWWA, along with the Nadolski 2014 and geoarchaeological survey (Scher 2016 as cited in Pierce 2017) results, it was concluded that further survey of inundated and inaccessible areas within the FWWA was unnecessary.

10.1.2 Archaeological Setting

The Project area lies in the Sacramento Valley, drained by the southward-flowing Sacramento River. Three habitat types, mostly differentiated by elevation, divided the Project area before land reclamation and flood control efforts. The higher ground near the Sacramento River was valley foothill riparian, which graded into wet meadow and seasonal wetland to the south, and

then into non-tidal freshwater emergent wetland. The Yolo Basin was largely a flood-prone tule marsh that supported elk, waterfowl, and fresh water fish.

Early inhabitants of the Yolo Basin used the various habitats found throughout the valley, including those previously detailed. They created a sophisticated material culture and established a trade system involving a wide range of manufactured goods from distant and neighboring regions, and their population and villages prospered in the centuries prior to historic contact (Rosenthal et al. 2007).

Many surface sites in the Sacramento Valley have been disturbed, buried, or destroyed by agricultural development, levee construction, and river processes. Untrained individuals and professionals with rudimentary methods performed many excavations of Sacramento Valley and Sacramento-San Joaquin Delta (Delta) sites in the early twentieth century. They focused on excavating burials and artifacts that could be arranged into chronological and stylistic groups and paid little attention to other artifacts such as tool stone manufacturing debris, dietary remains, and cooking features; thus, hampering modern attempts at reanalysis. Early professional efforts emphasized culture history rather than processes that drive culture change.

There are three basic periods include Paleo-Indian, Archaic, and Emergent/Historic (1973, 1974). The discussion that follows is based on these divisions.

10.1.2.1 Paleo-Indian Period

The earliest accepted evidence of human occupation in the Central Valley during the Paleo-Indian Period (11550–8500 BC) comes from the discovery of basally thinned and fluted projectile points at three separate locations in the southern portion of the basin (Rosenthal et al. 2007:151). Evidence of occupation in the Sacramento Valley is rare prior to approximately 3,500 years ago. The extremely sparse evidence for very early dates of occupation is likely due to the frequent flooding the valley endures and the resulting sedimentation (Elsasser 1978; Pierce 2017).

10.1.2.2 Archaic Period

The Archaic Period (5550–1100AD) includes a change to settlement-subsistence in the early part of the period, followed by what appears to be increasingly sedentary lifestyle. Cultural resources identified includes refined and specialized tool assemblages and features, a wide range of non-utilitarian artifacts, abundant trade objects, and plant and animal remains indicative of year-round occupation (Moratto 1984; Ragir 1972; White 2003a, 2003b).

Further changes were noted in later as new technologies were developed during this period, including new types of bone tools and bone implements, and widespread manufactured goods such as ornaments and ceremonial blades (Bennyhoff and Fredrickson 1969; Fredrickson 1974; Moratto 1984) large quantities of habitation debris and features (such as fire-cracked rock heaps, shallow hearths, house floors, and flexed burials) that reflected long-term residential occupation.

10.1.2.3 Emergent/Historic Period

The archaeological record for the Emergent/Historic Period (AD 1000) is more substantial and comprehensive than those of earlier periods in the Central Valley, and the artifact assemblages are the most diverse (Fredrickson 1974; Kowta 1988; Sundahl 1992). The Emergent/Historic

Period, which enjoyed a relatively stable climate as opposed to the earlier periods, is associated with the use of the bow and arrow over the dart and atlatl (Bennyhoff 1994). Other characteristics of this period include a regionally variable economy, changes in manufacturing residues at Emergent/Historic Period sites, and the decentralization of shell bead production (Rosenthal et al. 2007:159).

10.1.3 Ethnographic Setting

According to ethnographer Alfred Kroeber (1932), the Project area falls between ethnographically reported Patwin and Nisenan areas. Heizer and Hester (1970) present information naming the Patwin village of Yo'doi at Knights Landing and the Nisenan village of Hol'lo-wi near the historic town of Fremont. The NAHC however has previously assigned the Patwin as Most Likely Descendants (MLDs) for the Project area. Both the Yocha Dehe Wintun Nation (Patwin) and the United Auburn Indian Community of the Auburn Rancheria (Nisenan and Miwok) claim cultural and traditional affiliation with the Project area.

10.1.3.1 Patwin

Patwin is the name of the southern Wintun people. The Patwin were a series of linguistically and culturally related tribelets that occupied a portion of the lower Sacramento Valley west of the Sacramento River and north of Suisun Bay. The tribelet was the largest political unit for the Patwin and consisted of one primary and several satellite villages. Each tribelet had a discrete territory as well as autonomy relative to other social units. While a common language unified these social units, tribelets each had subtle cultural differences relative to one another. Today, the Patwin descendants affiliated with the Project area are the Yocha Dehe Wintun Nation.

10.1.3.2 Nisenan

The Nisenan are a subgroup of the Penutian linguistic family. Wilson and Towne (1978) defined three main subgroups within the Nisenan tribe: Northern Hill Nisenan, Southern Hill Nisenan, and Valley Nisenan. The Valley Nisenan resided adjacent to the northwestern-most extent of the Project area before Euroamerican contact. Wilson and Towne (1978) report the "Valley Patwin, Northern Maidu and Valley Nisenan shared a consciousness of cultural similarity and an attitude of common cooperation and defense". The traditional Valley Nisenan lived on both sides of the Feather River from above Marysville to the confluence of the Sacramento and Feather rivers, then down both sides of the Sacramento River past the city of Sacramento (Wilson and Towne 1978; Kroeber 1932).

Descendants of the Nisenan still live in the northern Central Valley and maintain their cultural identity (Wilson and Towne 1978: 396–397).

10.1.4 Historic-Era Setting

10.1.4.1 The Spanish Era to the Gold Rush

The first European visitors to California's Sacramento Valley were Spanish explorers. The Spanish presence in California remained concentrated mainly along the coastal strip of missions and presidios, the nearest of which was west of the Delta. When Mexico achieved independence

from Spain in 1822, California became a territory of Mexico but remained a remote frontier province.

Eleven land grants were originally made by the Mexican government in what became Yolo County; however, only five were eventually confirmed after the United States government assumed control of the region. A large portion of the Project area is within the former Rancho Rio de Jesus Maria, which consisted of 26,637 acres granted to Thomas M. Hardy in 1843. Hardy reportedly built a house of tules near the confluence of the Feather and Sacramento rivers (just northeast of the current Project area), but enlisted in the Mexican military and was away most of the time. An 1857 map of the rancho shows several small settlements or residences along the Sacramento River, including McLauren's, Newcomb's, Neelan's, Gleeson's, the town of Fremont, and Spee's Ferry at Fremont.

The discovery of gold at Sutter's Mill in 1848 drew large numbers of gold-seekers to the Central Valley. Sacramento and Stockton developed as shipping centers and stopovers for the mining economy. Some California newcomers made the sometimes-lucrative decision to forego mining and produce food to feed the growing population of miners. Farmers began to work land along the natural levees of the major rivers draining into the Delta. Known as rim landers, these early settlers built so-called shoestring levees atop the natural levees to withstand the highest tidal rises. Later, more extensive levee construction would transform the Central Valley (Thompson 1957:133–146).

10.1.4.2 History of Reclamation in Yolo County to 1917

The Swampland Act of 1850 and subsequent creation of the State Board of Swamp Land Commissioners enabled groups of small landholders to establish districts to undertake Central Valley land reclamation. Although the general region was prone to flooding and often swampy, agriculture was, and continues to be, the primary economic base for Yolo County.

The Project area was subject to flooding and the land did not drain quickly, so it was unsuitable for most agriculture. The early landowners in the Yolo Bypass area used it primarily for grazing livestock. Thomas F. Laugenour, one of the landowners in the northern Yolo Bypass area, built a flood gate in 1892 and had a creamery in what is now the FWWA. It was not until after the Reclamation Districts and the SRFCP built levees and controlled flood waters that agriculture became a viable venture in the Yolo Bypass area. In fact, RD 1600 was one of the last areas to be leveed in 1916.

10.1.4.3 USACE Sacramento River Flood Control Project (1917–1961)

The SRFCP is the core of the flood protection system along the Sacramento River and its tributaries. The SRFCP was authorized under the Flood Control Act of 1917, and by 1961, construction of all components was completed. Upon completion, the SRFCP was composed of approximately 1,000 miles of levees, five weirs (Moulton, Colusa, Tisdale, Fremont, and Sacramento), control structures (Knight's Landing Outfall Gates, Butte Slough Outfall Gates, Sutter-Butte Canal Headgate), and bypasses (Sutter and Yolo) (refer to Figure 1-1). Units of the SRFCP cross nine counties (Glenn, Colusa, Butte, Sutter, Yuba, Placer, Sacramento, Yolo, and Solano). The northwestern limit of the system is Unit 140 in Glenn County, the northeastern end is Unit 152 in Butte County, and the southern end is in Sacramento County at Sherman Island (Unit 101). The system was designed so that 82 percent of flood discharges flow through the

Yolo Bypass and only 18 percent flow in the main river channel. The northern extent of the SRFCP lies along the Sacramento River in Glenn County and includes levees along the Sacramento and Feather rivers and many tributaries down to Sherman Island at the southern end of Sacramento County. Segments of the SRFCP levees were originally constructed by local interests and were modified to USACE flood control standards before being incorporated into the SRFCP system. Once the levee system was finalized in 1961, the State took over the operations and maintenance in accordance with USACE regulations.

There are four SRFCP flood control units in the Project vicinity. Unit 157 Fremont Weir; Unit 127 Levees of Knights Landing Ridge Cut and Sacramento River and Yolo Bypass, Levees of Reclamation Districts No. 730 and 819, and South Levee of Sycamore Slough; and Unit 123 Levees of RD 1600; together, these three units form the head of the Yolo Bypass. Further to the south is the fourth flood control unit, Unit 122.1. The portion of that unit in the Project area is called the East Levee of Yolo Bypass from Woodland Highway to Sacramento Bypass.

10.1.5 Paleontological Setting

The Project area is located within the Great Valley geomorphic province of California. The Project area is underlain by alluvial basin deposits. The geologic unit in the northern portion of the Project area is Holocene alluvium, undivided (Qha), defined as, “alluvium deposited on fans, terraces, or basins. Sand, gravel, and silt that are poorly to moderately sorted. Mapped where separate types of alluvial deposits are not delineated”. The lower elevations are in Holocene basin deposits (Qhb) defined as fine grained sediments of late Holocene age with horizontal stratification deposited by slow moving water in topographic lows. Detailed descriptions of geological resources are described in Chapter 12, *Geology and Soils*.

The APE is located in Holocene-age sediments, which formed after the end of the last glacial maximum. Holocene sediments are recent, less than 11,000 years old, and are not considered to contain paleontological resources.

10.2 Regulatory Setting

10.2.1 Federal Plans, Policies, and Regulations

10.2.1.1 National Environmental Policy Act

The National Environmental Policy Act (NEPA) establishes the federal policy of preserving important historic, cultural, and natural aspects of national heritage during federal project planning. All federal or federally assisted projects requiring action pursuant to Section 102 of the act must take into account impacts on cultural resources (42 United States Code [USC] Sections 4321–4347).

The Council on Environmental Quality (CEQ) Guidelines provided a standard for determining the significance of impacts analyzed under NEPA. Significance, as used in NEPA, requires considering impacts in terms of both context and intensity (40 Code of Federal Regulations [CFR] 1508.27).

- *Context* means that the action must be analyzed in terms of society as a whole – the affected region and interests and the local setting. The span of the context should be scaled to match the action. For larger actions, a wider context is appropriate. For smaller site-specific actions, the local context may be sufficient. Both the short- and long-term impacts of an action are relevant to this analysis [40 CFR 1508.27(a)].
- *Intensity* means the severity of an impact. The CEQ Guidelines direct federal agencies to consider cultural resources when evaluating intensity. Specific factors that may affect the intensity of an impact include the proximity to historical or cultural resources, the potential for impacts on NRHP-eligible or listed properties, and the potential for loss or destruction of significant scientific, cultural, or historical resources [40 CFR 1508.27(b)].

These considerations mean that NEPA analysis should identify the potential for an action to adversely affect resources that are or may be eligible for listing on the NRHP. The substance of these regulations generally follows 36 CFR Part 800.

10.2.1.2 Section 106 of the National Historic Preservation Act of 1966

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires federal agencies to consider the impacts of their actions on historic properties (16 USC Section 470f). Historic properties are resources listed on or eligible for listing on the NRHP [36 CFR 800.16(l)(1)]. A property may be listed on the NRHP if it meets any of the criteria provided in the NRHP regulations (36 CFR 60.4) and retains integrity. Typically, properties must also be 50 years old or older [36 CFR 60.4(d)].

- The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and:
 - Are associated with events that have made a significant contribution to the broad patterns of our history
 - Are associated with the lives of persons significant in our past
 - Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction
 - Have yielded, or may be likely to yield, information important in prehistory or history

Some property types do not typically qualify for listing on the NRHP; however, these properties may qualify if they fall into one or more of the following criteria considerations. These considerations consist of the following (36 CFR 60.4):

- A religious property deriving primary significance from architectural or artistic distinction or historical importance
- A building or structure removed from its original location but which is significant primarily for architectural value or which is the surviving structure most importantly associated with a historic person or event
- A birthplace or grave of a historical figure of outstanding importance if there is no appropriate site or building directly associated with his productive life

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- A cemetery that derives its primary significance from graves of persons of transcendent importance, from age, from distinctive design features, or from association with historic events
- A reconstructed building when accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan and when no other building or structure with the same association has survived
- A property primarily commemorative in intent if design, age, tradition, or symbolic value has invested it with its own exceptional significance
- A property achieving significance within the past 50 years if it is of exceptional importance

The Section 106 review process typically consists of the following major steps:

1. Identify the federal agency undertaking
2. Initiate the Section 106 process
3. Define an APE, and within these limits, identify historic properties
4. Assess adverse effects

Resolve adverse effects (typically through treatment, avoidance, preservation, or other mechanisms identified by the lead agency in consultation with SHPO and interested parties)

The Section 106 regulations define an adverse effect as an undertaking that alters, directly or indirectly, the qualities that make a resource eligible for listing on the NRHP (36 CFR 800.5(a)(1)). Consideration must be given to the property's location, design, setting, materials, workmanship, feeling, and association, to the extent these qualities contribute to the integrity and significance of the resource. Adverse effects may be direct and reasonably foreseeable or may be more remote in time or distance [36 CFR 8010.5(a)(1)].

Under Section 304(a) of the NHPA,

[t]he head of a Federal agency ...shall withhold from disclosure to the public, information about the location, character, or ownership of a historic resource if the Secretary and the agency determine that disclosure may ... risk harm to the historic resources ...

10.2.2 State Plans, Policies, and Regulations

10.2.2.1 California Environmental Quality Act – Statute and Guidelines

The CEQA requires the lead State agency to consider the impacts of a project on historical resources. Two categories of historical resources are specifically identified in the State CEQA Guidelines: historical resources [State CEQA Guidelines Section 15064.5(b)] and unique archaeological sites [State CEQA Guidelines 15064.5(c) and California Public Resources Code (PRC) Section 21083.2]. Different legal rules apply to the two different categories of cultural resources although the two categories sometimes overlap where a unique archaeological resource also qualifies as a historical resource. In such an instance, the more stringent rules for archaeological resources that are historical resources apply, as explained in the following. CEQA

and other California laws also set forth special rules for dealing with human remains that might be encountered during construction.

Historical resources are those meeting the requirements listed in the following:

- Resources listed in or determined eligible for listing in the CRHR [State CEQA Guidelines Section 15064.5(a)(1)]. Note that CRHR-eligible resources include resources listed on or eligible for listing on the NRHP (California PRC Section 5024.1).
- Resources included in a local register as defined in California PRC Section 5020.1(k), “unless the preponderance of evidence demonstrates” that the resource “is not historically or culturally significant” [State CEQA Guidelines Section 15064.5(a)(2)].
- Resources that are identified as significant in surveys that meet the standards provided in California PRC Section 5024.1(g) [State CEQA Guidelines Section 15064.5(a)(3)].

Resources that the lead agency determines are significant, based on substantial evidence [State CEQA Guidelines Section 15064.5(a)(3)].

Historical resources may be listed in the CRHR if they have historical significance and integrity. Cultural resources are historically significant if they meet any of the following criteria:

- Are associated with events that have made a significant contribution to the broad patterns of California’s history and cultural heritage, or the United States [California Code of Regulations (CCR), Title 14, Section 4852(b)(1)]
- Are associated with the lives of persons important in our past [14 CCR Section 4852(b)(2)]
- Embody the distinctive characteristics of a type, period, region, or method of construction; or represent the work of an important creative individual; or possess high artistic values [14 CCR Section 4852(b)(3)]
- Yield, or may be likely to yield, information important in prehistory or history [14 CCR Section 4852(b)(4)]

Integrity for built environment resources means the “survival of characteristics that existed during the resource’s period of significance.” Integrity must also be assessed in relationship to the particular criterion under which a resource has significance. For example, even where a resource has “lost its historic character or appearance [it] may still have sufficient integrity for the California Register if it maintains the potential to yield significant scientific or historical information or specific data.” Integrity is further defined as the ability to “convey the reasons” for the significance of the resource [14 CCR Section 4852(c)].

For archaeological sites, this language therefore means that a site must have a likelihood of yielding useful information for research in order to have integrity if the site is significant for its data potential.

The fact that a resource is not listed in, or determined to be eligible for listing in the CRHR, not included in a local register of historical resources, nor identified in an historical resource survey does not preclude a CEQA lead agency from determining that the resource may be a historical resource as defined in California PRC Section 5020.1(j) or 5024.1 [State CEQA Guidelines Section 15064.5(a)(4)].

Notably, a project that causes a substantial adverse change in the significance of a historical resource is a project that may have a significant impact under CEQA [State CEQA Guidelines Section 15064.5(b)]. A substantial adverse change in the significance of an historical resource means physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of the historical resource would be materially impaired. The significance of a historical resource is materially impaired if the project demolishes or materially alters any qualities that justify either one of the following:

- The inclusion or eligibility for inclusion of a resource on the CRHR [State CEQA Guidelines Section 15064.5(b)(2)(A)(C)]
- The inclusion of the resource on a local register [State CEQA Guidelines Section 15064.5(b)(2)(B)]

A unique archaeological resource, on the other hand, is defined in California PRC Section 21083.2 as a resource that meets at least one of the following criteria:

- Contains information needed to answer important scientific research questions, and there is a demonstrable public interest in that information
- Has a special and particular quality such as being the oldest of its type or the best available example of its type
- Is directly associated with a scientifically recognized important prehistoric or historic event or person [California PRC Section 21083.2(g)]

10.2.2.2 Discoveries of Human Remains under California Health and Safety Code and the Environmental Quality Act Public Law

California law sets forth special rules that apply where human remains are encountered on private lands. These rules are set forth in Health and Safety Code 7050.5 and in PRC 5097.98. State CEQA Guidelines, Section 15064.5(e) as follows:

In the event of the accidental discovery or recognition of human remains in any location other than a dedicated cemetery, the following steps should be taken:

- There shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until the coroner of the county in which the remains are discovered is contacted to determine that no investigation of the cause of death is required (as required under California Health and Safety Code Section 7050.5).
- If the coroner determines the remains to be Native American:
 - The coroner shall contact the NAHC within 24 hours.
 - The NAHC shall identify the person or persons it believes to be the most likely descended from the deceased Native American.
 - The MLD may make recommendations to the landowner or the person responsible for the excavation work, for means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods (as provided in PRC Section 5097.98).
 - Where the following conditions occur, the landowner or his authorized representative shall rebury the Native American human remains and associated grave goods with

appropriate dignity on the property in a location not subject to further subsurface disturbance.

- The NAHC is unable to identify an MLD or the MLD failed to make a recommendation within 24 hours after being notified by the commission.
- The descendant identified fails to make a recommendation.
- The landowner or his authorized representative rejects the recommendation of the descendant, and the mediation by the NAHC fails to provide measures acceptable to the landowner.

10.2.2.3 California Native American Graves Protection and Repatriation Act

Sections 8010 to 8011 of the California Health and Safety Code establish a state repatriation policy that is consistent with and facilitates implementation of the Native American Graves Protection and Repatriation Act (NAGPRA). The policy requires that all California Native American human remains and cultural items be treated with dignity and respect and encourages voluntary disclosure and return of remains and cultural items by publicly funded agencies and museums in California. The policy provides for mechanisms to aid California Native tribes, including non-federally recognized tribes, in filing repatriation claims and getting responses to those claims.

10.2.3 Regional and Local Plans, Policies, and Regulations

10.2.3.1 County of Yolo General Plan

Yolo County's *2030 Countywide General Plan* was adopted November 10, 2009. The general plan integrates, by reference, locally effective parts of the Delta Protection Commission's *Land Use and Resource Management Plan* for the Primary Zone of the Delta.

The Conservation and Open Space Element of the *2030 Countywide General Plan* addresses preservation of various resources in an open space environment. The following policies from the general plan are considered applicable to implementation of the Project (County of Yolo 2009).

- **Goal CO-4 Cultural Resources:** Preserve and protect cultural resources within the county.
- **Policy CO-4.1:** Identify and safeguard important cultural resources.
- **Policy CO-4.12:** Work with culturally affiliated tribes to identify and appropriately address cultural resources and tribal sacred sites through the development review process.
- **Policy CO-4.13:** Avoid or mitigate to the maximum extent feasible the impacts of development on Native American archaeological and cultural resources.
- **Policy CO-4.14:** Within the Delta Primary Zone, ensure compatibility of permitted land use activities with applicable cultural resources policies of the Land Use and Resource Management Plan of the Delta Protection Commission.

10.3 Environmental Consequences

This section describes the methods used to assess impacts on historic properties and historical resources that may be affected by the action alternatives, as well as impacts on previously unidentified resources. The direct, indirect, and cumulative impacts on known and unknown archeological and built environment resources that would result from implementing the action alternatives are evaluated, and mitigation measures are presented to reduce potential impacts.

Detailed descriptions of the alternatives evaluated in this section are provided in Chapter 2, *Description of Alternatives*.

Impacts to cultural and historic resources are determined relative to existing conditions (for California Environmental Quality Act [CEQA]) and the No Action Alternative (for the National Environmental Policy Act [NEPA]). However, as described below, the No Action Alternative would be the same as existing conditions because cultural and historic resources are not anticipated to experience substantive changes in the area of potential effect. Therefore, the analysis compares the impacts of the action alternatives only to existing conditions.

10.3.1 Thresholds of Significance – CEQA

This section describes the criteria used to identify adverse impacts on cultural resources. Adverse impacts are defined as impacts that are significant under CEQA and other relevant State regulatory frameworks and thresholds and that are adverse within the meaning of CEQA regulations. These thresholds also encompass the factors considered under NEPA to determine the context and the intensity of its impacts.

Impacts on unique archaeological resources and historical resources are considered significant for purposes of CEQA if the Project would do any of the following:

- Demolish or materially alter the qualities that justify the resource for inclusion or eligibility for inclusion on the CRHR [State CEQA Guidelines Section 15064.5(b)(2)(A)(C)]. For the purposes of this analysis, “materially altering or destroying qualities that contribute to eligibility” means altering the resource so that it can no longer convey its association with significant historical events or people, distinctive style or artistic value, or the potential to yield information important in history or prehistory [14 CCR Section 4852(b)].
- Demolish or materially alter the qualities that justify the inclusion of the resource on a local register [State CEQA Guidelines Section 15064.5(b)(2)(B)] or its identification as a historical resource survey meeting the requirements of California PRC Section 5024.1(g). For the purposes of this analysis, “materially altering a resource so that it no longer qualifies for a local register” means altering the resource so it can no longer convey the significance that makes it eligible for the local register. These significance themes often mirror the CRHR and the NRHP but emphasize historical or cultural themes that are locally relevant.
- Demolish or materially impair the characteristics that allow a site to qualify as a unique archaeological resource [California PRC Section 21083.2(g)]. “Demolishing or materially impairing a unique archaeological resource” means altering the ability of the site to convey one or more of the following characteristics:

- Data useful in important scientific questions associated with demonstrable public interest in those questions
- The quality of being the oldest or best example of a type
- Association with an important person or event in history or prehistory [California PRC Section 21083.2(g)]
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.
- The criteria of adverse effect in 36 CFR Part 800.5(a)(1) provides a standard for Section 106 of the NHPA¹. Alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association [36 CFR 800.5(a)(1)]. For the purposes of this analysis, “alteration of qualifying characteristics” may include but is not necessarily limited to:
 - Physical destruction of all or part of a property
 - Alteration of built environment resources that is not consistent with the Federal standards for treatment of historic properties (36 CFR 68)
 - Removal of a property from its historical location
 - Alteration of the significant features of a property or introduction of incongruous elements to the setting
 - For Federally owned properties, transfer of the property out of Federal control without adequate and legally enforceable mechanisms to ensure preservation
 - Neglect of a property that results in deterioration [36 CFR 800.5(a)(2)]
- Disturbance of human remains, including remains interred outside of established cemeteries is an adverse impact (State CEQA Guidelines, Appendix G checklist). For the purposes of this analysis, disturbance may consist of direct excavation or damage through compaction even where the resource is not directly excavated.

10.3.2 Effects and Mitigation Measures

This section provides an evaluation of the direct and indirect effects on cultural resources from implementing the Project alternatives. This analysis is organized by Project alternative, with specific impact topics numbered sequentially under each alternative.

¹ Because the Project will require various federal approvals, it is considered to be an undertaking subject to compliance with relevant federal historic preservation laws. In particular, the Project must comply with Section 106 of the NHPA. To that end the agencies have initiated the identification of historic properties with the field studies conducted between 2014 and 2017. The results of these studies, further identification and evaluation of historic properties in the APE, and appropriate treatment and management measures will be developed in consultation with the SHPO and Indian Tribes, the Advisory Council on Historic Preservation, and other interested parties that choose to participate in the Section 106 process.

For purposes of this environmental review, Reclamation, U.S. Army Corps of Engineers, and DWR identified known cultural resources within each action alternative through use of existing information and have characterized the types of cultural resources anticipated in as yet unsurveyed areas. Complete cultural resources surveys were not possible for each action alternative due primarily to property access restrictions. The impact analyses here are based on the nature of the impacts for each action alternative on the types of cultural resources known and assumed to be present. Should one of the action alternatives be selected, Federal agencies with an undertaking as defined in Title 54 U.S.C. § 300320 and subject to compliance with Title 54 U.S.C. § 306108 (commonly known as NHPA Section 106) will continue with compliance and consultations as required under that law and other applicable Federal cultural resources and historic preservation laws and requirements. This compliance may be fulfilled through a Programmatic Agreement, as defined in 36 C.F.R § 800.14(b), which will address historic property identification efforts and methods or modifications to avoidance, minimize, and/or mitigation adverse effects to historic properties, through a consultative process.

10.3.2.1 No Action Alternative

Under the No Action Alternative, the potential for impacts within the Yolo Bypass on cultural resources would not increase over existing conditions. The Yolo Bypass would continue to function as a flood management facility, and maintenance activities within the FWWA that excavate soil would continue; however, the effects would not be exacerbated under the No Action Alternative. Impacts from subsidence, levee failure, and climate change could result in the inundation and erosion of cultural resources that currently occur on the landside of existing flood management structures.

Paleontological resources are not currently being adversely affected because the ongoing disturbance (sedimentation and sediment removal) is not in areas with fossiliferous forming strata. Future conditions under the No Action Alternative would assume the same type of effects (sedimentation and the removal of sediments). These actions would not result in any new adverse effects on paleontological resources under the No Action Alternative.

CEQA Conclusion

Under the No Action Alternative, there would be **no impact** on cultural and paleontological resources in the Project area because any effects of continued operation as a flood management facility would not be changed under the No Action Alternative.

10.3.2.2 Alternative 1: East Side Gated Notch

Alternative 1, East Side Gated Notch, would allow increased flow from the Sacramento River to enter the Yolo Bypass through a gated notch on the east side of Fremont Weir. The invert of the new notch would be at an elevation of 14 feet, which is approximately 18 feet below the existing Fremont Weir crest. Alternative 1 would allow up to 6,000 cfs to flow through the notch during periods when the river levels are not high enough to go over the crest of Fremont Weir to provide open channel flow for adult fish passage. See Section 2.4 for more details on the alternative features.

10.3.2.2.1 Impact CULT-1: Impacts on Identified Archaeological Sites and Historic-Era Built Environment Resources Resulting from Construction

The 2014 pedestrian surface survey confirmed that large parts of the Project area experienced previous ground disturbance (i.e., sediment removal, excavation of borrow areas, and excavation for construction of Tule Canal and Fremont Weir). The study further revealed that the Alternative 1 survey area is sensitive for the presence of buried deposits of cultural resources, as confirmed by the discovery of buried deposits identified at prehistoric sites DWR-FW-1, DWR-FW-2 and DWR-FW-3. Communication with DWR archaeologists indicates these resources may be sensitive for human remains. The 2017 study further identified the Fremont Weir and the East Yolo Bypass Levee as historic-era cultural resources likely eligible for listing on the NRHP and CRHR. Impacts from the placement of the Supplemental Fish Passage structure described in Section 2.4.1.7 may cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Section 15064.5.

Because many of the archaeological resources are large (typically in excess of 30 meters across), they are each likely to contain some portion of their deposits with sufficient integrity to yield artifacts in their original associations in a manner that will convey significance themes in prehistory and history. Therefore, these identified resources are likely to qualify as historical resources under CEQA. For the same reasons, these resources are likely to be eligible for listing on the NRHP.

Additionally, the Fremont Weir (P-57-001117) and the East Yolo Bypass Levee (P-57-001118) are assumed to be eligible for listing on the NRHP and would also then be considered historical resources eligible for the CRHR and managed accordingly. Pierce (2017:29-30) addressed the Sacramento River Flood Control Project (SRFCP) as a potential historic district, but did not fully evaluate it as a historic district because the small size of the current undertaking did not warrant the larger scale evaluation. However, for management purposes under the current undertaking, the SRFCP is assumed to be eligible for listing on the NRHP and CRHR under NRHP/CRHR Criterion A/1 for its association with the development of flood control in the Sacramento River basin, and under NRHP/CRHR Criterion C/3 as a historic district that collectively embodies the distinct characteristics of a type, period, or method of construction, or represents a significant and distinguishable entity whose components may lack individual distinction. The Fremont Weir and East Yolo Bypass Levee were evaluated by Pierce (2017:30-31) as eligible for listing on the NRHP and CRHR under criteria A/1 and C/3 as components of the potential SRFCP historic district. These evaluations are pending concurrence by the State Historic Preservation Officer.

Likewise, Alternative 1 may impact and adversely affect the Fremont Weir and/or East Yolo Bypass Levee built resources. The weir may be affected by altering its physical configuration through construction of a gated notch on its east side. This may affect the physical integrity of the method of construction or other characteristics that could qualify the weir and the proposed SRFCP historic district for listing on the NRHP and CRHR. Indirect impacts to setting or other aspects of integrity may further affect the significance of these two resources.

For these reasons, construction has the potential to materially impair the archaeological and historic built resources under CEQA and adversely affect the resources as defined by Section 106 of the NHPA, as well as potentially impact the setting or other aspects of integrity.

CEQA Conclusion

Construction of conveyance facilities associated with Alternative 1 would affect identified archaeological resources that occur in the footprint of this alternative. DWR identified these resources and finds they are likely to qualify as historical resources under CEQA. Therefore, these sites are considered historical resources for the purposes of CEQA. This impact would be **significant** because construction could materially alter or destroy the potential of these resources to yield information useful in archaeological research, the basis for the significance of these resources, through excavation and disruption of the spatial associations that contain meaningful information. Identified but currently inaccessible resources also may be significant under other register criteria. Indirect impacts, such as introduction of new inconsistent changes to the setting, also may diminish the significance of these resources.

The Fremont Weir and East Yolo Bypass Levee both are assumed eligible for listing on the NRHP and therefore would also qualify for listing on the CRHR. The construction proposed under Alternative 1 would directly affect the Fremont Weir and may affect the integrity of setting or other aspects of the integrity of the proposed historic district. Therefore, this impact would be **significant** because construction could materially alter or destroy significant characteristics that contribute the proposed historic district.

Mitigation Measure MM-CULT-1: Prepare a Treatment Plan and Perform Treatment to Address the Affected Resources Identified as Significant and Eligible for the NRHP and/or CRHR

The Lead Agencies will prepare a treatment plan that provides measures for the management of identified “historic properties,” “historical resources,” and “unique archaeological resources” and potentially unevaluated cultural resources which cannot be avoided during Project-related ground-disturbances or other construction activities. The purpose of the treatment plan will be to establish a research design, methods, and guidelines for evaluations of unevaluated resources for potential listing on the NRHP and/or CRHR, and for mitigation of Project-related adverse effects and significant impacts to historic properties and historical resources located within the APE. The treatment plan will also describe a process of consultation with appropriate state and federal agencies, as well as with Native Americans who may have interests in historic properties and historical resources within the APE.

Preservation in place, through methods such as redesign of relevant facilities to avoid destruction or damage to eligible cultural resources, capping resources with fill, or deeding resources into conservation easements, shall be the preferred method of mitigation where feasible. If these options are not feasible, the measures that are developed in the treatment plan will be followed.

Implementation of Mitigation Measure MM-CULT-1 would ensure that significant risks to archaeological and historic built resources would be minimized and impacts would be reduced to **less than significant**. Although application of Mitigation Measure MM-CULT-1 would reduce this impact to **less than significant**, it would not guarantee that all the scientifically important material would be retrieved because feasible archaeological excavation typically only retrieves a sample of the deposit, and portions of the site with important information may remain after treatment.

10.3.2.2.2 Impact CULT-2: Impacts on Archaeological Sites and Historic-Era Built Environment Resources to Be Identified Through Future Inventory Efforts

Record searches performed through the CHRIS revealed that a cultural resources inventory has never been conducted in the majority of the footprint for this Alternative 1. The presence of archaeological sites that qualify as historical resources and historic properties in the portion of the footprint that has been previously inspected provides a sample of the likely density and occurrence of resources in the remaining footprint. For this reason, additional prehistoric archaeological resources are likely to be found in the portion of the footprint where surveys have not been conducted once access is available and such studies can be completed. Prehistoric sites in the Project area tend to be large and rich in material remains, including human burials and associated ornaments and beads. Habitation debris also often contains both floral and faunal material that can be used for both radiocarbon dating and analysis regarding subsistence strategies. In addition, the large scale of typical prehistoric archaeological resources suggests portions of these deposits will remain with sufficient integrity to convey research information.

In addition to prehistoric archaeological resources, the Alternative 1 footprint is sensitive for historic-era archaeological resources. It is likely that previously unidentified historic archaeological sites occur in the footprint of Alternative 1 because of the intensity of human activity in the Project area during the historic era. Therefore, these sites are likely to qualify as historical resources or unique archaeological resources under CEQA and be eligible for the NRHP.

Historic sites are likely to be associated with the historic-era themes of settlement, reclamation, agriculture, and flood management in the Project area. Because the reclamation and agricultural development of the region provided part of the economic base for the development of surrounding urban centers, these historic themes are significant at both a State and national level. These resources accordingly may contain data useful in historical research. Historic sites may include built resource components (e.g., buildings, structures, or objects). Additionally, historic built resources may be present in locations not yet subject to cultural resource studies that represent structures built as part of the reclamation and flood management systems, or represent local settlement. In addition, the intensity of historical activity in the region suggests that many of these resources are likely to be distributed across the footprint of this alternative, and some are likely to retain sufficient integrity to convey this significance if they are subject to archaeological excavation and investigation. Therefore, these sites are likely to qualify as historical resources or unique archaeological resources under CEQA and be eligible for the NRHP.

Absent mitigation, ground-disturbing construction is likely to physically damage many of these resources by disrupting the spatial associations that convey data useful in research or changing the setting such that the resource no longer contains the physical characteristics that convey its significance. These impacts would thus materially impair these resources within the meaning of CEQA and adversely affect the resources within the meaning of Section 106 of the NHPA. Various features would result in ground disturbances.

CEQA Conclusion

The footprint for Alternative 1 is sensitive for both prehistoric and historic-era archaeological and historic built resources. Because many of these resources are likely to have data useful in prehistoric and historic archaeological research, as well as the integrity to convey this

significance, they are likely to qualify as historical resources or unique archaeological sites under CEQA and be eligible for the NRHP. Ground-disturbing construction may materially alter the significance of these resources by disrupting the spatial associations that could yield important data, resulting in a **significant impact**.

Mitigation Measure MM-CULT-2: Conduct Inventory, Evaluation, and Treatment of Archaeological and Historic Built Environment Resources

Prior to ground-disturbing construction, the Lead Agencies will implement the following mitigation measures:

- The Lead Agencies will ensure that a cultural resources inventory is conducted that encompass the entirety of the APE.
- The Lead Agencies will ensure that the inventory scope of work is developed prior to any Project-related ground-disturbances and includes methods for pedestrian surveys, reviews of historic maps, documentation of identified resources, and other appropriate sampling methods. The survey methods, results, and recommendations will be detailed in a technical report of findings.
- For all identified resources, DWR and/or the appropriate Federal agencies will evaluate the resources to determine whether they are any of the following:
 - Historical resources [State CEQA Guidelines Section 15064.5(a)]
 - Unique archaeological resources under CEQA [California PRC Section 21083.2(g)]
 - Historic properties (36 CFR 60.4)
 - Resources eligible for other local registers as may be appropriate
- The results of the evaluations will be documented in an evaluation report that provides an assessment of CRHR and/or NRHP-eligible resources requiring treatment to mitigate adverse effects and **significant impacts**. The Lead Agencies will make such a determination if project construction would involve any of the following consequences:
 - Demolish or materially alter the qualities that make the resource eligible for listing in the CRHR [State CEQA Guidelines Section 15064.5(b)(2)(A)(C)]
 - Demolish or materially alter the qualities that justify the inclusion of the resource on a local register or its identification in a historical resources survey meeting the requirements of California PRC Section 5024.1(g) unless the Lead Agencies establish by a preponderance of evidence that the resource is not historically or culturally significant [State CEQA Guidelines Section 15064.5(b)(2)(B)]
 - Alter, directly or indirectly, the qualities that make a resource eligible for listing in the NRHP [36 CFR 800.5(a)(1)]
 - Demolish or materially impair the qualities that allow a resource to qualify as a unique archaeological site (California PRC Section 21083.2)
- For all resources qualifying as unique archaeological resources, historical resources, or historic properties that would be subject to **significant impacts**, the Lead Agencies would

develop and implement a treatment plan, as described above in Mitigation Measure MM-CULT-1.

- All technical work will be led or supervised by professional cultural resources specialists who meet the Secretary of the Interior's qualification standards for archaeology, history, and/or architectural history/architecture as appropriate (per 36 CFR 61).

Implementation of Mitigation Measure MM-CULT-2 would ensure that risks to archaeological and historical resources, including historic built environmental resources, would be minimized and impacts would be reduced to **less than significant**. While mitigation is available, this mitigation cannot guarantee that all eligible or significant resources would be preserved in place or that all important data would be retrieved before construction destroys these resources. The scale of Alternative 1, investment into existing designs, and the presence of other important environmental resources, such as habitat, natural communities, and wetlands that should be avoided are constraints on the flexibility and feasibility of avoidance.

10.3.2.2.3 Impact CULT-3: Impacts on Archaeological Sites that May Not Be Identified through Inventory Efforts

Previously unidentified archaeological resources and additional prehistoric and historic-era sites that have not yet been identified are almost certain to occur in the portion of the Project area where Alternative 1 would be constructed. While surveys would be completed for the footprint, once access is available, such surveys cannot guarantee that all sites would be identified prior to construction. The rapid rate at which alluvium and sediment accumulates in the Delta region, and the geologically unstable nature of the floodplain and riverbank environments in which these resources may occur, makes it likely that numerous sites are naturally capped below surface soils. Cultural resource inventory efforts cannot always identify such resources, even with exhaustive sampling methods designed to reveal sites with little or no surface manifestation, because subsurface sampling to identify every buried resource is economically and technically infeasible. Many of the unidentified prehistoric resources are likely to qualify as historical resources, historic properties, or unique archaeological resources because prehistoric sites in the Delta region tend to be large and contain a rich material culture. In particular, burial features tend to be associated with numerous shell ornaments, charmstones, and associated grave goods. Habitation components often contain abundant faunal and floral remains that elucidate prehistoric adaptations such as subsistence methods.

In addition to prehistoric archaeological resources, the Project area is sensitive for historic-era archaeological resources. Archaeological debris found in historic-era archaeological sites is likely to be associated with significant themes such as agriculture, reclamation, and settlement of the Delta region. The size of the Project area and the intensity of historic activity suggest that some of these resources may qualify as historical resources, historic properties, or unique archaeological resources.

Ground-disturbing work, including the construction of surface features, such as intakes, and subterranean operations, may disturb and damage these resources before they can be identified and avoided. This damage and disturbance may materially impair these resources within the meaning of CEQA or adversely affect the resources within the meaning of Section 106 because this disturbance would impair the ability of these resources to yield data useful in research.

CEQA Conclusion

Construction under Alternative 1 has the potential to disturb previously unidentified archaeological sites qualifying as historical resources, historic properties, or unique archaeological resources. Because direct excavation, compaction, or other disturbance may disrupt the spatial associations that contain scientifically useful information, it would alter the potential basis for eligibility, thus, materially altering the resource and resulting in a **significant impact**. Because these resources would not be identified prior to construction, they cannot be recorded, and impacts cannot be managed through construction treatment.

Mitigation Measure MM-CULT-3: Implement an Archaeological Resources Discovery Plan, Conduct Evaluation, and Treatment of Archaeological Discoveries

Prior to ground-disturbing construction, the Lead Agencies will include a cultural resources discovery plan in the contract conditions of the construction contractor, incorporating the following actions to be taken in the event of the inadvertent discovery of archaeological resources.

- An archaeological monitor will be present to observe construction at geographic locations that are sensitive for unidentified cultural resources. Such locations consist of construction near identified sites (within a 100-foot radius around the known boundaries of identified resources) and where ground-disturbing construction would occur within 500 feet of major water features.
- In the event of an archaeological resources discovery, work will cease in the immediate vicinity of the find (typically 100 feet), based on the direction of the archaeological monitor or the apparent distribution of archaeological resources if no monitor is present. A qualified archaeologist will assess the significance of the find and make recommendations for further evaluation and treatment as necessary.
- Discovered resources will be mapped and described on DPR 523 forms. Mapping will be performed by recording data points with GPS hardware that can be imported and managed digitally.
- If it is determined that the discovery requires evaluation for the NRHP and/or CRHR or treatment to mitigate adverse effects or **significant impacts**, the mitigation measures to develop a treatment plan discussed above in MM-CULT-1 will be followed.

Based on the high level of sensitivity for potentially buried archaeological sites, construction under Alternative 1 has the potential to disturb previously unidentified buried resources qualifying as historical resources, historic properties, or unique archaeological resources. Disturbances to buried resources would affect the physical integrity and data potential that may qualify such resources for the CRHR and NRHP, thereby resulting in a **significant impact**. Because these resources are not known and would not be known until accidentally exposed, it is important that construction contractors be educated and trained to identify prehistoric and historic-era archaeological resources to provide for the earliest identification if such materials are exposed, and to follow an appropriate course of action and protocols if archaeological materials are found.

Mitigation Measure MM-CULT-4: Conduct Preconstruction Training for Construction Crews

The Lead Agencies shall provide preconstruction training for all construction personnel engaged in construction that have the potential to affect archaeological resources. This training will provide instruction on how to identify resources in the field and appropriate measures to be taken if a discovery or potential discovery occurs. The Lead Agencies will include a list of cultural resources staff that can respond to cultural resource discoveries, provide management direction following discoveries in the construction training materials, and provide this list and these discovery requirements to the supervisory field staff for the construction workers.

Construction worker trainings in the form of tailgate meetings would be implemented to familiarize workers with common types of artifacts (stone flakes, charmstones, and historic debris-like bottles) and the procedures to follow in the event of a buried discovery.

By implementing discovery protocols, Mitigation Measure MM-CULT-3 would reduce the potential for this impact. However, because archaeological resources may not be identified prior to disturbance through these measures, the impact cannot be entirely avoided. Therefore, this impact would remain **significant and unavoidable**.

By providing preconstruction training for workers, Mitigation Measure MM-CULT-4 would reduce the potential for this impact. However, because archaeological resources may not be identified prior to disturbance through these measures, the impact cannot be entirely avoided. Therefore, this impact would remain **significant and unavoidable**.

10.3.2.2.4 Impact CULT-4: Damage to Buried Human Remains

The footprint of Alternative 1 is sensitive for buried human remains that may occur in isolation rather than as part of prehistoric or historic archaeological sites. Historic and prehistoric human remains have been discovered as isolated interments rather than as part of larger sites. Because these isolated resources are not associated with larger deposits, their distribution and depth cannot be estimated. Construction of Alternative 1 would require ground-disturbing work that may damage previously unidentified human remains, resulting in direct impacts on these resources.

CEQA Conclusion

The Alternative 1 area is sensitive for buried human remains. Construction likely would result in disturbance of these features. Disturbance of human remains, including remains interred outside of cemeteries, is considered a significant impact in the CEQA Appendix G checklist; therefore, disturbance of these remains would result in a **significant impact**.

Mitigation Measure MM-CULT-5: Follow State and Federal Law Governing Human Remains if Such Resources Are Discovered during Construction

If human remains are discovered as part of a larger cultural deposit, the Lead Agencies and the construction contractors will coordinate with the county coroner and NAHC to make the determinations and perform the management steps prescribed in California Health and Safety Code Section 7050.5 and California PRC Section 5097.98. The provisions of these State laws apply unless discoveries occur on land owned or controlled by the Federal government. For

discoveries on Federal land, the bulleted procedures for NAGPRA provided below shall be followed. Compliance with State law for discoveries occurring on private or State lands requires the following steps:

- Notification of the county coroner so the coroner may determine whether an investigation regarding the cause of death is required. If the coroner determines the remains are of prehistoric Native American origin, the coroner would notify the NAHC.
- Upon notification, the NAHC would identify the MLD, and the MLD would be given the opportunity to reinter the remains with appropriate dignity. If the NAHC fails to identify the MLD or if the parties cannot reach agreement as to how to reinter the remains as described in California PRC Section 5097.98(e), the landowner would reinter the remains at a location not subject to further disturbance. The Project proponents would ensure the protections prescribed in California PRC Section 5097.98(e) are performed such as using conservation easements and recording the location with the relevant county and an information center of the CHRIS.

While inventory and monitoring efforts are prescribed under Mitigation Measures MM-CULT-2 and MM-CULT-3, the large acreages subject to disturbance under Alternative 1 make exhaustive sampling to identify all buried and isolated human remains technically and economically infeasible. For these reasons, it is still possible that such resources may be damaged or exposed before they can be discovered through inventory or monitoring. Implementation of Mitigation Measure MM-CULT-5 would ensure that all significant risks to human remains outside of known cemeteries would be minimized and impacts would be reduced to **less than significant**.

10.3.2.2.5 Impact CULT-5: Impacts on Paleontological Resources Resulting from Construction

Fossil discovery within Sacramento and Yolo counties largely occurs within quarries and along river banks. The Sacramento River and its tributaries have been heavily impacted by anthropogenic processes. The natural flooding and meandering have been confined to manmade earthen structures with no course deviation. Since proposed excavations are limited to less than 20 feet from surface, the probability of paleontological resource discovery within the Project area is unlikely. Therefore, there is limited potential for adverse effects to paleontological resources associated with Alternative 1.

CEQA Conclusion

Due to the shallow depth of proposed excavations and the limited extent of fossiliferous forming strata in the vicinity of the project area, the effect of Alternative 1 on paleontological resources would be **less than significant**.

10.3.2.3 Alternative 2: Central Gated Notch

Alternative 2, Central Gated Notch, would provide a similar new gated notch through Fremont Weir as described for Alternative 1. The primary difference between Alternatives 1 and 2 is the location of the notch; Alternative 2 would site the notch near the center of Fremont Weir. This gate would be a similar size but would have an invert elevation that is higher (14.8 feet) because the river is higher at this upstream location, and the gate would allow up to 6,000 cfs to provide

open channel flow for adult fish passage. See Section 2.5 for more details on the alternative features.

10.3.2.3.1 Impact CULT-1: Impacts on Identified Archaeological Sites and Historic-Era Built Environment Resources Resulting from Construction

Potential impacts to identified archeological sites and historic built environment resources under Alternative 2 would be similar to those described for Alternative 1.

CEQA Conclusion

This impact would be **significant** under Alternative 2 because construction could materially alter or destroy the potential of identified resources to yield information useful in archaeological research or affect the physical configuration of Fremont Weir that may affect the significant characteristic that qualify the weir for potential listing on the NRHP or CRHR. Indirect impacts, such as introduction of new inconsistent changes to the setting, may also diminish the significance of these resources.

Implementation of Mitigation Measure MM-CULT-1 would ensure that significant risks to identified prehistoric and historic archaeological and historic built environment resources would be minimized and impacts would be reduced to **less than significant**. Although application of MM-CULT-1 would reduce this impact to **less than significant**, it would not guarantee that all of the scientifically important material would be retrieved because feasible archaeological excavation typically only retrieves a sample of the deposit, and portions of the site with important information may remain after treatment.

10.3.2.3.2 Impact CULT-2: Impacts on Archaeological Sites and Historic-Era Built Environment Resources to Be Identified Through Future Inventory Efforts

Potential impacts to previously unidentified archeological sites and historic built environment resources under Alternative 2 would be similar to those described for Alternative 1.

CEQA Conclusion

This impact would be **significant** under Alternative 2 because ground-disturbing construction may materially alter the physical characteristics that convey the significance of previously unidentified resources.

Implementation of Mitigation Measure MM-CULT-2 would ensure that all significant risks to archaeological and historical resources would be minimized and impacts would be reduced to **less than significant**.

10.3.2.3.3 Impact CULT-3: Impacts on Archaeological Sites that May Not Be Identified through Inventory Efforts

Potential impacts to previously unidentified archeological sites under Alternative 2 would be similar to those described for Alternative 1.

CEQA Conclusion

This impact would be **significant** under Alternative 2 because ground-disturbing construction may materially alter the significance of previously unidentified resources by disrupting the spatial associations that could yield important data.

By implementing construction worker training and monitoring and discovery protocols, Mitigation Measures MM-CULT-3 and MM-CULT-4 would reduce the potential for this impact. However, because archaeological resources may not be identified prior to disturbance through these measures, the impact cannot be entirely avoided. Therefore, this impact would remain **significant and unavoidable**.

10.3.2.3.4 Impact CULT-4: Damage to Buried Human Remains

Potential impacts to buried human remains under Alternative 2 would be similar to those described for Alternative 1.

CEQA Conclusion

This impact would be **significant** under Alternative 2 because the area is sensitive for buried human remains and construction could result in disturbance of these features.

Implementation of Mitigation Measure MM-CULT-5 would ensure that all significant risks to human remains outside of known cemeteries would be minimized and impacts would be reduced to **less than significant**.

10.3.2.3.5 Impact CULT-5: Impacts on Paleontological Resources Resulting from Construction

Potential impacts to paleontological resources under Alternative 2 would be identical to those described for Alternative 1.

CEQA Conclusion

Due to the shallow depth of proposed excavations and the limited extent of fossiliferous forming strata in the vicinity of the project area, the effect of Alternative 2 on paleontological resources would be **less than significant**.

10.3.2.4 Alternative 3: West Side Gated Notch

Alternative 3, West Side Gated Notch, would provide a similar new gated notch through Fremont Weir as described for Alternative 1. The primary difference between Alternatives 1 and 3 is the location of the notch; Alternative 3 would site the notch on the western side of Fremont Weir. This gate would be a similar size but would have an invert elevation that is higher (16.1 feet) because the river is higher at this upstream location. Alternative 3 would allow up to 6,000 cfs through the gated notch to provide open channel flow for adult fish passage. See Section 2.6 for more details on the alternative features.

10.3.2.4.1 Impact CULT-1: Impacts on Identified Archaeological Sites and Historic-Era Built Environment Resources Resulting from Construction

The sensitivity for cultural resources in Alternative 3 is high, the same as it is described above for Alternative 1. Particularly, impacts from the placement of the Supplemental Fish Passage structure described in Section 2.4.1.7 may cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Section 15064.5. Moreover, Fremont Weir, which would be modified under Alternative 3, and the East Yolo Bypass Levee, also located within the Alternative 3 project area, are both assumed to be eligible for listing on the NRHP and the CRHR.

Potential impacts to identified archeological sites and historic built environment resources under Alternative 3 would therefore be similar to those described for Alternative 1.

CEQA Conclusion

This impact would be **significant** under Alternative 3 because construction could materially alter or destroy the potential of identified archaeological resources to yield information useful in archaeological research. Indirect impacts, such as the introduction of new inconsistent changes to the setting, may also diminish the significance of these resources.

Likewise, Alternative 3 may adversely affect Fremont Weir by altering its physical configuration through construction of a gated notch on its west side. This may affect the physical integrity of the method of construction or other characteristics that could qualify the weir and/or the proposed SRFCP historic district for listing on the NRHP and CRHR. For both the weir and the East Yolo Bypass Levee, indirect impacts to their setting or aspects of integrity may further affect the ability of these two resources to convey their significance as part of the SRFCP historic district.

Implementation of Mitigation Measure MM-CULT-1 would ensure that significant risks to prehistoric and historic archaeological and historic built environment resources would be minimized and impacts would be reduced to **less than significant**. Although application of Mitigation Measure MM-CULT-1 would reduce this impact to less than significant, it would not guarantee that all the scientifically important material would be retrieved because feasible archaeological excavation typically only retrieves a sample of the deposit, and portions of the site with important information may remain after treatment.

10.3.2.4.2 Impact CULT-2: Impacts on Archaeological Sites and Historic-Era Built Environment Resources to Be Identified Through Future Inventory Efforts

Potential impacts to previously unidentified archeological sites and historic built environment resources under Alternative 3 would be similar to those described for Alternative 1.

CEQA Conclusion

This impact would be **significant** under Alternative 3 because ground-disturbing construction may materially alter the physical characteristics that convey the significance of previously unidentified resources.

Implementation of Mitigation Measure MM-CULT-2 would ensure that all significant risks to prehistoric and historic archaeological and historic built environment resources would be minimized and impacts would be reduced to **less than significant**.

10.3.2.4.3 Impact CULT-3: Impacts on Archaeological Sites that May Not Be Identified through Inventory Efforts

Potential impacts to previously unidentified archeological sites under Alternative 3 would be identical to those described for Alternative 1 because buried archaeological deposits have been confirmed in this portion of the Project by the identification of three buried prehistoric sites (DWR-FW-1, DWR-FW-2 and DWR-FW-3).

CEQA Conclusion

This impact would be **significant** under Alternative 3 because ground-disturbing construction may materially alter the significance of previously unidentified resources by disrupting the spatial associations that could yield important data, by altering the physical characteristics of built resources, and potentially affecting the setting or other aspects of integrity for both the archaeological and historic built environment resources.

By implementing construction worker training and monitoring and discovery protocols, Mitigation Measures MM-CULT-3 and MM-CULT-4 would reduce the potential for these impacts. However, because archaeological resources may not be identified prior to disturbance through these measures, the impact cannot be entirely avoided. Therefore, this impact would remain **significant and unavoidable**.

10.3.2.4.4 Impact CULT-4: Damage to Buried Human Remains

Potential impacts to buried human remains under Alternative 3 would be similar to those described for Alternative 1.

CEQA Conclusion

This impact would be **significant** under Alternative 3 because the area is sensitive for buried human remains and construction could result in disturbance of these features.

Implementation of Mitigation Measure MM-CULT-5 would ensure that all significant risks to human remains outside of known cemeteries would be minimized and impacts would be reduced to **less than significant**.

10.3.2.4.5 Impact CULT-5: Impacts on Paleontological Resources Resulting from Construction

Potential impacts to paleontological resources under Alternative 3 would be identical to those described for Alternative 1.

CEQA Conclusion

Due to the shallow depth of proposed excavations and the limited extent of fossiliferous forming strata in the vicinity of the project area, the effect of Alternative 3 on paleontological resources would be **less than significant**.

10.3.2.5 Alternative 4: West Side Gated Notch – Managed Flow²

Alternative 4, West Side Gated Notch – Managed Flow, would have a smaller amount of flow entering the Yolo Bypass through the gated notch in Fremont Weir than some other alternatives, but it would incorporate water control structures to maintain inundation for longer periods of time within the northern portion of the Yolo Bypass. Alternative 4 would include the same gated notch and associated facilities as described for Alternative 3; however, it would be operated to limit the maximum inflow to 3,000 cfs. See Section 2.7 for more details on the alternative features.

10.3.2.5.1 Impact CULT-1: Impacts on Identified Archaeological Sites and Historic-Era Built Environment Resources Resulting from Construction

Alternative 4 would have the same impacts on identified archaeological sites and historic-era built environment resources as described for Alternative 1, with the exception of a historical segment of the levee along the west side of the Yolo Bypass which is included in Alternative 4. The sensitivity for cultural resources under Alternative 4 is the same as described above for Alternative 1. For these reasons, construction has the potential to materially impair these resources under CEQA and adversely affect the resources as defined by Section 106 of the NHPA.

CEQA Conclusion

Construction of conveyance facilities would affect identified archaeological resources that occur in the footprint of Alternative 4. DWR identified these resources and finds they are likely to qualify as historical resources under CEQA; thus, these resources have the potential to qualify as historical resources. Additionally, the Fremont Weir and the East Yolo Bypass Levee, managed as if eligible for the NRHP and CRHR, would also be affected by construction of the facilities included under Alternative 4. Therefore, these resources are considered historic resources for the purposes of CEQA. Identified but currently inaccessible resources may also be significant under other register criteria; indirect impacts, such as introduction of new inconsistent changes to the setting, may also diminish the significance of these resources.

This impact would be **significant** under Alternative 4 because construction could materially alter or destroy the potential of these resources to yield information useful in archaeological research, the basis for the significance of the archaeological sites, through excavation and disruption of the spatial associations that contain meaningful information. The physical integrity of the weir and levees, both considered to be eligible for the NRHP and CRHR, as well as the proposed SRFCP historic district, would also be materially altered by construction. Given the manufactured nature

² Additional surveys/records searches may be conducted for the additional features above/below County Road 22.

of the levee, specifically, the fact that the function of the levee would not be impaired by the modification, and that substantial portions of the levee would be retained/unaltered, impacts resulting from construction would be **less than significant**.

Implementation of Mitigation Measure MM-CULT-1 would ensure that all significant risks to archaeological and historical resources, including historic built environment resources, would be minimized and impacts would be reduced to **less than significant**. Although application of Mitigation Measure MM-CULT-1 would reduce this impact to **less than significant**, it would not guarantee that all the scientifically important material would be retrieved because feasible archaeological excavation typically only retrieves a sample of the deposit, and portions of the site with important information may remain after treatment.

10.3.2.5.2 Impact CULT-2: Impacts on Archaeological Sites and Historic-Era Built Environment Resources to Be Identified Through Future Inventory Efforts

Potential impacts to previously unidentified archeological sites and historic built environment resources under Alternative 4 would be similar to those described for Alternative 1.

CEQA Conclusion

The footprint for Alternative 4 is sensitive for both prehistoric and historic-era archaeological and built resources. Because many of these resources are likely to have data useful in prehistoric and historic archaeological research, as well as the integrity to convey this significance, they are likely to qualify as historical resources or unique archaeological sites under CEQA and be eligible for the NRHP. Ground-disturbing construction may materially alter the significance of these resources by disrupting the spatial associations that could yield important data, resulting in a **significant impact**.

Implementation of Mitigation Measure MM-CULT-2 would ensure that all significant risks to archaeological and historical resources would be minimized and impacts would be reduced to **less than significant**. While mitigation is available (Mitigation Measure MM-CULT-2), this mitigation cannot guarantee that all eligible or significant resources would be preserved in place or that all important data would be retrieved before construction destroys these resources. The scale of the Project, investment into existing designs, and the presence of other important environmental resources, such as habitat, natural communities, and wetlands that should be avoided, are constraints on the flexibility and feasibility of avoidance.

10.3.2.5.3 Impact CULT-3: Impacts on Archaeological Sites that May Not Be Identified through Inventory Efforts

Potential impacts to previously unidentified archeological sites under Alternative 4 would be similar to those described for Alternative 1.

CEQA Conclusion

Construction has the potential to disturb previously unidentified archaeological sites qualifying as historical resources, historic properties, or unique archaeological resources. This impact would be **significant** under Alternative 4 because ground-disturbing construction may materially alter the significance of previously unidentified resources by disrupting the spatial associations that

could yield important data, by altering the physical characteristics of built resources, and potentially affecting the setting or other aspects of integrity for both the archaeological and historic built environment resources.

By implementing construction worker training and monitoring and discovery protocols, Mitigation Measures MM-CULT-3 and MM-CULT-4 would reduce the potential for this impact. However, because archaeological resources may not be identified prior to disturbance through these measures, the impact cannot be entirely avoided. Therefore, this impact would remain **significant and unavoidable**.

10.3.2.5.4 Impact CULT-4: Damage to Buried Human Remains

The footprint of Alternative 4 is sensitive for buried human remains that may occur in isolation rather than as part of prehistoric or historic archaeological sites. Historic and prehistoric human remains have been discovered as isolated interments rather than as part of larger sites. Because these isolated resources are not associated with larger deposits, their distribution and depth cannot be estimated. Construction of Alternative 4 would require ground-disturbing work that may damage previously unidentified human remains, resulting in direct impacts on these resources. While inventory and monitoring efforts are prescribed under Mitigation Measures MM-CULT-1, MM-CULT-2 and MM-CULT-3, the large acreages subject to disturbance under Alternative 4 make exhaustive sampling to identify all buried and isolated human remains technically and economically infeasible. For these reasons, the potential remains that such resources may be damaged or exposed before they can be discovered through inventory or monitoring.

CEQA Conclusion

The Alternative 4 area is sensitive for buried human remains. Construction likely would result in disturbance of these features. Disturbance of human remains, including remains interred outside of cemeteries, is considered a significant impact in the CEQA Appendix G checklist; therefore, disturbance of these remains would result in a **significant impact**.

Implementation of Mitigation Measure MM-CULT-5 would ensure that all significant risks to human remains outside of known cemeteries would be minimized and impacts would be reduced to **less than significant**.

10.3.2.5.5 Impact CULT-5: Impacts on Paleontological Resources Resulting from Construction

Potential impacts to paleontological resources under Alternative 4 would be identical to those described for Alternative 1.

CEQA Conclusion

Due to the shallow depth of proposed excavations and the limited extent of fossiliferous forming strata in the vicinity of the project area, the effect of Alternative 4 on paleontological resources would be **less than significant**.

10.3.2.6 Alternative 5: Central Multiple Gated Notches

Alternative 5, Central Multiple Gated Notches, would improve the entrainment of fish by using multiple gates and intake channels so that the deeper gate could allow more flow to enter the bypass when the river is at lower elevations. Flows would move to other gates when the river is higher to control inflows. Alternative 5 incorporates multiple gated notches in the central location on the existing Fremont Weir that would allow combined flows of up to 3,400 cfs. See Section 2.8 for more details on the alternative features.

10.3.2.6.1 Impact CULT-1: Impacts on Identified Archaeological Sites and Historic-Era Built Environment Resources Resulting from Construction

Potential impacts to identified archeological sites and historic-era built resources under Alternative 5 would be similar to those described for Alternative 1.

CEQA Conclusion

This impact would be **significant** under Alternative 5 because construction could materially alter or destroy the potential of identified resources to yield information useful in archaeological research. Indirect impacts, such as introduction of new inconsistent changes to the setting, may also diminish the significance of these resources. The physical integrity of Fremont Weir and the East Yolo Bypass Levee, both considered to be eligible for the NRHP and CRHR, as well as the proposed SRFCP historic district, would also be materially altered by construction. Given the manufactured nature of the levee, specifically, the fact that the function of the levee would not be impaired by the modification, and that substantial portions of the levee would be retained/unaltered, impacts resulting from construction would be **less than significant**.

Implementation of Mitigation Measure MM-CULT-1 would ensure that all significant risks to archaeological and historical resources would be minimized and impacts would be reduced to **less than significant**.

10.3.2.6.2 Impact CULT-2: Impacts on Archaeological Sites and Historic-Era Built Environment Resources to Be Identified Through Future Inventory Efforts

Potential impacts to previously unidentified archeological sites and historic-era built resources under Alternative 5 would be similar to those described for Alternative 1.

CEQA Conclusion

This impact would be **significant** under Alternative 5 because ground-disturbing construction may materially alter the significance of previously unidentified resources.

Implementation of Mitigation Measure MM-CULT-2 would ensure that all significant risks to archaeological and historical resources would be minimized and impacts would be reduced to **less than significant**.

10.3.2.6.3 Impact CULT-3: Impacts on Archaeological Sites that May Not Be Identified through Inventory Efforts

Potential impacts to previously unidentified archeological sites under Alternative 5 would be similar to those described for Alternative 1.

CEQA Conclusion

This impact would be **significant** under Alternative 5 because ground-disturbing construction may materially alter the significance of previously unidentified resources by disrupting the spatial associations that could yield important data.

By implementing construction worker training and monitoring and discovery protocols, Mitigation Measures MM-CULT-3 and MM-CULT-4 would reduce the potential for this impact. However, because archaeological resources may not be identified prior to disturbance through these measures, the impact cannot be entirely avoided. Therefore, this impact would remain **significant and unavoidable**.

10.3.2.6.4 Impact CULT-4: Damage to Buried Human Remains

Potential impacts to buried human remains under Alternative 5 would be similar to those described for Alternative 1.

CEQA Conclusion

This impact would be **significant** under Alternative 5 because the area is sensitive for buried human remains and construction could result in disturbance of these features.

Implementation of Mitigation Measure MM-CULT-5 would ensure that all significant risks to human remains outside of known cemeteries would be minimized and impacts would be reduced to **less than significant**.

10.3.2.6.5 Impact CULT-5: Impacts on Paleontological Resources Resulting from Construction

Potential impacts to paleontological resources under Alternative 5 would be identical to those described for Alternative 1.

CEQA Conclusion

Due to the shallow depth of proposed excavations and the limited extent of fossiliferous forming strata in the vicinity of the project area, the effect of Alternative 5 on paleontological resources would be **less than significant**.

10.3.2.6.6 Tule Canal Floodplain Improvements (Program Level)

As described in Section 2.8.1.7, Alternative 5 would include floodplain improvements along Tule Canal, just north of Interstate 80. These improvements would not be constructed at the same time as the remaining facilities. They are included at a program level of detail to consider all of

the potential impacts and benefits of Alternative 5. Subsequent consideration of environmental impacts would be necessary before construction could begin.

The floodplain improvements would develop a series of secondary channels that connect to Tule Canal north of I-80 (refer to Figure 2-18). Channels A, B, and C would have a 30-foot bottom width with 3:1 side slopes (horizontal to vertical). An operable weir in Tule Canal would help increase the water surface elevation upstream and move water into these channels. These improvements also include a fish bypass channel around the weir with a 10-foot bottom width and 3:1 side slopes (horizontal to vertical). The bypass channel would be about 2,100 feet long and convey up to 300 cfs. These channels would increase inundation in the surrounding areas, which are currently managed as wetland habitat for waterfowl.

Surveys for archeological and historic-era built resources have not been conducted in the area of Tule Canal Floodplain Improvements. However, the Tule Canal is not eligible for the NRHP or CRHR (see Table 10-3). Future surveys may find archaeological sites, historic buildings structures, or objects; or human remains, or they may be found unexpectedly during construction.

CEQA Conclusion

Impacts from the Tule Canal Floodplain Improvements would be **significant** because ground-disturbing construction may materially alter the physical characteristics that convey the significance of previously unidentified resources or disturb human remains.

Because these floodplain improvements would not be constructed at the same time as the remaining facilities, future inventory, research, CRHR and NRHP eligibility evaluations, and assessment of proposed effects and impacts would be necessary before construction could begin.

Implementation of Mitigation Measures MM-CULT-1 through MM-CULT-4 would minimize adverse effects to archaeological and historical resources and human remains; however, due to the uncertainty of the magnitude of the effects to archaeological sites that may not be identified through inventory efforts and disturbance to human burials remains, Impacts CULT-3 and CULT-4 are considered potentially **significant and unavoidable**.

10.3.2.7 Alternative 6: West Side Large Gated Notch

Alternative 6, Large Gated Notch, is a large notch in the western location that would allow flows up to 12,000 cfs. The difference between Alternative 6 and Alternative 3 is the amount of flow allowed by each alternative. It was designed with the goal of entraining more fish by allowing more flow into the bypass when the Sacramento River is at lower elevations. See Section 2.9 for more details on the alternative features.

10.3.2.7.1 Impact CULT-1: Impacts on Identified Archaeological Sites and Historic-Era Built Environment Resources Resulting from Construction

Potential impacts to identified archeological sites and historic-era built resources under Alternative 6 would be similar to those described for Alternative 1.

CEQA Conclusion

This impact would be **significant** under Alternative 6 because construction could materially alter or destroy the potential of identified resources to yield information useful in archaeological research or to continue to convey other significant qualities that may make the resources eligible for the NRHP or CRHR (e.g., Fremont Weir). Indirect impacts, such as introduction of new inconsistent changes to the setting, may also diminish the significance of these resources.

Implementation of Mitigation Measure MM-CULT-1 would ensure that all significant risks to archaeological and historical resources would be minimized and impacts would be reduced to **less than significant**. Although application of Mitigation Measure MM-CULT-1 would reduce this impact to less than significant, it would not guarantee that all of the scientifically important material would be retrieved because feasible archaeological excavation typically only retrieves a sample of the deposit, and portions of the site with important information may remain after treatment.

10.3.2.7.2 Impact CULT-2: Impacts on Archaeological Sites and Historic-Era Built Environment Resources to Be Identified Through Future Inventory Efforts

Potential impacts to previously unidentified archeological sites and historic-era buildings, structures, or objects under Alternative 6 would be similar to those described for Alternative 1.

CEQA Conclusion

This impact would be **significant** under Alternative 6 because ground-disturbing construction may materially alter the physical characteristics that convey the significance of previously unidentified resources.

Implementation of Mitigation Measure MM-CULT-2 would ensure that all significant risks to archaeological and historical resources would be minimized and impacts would be reduced to **less than significant**.

10.3.2.7.3 Impact CULT-3: Impacts on Archaeological Sites that May Not Be Identified through Inventory Efforts

Potential impacts to previously unidentified archeological sites under Alternative 6 would be similar to those described for Alternative 1.

CEQA Conclusion

This impact would be **significant** under Alternative 6 because ground-disturbing construction may materially alter the significance of previously unidentified resources by disrupting the spatial associations that could yield important data.

By implementing construction worker training and monitoring and discovery protocols, Mitigation Measures MM-CULT-3 and MM-CULT-4 would reduce the potential for this impact. However, because archaeological resources may not be identified prior to disturbance through these measures, the impact cannot be entirely avoided. Therefore, this impact would remain **significant and unavoidable**.

10.3.2.7.4 Impact CULT-4: Damage to Buried Human Remains

Potential impacts to buried human remains under Alternative 6 would be similar to those described for Alternative 1.

CEQA Conclusion

This impact would be **significant** under Alternative 6 because the area is sensitive for buried human remains and construction could result in disturbance of these features.

Implementation of Mitigation Measure MM-CULT-5 would ensure that all significant risks to human remains outside of known cemeteries would be minimized and impacts would be reduced to **less than significant**.

10.3.2.7.5 Impact CULT-5: Impacts on Paleontological Resources Resulting from Construction

Potential impacts to paleontological resources under Alternative 6 would be identical to those described for Alternative 1.

CEQA Conclusion

Excavations proposed under Alternative 6 would be shallow and would not affect the limited extent of fossiliferous forming strata in vicinity of the project area. Therefore, the effect of Alternative 6 on paleontological resources would be **less than significant**.

10.3.3 Summary of Impacts

Table 10-4 summarizes the impacts to cultural resources in the APE.

Table 10-4. Summary of Cultural Resources Impacts and Mitigation

Impact	Alternative	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Impact CULT-1: Impacts on Identified Archaeological Sites and Historic-Era Built Resources Resulting from Construction	No Action	NI	—	NI
	All Action Alternatives	S	MM-CULT-1	LTS
Impact CULT-2: Impacts on Archaeological Sites and Historic-Era Built Resources to Be Identified Through Future Inventory Efforts	No Action	NI	—	NI

Impact	Alternative	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
	All Action Alternatives	S	MM-CULT-2	LTS
Impact CULT-3: Impacts on Archaeological Sites That May Not Be Identified through Inventory Efforts	No Action	NI	—	NI
	All Action Alternatives	S	MM-CULT-3 MM-CULT-4	SU
Impact CULT-4: Damage to Buried Human Remains	No Action	NI	—	NI
	1, 2, 3, 4, 5 (Project), 6	S	MM-CULT -5	LTS
	5 (Program)	S	MM-CULT -5	SU
Impact CULT-5: Impacts on Paleontological Resources Resulting from Construction	No Action	NI	—	NI
	All Action Alternatives	LTS	—	LTS

Key: LTS = less than significant; NI = no impact; S = significant; SU = significant and unavoidable

10.4 Cumulative Impacts Analysis

This section describes the cumulative impacts analysis for cultural resources. Section 3.3, *Cumulative Impacts*, presents an overview of the cumulative impacts analysis, including the methodology and the projects, plans, and programs considered in the analysis.

10.4.1 Methodology

This evaluation of cumulative impacts for cultural resources considers the impacts of the Project and how they may combine with the impacts of other past, present, and future projects or actions to create significant impacts on specific resources. The area of analysis for these cumulative impacts is the Yolo Bypass. The timeframe for this cumulative analysis includes the past, present, and probable future projects producing related or cumulative impacts that have been identified in the area of analysis.

The regulations for Section 106 of the NHPA define an adverse effect as an undertaking that may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association [36 CFR Section 800.5(a)(1)]. Adverse effects explicitly include reasonably foreseeable impacts caused

by the undertaking that may occur later in time, be farther removed in distance, or be cumulative [36 CFR Section 800.5(a)(1)].

Cumulative impacts, under Section 106 of the NHPA, applies only to those resources that are listed in or eligible for the NRHP. For NEPA, CEQA, and Section 106 of the NHPA, cumulative impacts are defined as two or more individual impacts that, when considered together, are considerable or that compound or increase other environmental impacts.

- a. The individual impacts may be changes resulting from a single project or a number of separate projects.
- b. The cumulative impact from several projects is the change in the environment that results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects.

Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time. Several related and reasonably foreseeable projects and actions may result in cultural resources impacts in the Project area. In particular, levee removal and relocation and other construction-related projects may result in additional construction equipment in the area of analysis, possibly introducing additional construction-related destruction of cultural resources in the Delta. Projects that could contribute cumulatively to cultural resources are those that have ground disturbing activities. Therefore, projects considered in the cumulative analysis for cultural resources include:

- Central Valley Flood Protection Plan
- Delta Wetlands Project
- Folsom Dam Water Control Manual Update
- Lower Cache Creek Flood Risk Management Feasibility Study and the Woodland Flood Risk Reduction Project
- Lower Putah Creek North America Wetlands Conservation Act Project
- North Bay Aqueduct Alternative Intake Project
- North Delta Flood Control and Ecosystem Restoration Project
- Sacramento River Bank Protection Project
- Sacramento River General Reevaluation Report
- Shasta Lake Water Resources Investigation
- Yolo Habitat Conservation Plan/Natural Communities Conservation Plan
- Yolo Local Conservation Plan

These programs would be expected to use proper mitigation measures to prevent impacts to cultural resources and likely would coordinate proposed actions within this Project area to avoid significant cumulative impacts.

10.4.2 Cumulative Impacts

The Lower Yolo Restoration Project is aimed at restoring tidal flux to 1,100 acres of existing pasture land and may increase inundation in the Yolo Bypass, destabilizing cultural resources and potentially affecting human remains.

Under any of the build alternatives (Alternatives 1 through 6), it is highly unlikely that paleontological resources would be affected. Although some of the projects considered in this cumulative analysis could adversely affect paleontological resources, implementation of the Project would not contribute to those cumulative effects.

While construction-related projects would be expected to have significant short-term impacts on the area of analysis, it is expected that most of the projects would result in potential impacts being mitigated to a less than significant level. As noted in the discussion on “Impacts on Archaeological Sites That May Not Be Identified through Inventory Efforts” any of the build alternatives (Alternatives 1-6) would result in significant and unmitigated impacts under CEQA. It is anticipated that other large-scale ground disturbing projects may also contribute to the loss of archaeological sites. These effects could be **cumulatively considerable** depending upon the scale.

10.5 References

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