9 Vegetation, Wetlands, and Wildlife Resources

This chapter addresses terrestrial biological resources that are known or have the potential to occur in the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project (Project) area and describes the potential effects of the Project alternatives on those resources. Terrestrial biological resources include common vegetation and habitat types, sensitive plant communities, and special-status plant and animal species. Aquatic resources and fisheries are addressed in Chapter 8. The analysis provided in this chapter includes a description of existing environmental conditions, the methods used to assess environmental effects, the potential direct and indirect impacts of the Project alternatives, and mitigation measures recommended to address adverse effects under the National Environmental Policy Act (NEPA) and significant impacts under the California Environmental Quality Act (CEQA). Federal, State of California (State), and local regulations that pertain to biological resources are summarized in this chapter.

9.1 Environmental Setting/Affected Environment

The Yolo Bypass is a leveed, 59,000-acre floodplain on the west side of the lower Sacramento River in California's Yolo and Solano counties. The Yolo Bypass is located within the boundaries and levees of the Sacramento River Flood Control Project and is the primary component that carries floodwaters from several northern California waterways to the Sacramento-San Joaquin Delta (Delta). These waterways include the Sacramento, Feather, and American rivers and their associated tributary watersheds. Tributaries specific to the Yolo Bypass include Cache and Putah creeks, Willow Slough, and Knights Landing Ridge Cut from the Colusa Basin (Jones and Stokes 2001). Floodplain ecology and bypass hydrology are described in further detail in Section 8.1.3 of Chapter 8, *Aquatic Resources and Fisheries*.

For the purpose of this Environmental Impact Statement/Environmental Impact Report (EIS/EIR), the Yolo Bypass comprises two main geographical sections: an upper 14.2-mile section (measured north to south) between Fremont Weir and the Interstate 80 (I-80) causeway (the northern portion of the Yolo Bypass) and a lower 26.8-mile section (measured north to south) between the I-80 causeway and the southern end of Egbert Tract (the southern portion of the Yolo Bypass). The northern portion of the Yolo Bypass is nontidal and bounded on the east by Tule Canal (the upper extension of the Toe Drain) and the east bypass levee and on the west by the west bypass levee. The I-5 causeway bisects the northern portion of the Yolo Bypass east to west.

The southern portion of the Yolo Bypass is bounded on the east by the Toe Drain and the east bypass levee (also considered the west levee of the Sacramento River Deep Water Ship Channel, downstream of the northwest corner of Prospect Island). At this location, the southern portion of the Yolo Bypass extends east to include Prospect Island although the east bypass levee remains intact along the west edge of Prospect Island. South of Prospect Island, the east side of the southern portion of the Yolo Bypass extends downstream of the confluence of Cache and

Lindsey sloughs to the downstream boundary of Egbert Tract (Jones and Stokes 2001). This eastern downstream limit of the southern portion of the Yolo Bypass is roughly co-located with the confluence of Steamboat and Cache sloughs.

The west side of the southern portion of the Yolo Bypass is bounded by the west bypass levee to just north of Putah Creek and Putah Creek Sink located downstream of Putah Creek. The southern portion of the Yolo Bypass does not have a levee on the west side for about eight miles. The lack of levees allows floodwaters to flow unimpeded as far west as Yolo County Road (CR) 104 (Jones and Stokes 2001). Farther downstream (about one mile north of Yolo CR 155), the west bypass levee resumes and extends south and west of Liberty Island. The west side of the southern portion of the Yolo Bypass extends farther south, downstream of Liberty Island, and along the western boundary of Egbert Tract (Jones and Stokes 2001).

The southern portion of the Yolo Bypass, which lies within the legally defined Delta, is tidally influenced in some areas. Tidal conditions are routinely measured as far upstream in the Toe Drain as the I-80 causeway. The 16,600-acre California Department of Fish and Wildlife (CDFW) Yolo Bypass Wildlife Area (YBWA) is situated predominantly south of I-80 in the upper reach of the southern portion of the Yolo Bypass. The YBWA includes 7,000 acres of managed wetlands. As previously described, the southern limit of the Project area extends to the southern boundary of Egbert Tract. However, because of limitations in available map data, figures in this EIS/EIR do not fully capture the southernmost portion of the Project area south of Liberty Island, including Prospect Island. There are no construction features proposed in this area.

The Project area includes areas in the Yolo Bypass that have been identified for ground disturbance. Most of the direct impacts associated with ground disturbance would occur in the northern portion of the Yolo Bypass in the Fremont Weir Wildlife Area (FWWA). Fremont Weir and the FWWA are the northernmost extent of the Yolo Bypass. Fremont Weir was completed in 1924; it is the first overflow structure on the Sacramento River's southern bank and marks the beginning of the Yolo Bypass. Fremont Weir is located 15 miles northwest of Sacramento and eight miles northeast of Woodland. The weir's primary purpose is to release overflow waters of the Sacramento River, the Sutter Bypass, and the Feather River into the Yolo Bypass. The crest elevation is 32 feet referenced to the North American Vertical Datum of 1988 (California Data Exchange Center 2017), and the design capacity of the weir is 343,000 cubic feet per second (cfs) (California Department of Water Resources [DWR] 2010).

The Yolo Bypass provides flood control; more specifically, it conveys flood flows generated by runoff from the entire Sacramento River watershed. Within this flood management context, most of the land in the Yolo Bypass is farmed, with the majority of the publicly and privately managed wetlands located in the southern portion of the Yolo Bypass south of I-80. Land use within the Yolo Bypass is restricted by easements held through the Sacramento-San Joaquin Drainage District, as amended by the State of California Reclamation Board (Jones and Stokes 2001). However, these easements do not restrict the use of land in the Yolo Bypass for agricultural and managed wetland (duck club) activities.

Those portions of the Yolo Bypass that are flooded in winter and early spring also function as a migration route and spawning and rearing habitat for many sensitive special-status fish species endemic to the region (as defined by the Federal Endangered Species Act [ESA] and the California Endangered Species Act [CESA]), as discussed further in Chapter 8, *Aquatic*

Resources and Fisheries). This migration connection occurs when floodwaters are spilling over Fremont and Sacramento weirs, creating an upstream hydrologic connection between the Yolo Bypass and Sacramento River. The Yolo Bypass also provides habitat for shorebirds, waterfowl, and terrestrial species (Jones and Stokes 2001). Large areas in the bypass are currently managed year-round for wildlife habitat, including the YBWA, Conaway Ranch, and private duck club lands in the southern section of the bypass (Jones and Stokes 2001).

The topography in the Yolo Bypass is mostly flat since the area is located in a basin characterized by natural levees created by overflow sediment from the Sacramento River. The bypass generally slopes from higher elevations in the north to lower elevations in the south and from higher elevations in the west to lower in the east. The elevation in the northern portion of the Yolo Bypass ranges from 20 to 32 feet above mean sea level while elevations in the southern portion range from 5 to 15 feet above mean sea level. The current topographic features and landforms in the Yolo Bypass are largely a product of anthropogenic (human) alterations to the natural system (California Department of Fish and Game [CDFG] 2008). The construction of dams and levees, management of water releases, and grading of topography to convert the historic floodplain to agricultural land has caused substantial changes to the natural topography. The primary topographic features now include human-made levees, trestles, and berms (CDFG 2008).

9.1.1 Vegetation Communities and Habitats

Vegetation communities were derived from the geographic information system (GIS) information in the *Fine-Scale Riparian Vegetation Mapping of the Central Valley Flood Protection Plan Area Final Report* (CDFW 2013), with modifications made during 2014 “ground-truthing” surveys conducted by DWR and HDR, Inc. (HDR) over a portion of the survey area (primarily the northern and eastern parts of the FWWA along the old river oxbow, Sacramento River, and Tule Canal) where access permitted. The vegetation and land use classification system generally follows that developed for the Delta by CDFW (Hickson and Keeler-Wolf 2007). The CDFW system follows Sawyer et al. (2009), which is consistent with the National Vegetation Classification System for the United States (Grossman et al. 1998).

Appendix H1 shows the vegetation communities in the Yolo Bypass.

Table 9-1 summarizes the acreages of vegetation communities and land cover types in the construction study area; these vegetation communities are described in further detail following the table. The biological resources construction study area for all Project alternatives includes the area of temporary and permanent disturbance plus a 100-foot buffer. Lists of commonly associated wildlife species provided in the vegetation community descriptions were based on California Wildlife Habitat Relationship descriptions (Mayer and Laudenslayer 1988) and field observations.

Table 9-2 summarizes the acreages of vegetation communities and land cover types in the operations study area (Yolo Bypass). However, detailed descriptions of these vegetation communities are not provided in this EIS/EIR.

Table 9-1. Vegetation Communities in the Construction Study Area

Vegetation Community	Alt. 1 (acres)	Alt. 2 (acres)	Alt. 3 (acres)	Alt. 4 (acres)	Alt. 5 (acres)	Alt. 6 (acres)
Annual and Perennial Grassland	**60.8**	**146.9**	**115.0**	**228.5**	**166.1**	**133.0**
California annual herb/grassland	0.8	40.0	41.7	41.7	63.9	58.6
California naturalized annual and perennial grassland	60.0	106.8	73.3	186.8	102.1	74.4
Freshwater Aquatic Vegetation	**6.9**	**9.5**	**9.5**	**10.2**	**4.2**	**9.7**
Temperate freshwater floating mat	3.1	3.1	3.1	3.1	2.0	3.1
Water primrose wetlands (semi-natural stands)	3.8	6.4	6.4	7.0	2.2	6.6
Freshwater Emergent Wetland	**28.8**	**26.7**	**28.2**	**141.6**	**10.6**	**28.3**
California and hardstem bulrush marsh	28.0	25.9	25.9	25.9	9.8	26.0
Managed annual wetland vegetation	0.8	0.8	2.3	115.8	0.8	2.3
Freshwater Seeps and Meadows	**0.0**	**0.0**	**6.6**	**6.6**	**0.0**	**7.1**
Douglas' mugwort patches	0.0	0.0	6.6	6.6	0.0	7.1
Riparian Forest/Woodland	**38.1**	**42.0**	**49.2**	**77.2**	**31.6**	**53.3**
Black willow thicket	0.9	1.1	1.1	10.0	1.9	1.1
Box elder forest	0.0	0.0	1.5	1.5	0.0	2.3
Fremont cottonwood forest	28.9	31.5	36.5	54.8	22.9	38.5
Mixed hardwood forest	0.0	0.0	0.0	0.9	0.0	0.0
Valley oak woodland	8.3	9.4	10.1	10.1	6.8	11.4
Riparian Scrub	**0.0**	**0.7**	**0.0**	**<0.1**	**0.7**	**0.0**
Himalayan blackberry brambles	0.0	0.7	0.0	0.0	0.7	0.0
Sandbar willow thicket	0.0	0.0	0.0	<0.1	0.0	0.0
Other	**12.4**	**17.8**	**11.3**	**172.6**	**11.0**	**13.8**
Agriculture	9.6	3.7	4.8	135.2	0.8	4.9
Open Water	2.8	14.1	6.5	37.5	10.2	8.9
Total	**147.0**	**243.6**	**219.8**	**636.7**	**224.2**	**238.1**

Table 9-2. Vegetation Communities in the Operations Study Area

Vegetation Community	Yolo Bypass (acres)
Annual and Perennial Grassland	**7,149**
California annual herb/grassland	3,115
California naturalized annual and perennial grassland	4,034
Coastal Scrub	**6**
Coyote brush scrub	6
Freshwater Aquatic Vegetation	**134**
Temperate freshwater floating mat	56
Water primrose wetlands (semi-natural stands)	78

Vegetation Community	Yolo Bypass (acres)
Freshwater Emergent Wetland	**8,123**
California and hardstem bulrush marsh	1,558
Cattail marsh	23
Common reed marsh	8
Managed annual wetland vegetation	4,743
Seasonally flooded grassland	1,428
Submerged aquatic vegetation	1
Vernal pool complex	51
Wet meadows	311
Freshwater Seeps and Meadows	**7**
Douglas' mugwort patches	7
Riparian Forest/Woodland	**861**
Black willow thicket	349
Box elder forest	7
California sycamore woodland	1
Fremont cottonwood forest	251
Hinds's walnut and related stands	3
Oregon ash grove	4
Red osier thicket	3
Seasonally flooded forest	4
Valley oak woodland	157
White alder grove	77
Unspecified	5
Riparian Scrub	**374**
Arroyo willow thicket	148
Button willow thicket	1
California rose briar patches	1
Himalayan blackberry brambles	13
Sandbar willow thicket	209
Seasonally flooded riparian scrub	2
Saline Emergent Wetland	**6,036**
Alkali heath marsh	2
Baltic rush marsh	6
Managed alkali wetland (*Crypsis*)	1,620
Perennial pepper weed patches	201
Salt grass flats	4,207
Other	**37,770**

Vegetation Community	Yolo Bypass (acres)
Agriculture	31,731
Barren	31
Eucalyptus grove	1
Open Water	5,807
Ornamental	31
Urban	169
Total	**60,460**

9.1.1.1 Agriculture

Agricultural lands in the study area include areas that are cultivated for a variety of crops. Cropland consists of major crops and cover types in agricultural production, including alfalfa grown on Conaway Ranch, sunflowers, rice, corn, milo, sorghum, millet, safflower, tomatoes, and irrigated pastures. Alfalfa, sunflowers, irrigated pastures, and fallow fields provide foraging habitat for Tricolored Blackbird (*Agelaius tricolor*). Non-cropland includes agricultural areas used for cattle grazing, small roads and ditches, and non-planted areas associated with cultivated lands (DWR 2013).

Cultivated crops include grain and seed crops as well as row crops and silage. Grain and seed crops are annual grasses that are grown in dense stands such as corn. Because the dense growth makes it difficult to move through these fields, most of the wildlife values are derived during the early growing period and especially following the harvest when waste grain is accessible to waterfowl and other birds such as Sandhill Cranes (*Grus canadensis*).

Although generally of lesser value to wildlife than native habitats, row crop and silage fields often support abundant populations of small mammals such as western harvest mouse (*Reithrodontomys megalotis*) and California vole (*Microtus californicus*), which is a major prey species for Swainson's Hawk. These species in turn attract predators such as gopher snake (*Pituophis catenifer catenifer*), western racer (*Coluber constrictor*), American Kestrel (*Falco sparverius*), and Red-Tailed Hawk (*Buteo jamaicensis*). Other reptile and bird species prey on the insect populations abundant in row crop and silage fields, including western fence lizard (*Sceloporus occidentalis*), Tricolored Blackbird, Brewer's Blackbird (*Euphagus cyanocephalus*), American Crow (*Corvus brachyrhynchos*), and the invasive non-native European Starling (*Sturnus vulgaris*). Although row crop and silage fields do support habitat for some common and special-status wildlife species, they do so for only a short duration, with such habitat eliminated after harvest. Tilling practices during and after harvest undoubtedly cause mortality of terrestrial wildlife species, including small mammals such as western harvest mouse and California vole.

Rice (*Oryza* sp.) is a flood-irrigated crop of seed-producing annual grasses. It is maintained in a flooded state until it is nearly mature. Rice is usually grown in areas that previously supported natural wetlands, and many wetland wildlife species, especially waterfowl and shorebirds, use rice fields. Waste grain also provides food for Sandhill Crane. Other wildlife that forage or use rice fields include giant garter snakes (*Thamnophis gigas*), bullfrogs (*Lithobates catesbeianus*), and wading birds that forage on aquatic invertebrates and small vertebrates (such as crayfish and small fishes). Rice fields provide habitat for a range of wintering waterfowl species in the Yolo Bypass. The practice of flooding rice fields in winter to allow rice stubble to rot, instead of

burning rice stubble in the fall, gives a wide variety of ducks and geese the opportunity to forage in rice fields in winter and provides important foraging habitat for shorebirds. Fallow rice fields also provide important habitat for geese, cranes, large herons, and egrets and can provide breeding habitat for waterfowl such as Mallard (*Anas platyrhynchos*) and Gadwall (*Anas strepera*) (DWR 2013).

Agricultural areas provide habitat for a variety of wildlife species, including bats, amphibians, reptiles, and birds. Flooded rice fields in the study area provide breeding habitat for giant garter snakes and valley garter snakes. Agricultural areas can also provide foraging habitat for Federally and/or State-listed species, including Swainson's Hawk and Greater Sandhill Crane (*Grus canadensis tabida*).

9.1.1.2 Annual and Perennial Grassland

The annual and perennial grassland community occupies a spectrum ranging from natural to intensively managed vegetation dominated by grasses. At the more natural end of the spectrum, this community consists of native or introduced annual and perennial grasses and forbs (Hickson and Keeler-Wolf 2007). At the intensively managed end of the spectrum, it includes non-irrigated pasturelands (CALFED Bay-Delta Program [CALFED] 2001). Grasslands are often found adjacent to wetland riparian habitats and are the dominant community on managed levees.

There are two types of annual and perennial grasslands in the study area: California annual herb/grassland (which includes native herbaceous plants although non-native grasses might still be dominant) and California naturalized annual and perennial grassland (which is dominated by non-native grass species with very little or no presence of native herbaceous plants). These grasslands are present throughout the FWWA. Grasslands in the study area contain herbaceous vegetation dominated in some large areas by native grasses, including wild-rye (*Elymus* spp.) and whiteroot (*Carex barbarae*), and in other areas by highly adaptive and invasive plant species, including non-native fobs and, to a lesser extent, non-native annual grasses, with few, if any, native plant species present.

The grassland community designation has also been applied to areas that have been cleared of their natural vegetation cover such as levee faces and edges of agricultural fields and roads. Vegetation in these areas is best characterized as ruderal, meaning it is dominated by herbaceous, non-native plant species, some of which are considered invasive by the California Invasive Plant Council (Cal-IPC). Representative species that are present in ruderal grassland areas are common mallow (*Malva* sp.), bull thistle (*Cirsium vulgare*), bindweed (*Convolvulus arvensis*), poison hemlock (*Conium maculatum*), wild lettuce (*Lactuca* spp.), Russian thistle (*Salsola tragus*), and non-native annual grasses, including wild oats (*Avena* spp.), bromes (*Bromus* spp.), and barleys (*Hordeum* spp.).

Representative plant species observed within the grassland community during 2014 field surveys include rye grass (*Festuca perennis*), mustard (*Brassica* spp.), bromes, yellow star-thistle (*Centaurea solstitialis*), annual rabbit's-foot grass (*Polypogon monspeliensis*), chicory (*Cichorium intybus*), cocklebur (*Xanthium* sp.), common groundsel (*Senecio vulgaris*), curly dock (*Rumex crispus*), evening primrose (*Oenothera* sp.), hyssop loosestrife (*Lythrum hyssopifolia*), ludwigia (*Ludwigia* sp.), milk thistle (*Silybum marianum*), Douglas' mugwort (*Artemisia douglasiana*), plantain (*Plantago* sp.), prickly lettuce (*Lactuca serriola*), woolly rose-

mallow (*Hibiscus lasiocarpus* var. *occidentalis*), salt grass (*Distichlis spicata*), verbena (*Verbena* sp.), and white sweet clover (*Melilotus albus*).

Grassland communities provide foraging, breeding, and cover habitat for a variety of wildlife species, including gopher snake, western racer, Tricolored Blackbird, Swainson's Hawk, Western Meadowlark (*Sturnella neglecta*), Red-tailed Hawk, giant garter snake, western harvest mouse, California vole, American badger (*Taxidea taxus*), and numerous bat species.

9.1.1.3 Open Water and Freshwater Aquatic Vegetation

Perennial aquatic communities range in size from small ponds to open waters and areas with freshwater aquatic vegetation. These communities can be found in association with any terrestrial habitat and can transition into freshwater emergent marsh and valley oak riparian woodland (DWR 2013).

9.1.1.3.1 Open Water

Perennial waters in the study area include the Sacramento River (a navigable water of the United States), a portion of an old river oxbow, and Tule Pond. Other open water in the study area includes small semi-permanent ponds and depressions. The Sacramento River intersects the northern edge of the study area at the boundary of the FWWA. A portion of an old river oxbow intersects the west side of the study area in the FWWA while small semi-permanent depressions are present along the eastern edge of the study area, and areas of ponding water also occur interspersed with woody riparian vegetation within the emergent tule marsh community. The depressional waters along the eastern edge were dry during field surveys conducted in August and October 2014; however, this occurred after several years of drought. Fish and beaver carcasses were observed in the dried-out pools. Water levels in these areas are dependent on overtopping events, hyporheic flow from the Sacramento River, and possible seepage from the cross drain.

Open water provides foraging and winter roosting habitat for wildlife that depend on other habitats for breeding and cover. Wildlife species typical of these communities include Pied-Billed Grebe (*Podilymbus podiceps*), Western Grebe (*Aechmophorus occidentalis*), Ruddy Duck (*Oxyura jamaicensis*), Mallard, Canada Goose (*Branta canadensis*), Bufflehead (*Bucephala albeola*), western pond turtle (*Actinemys marmorata*), and river otter (*Lontra canadensis*). Aquatic communities also provide suitable foraging habitat for numerous species of bats.

Open water is considered waters of the United States and activities involving dredging, excavation, filling, or other modifications are regulated by the United States Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act (CWA) and under Section 10 of the Rivers and Harbors Act (applies to navigable waters). Open water is also considered waters of the State subject to regulation by the Regional Water Quality Control Board (RWQCB) under Section 401 of the CWA and under the Porter-Cologne Water Quality Control Act (Porter-Cologne Act). When this community is associated with a river, lake, or stream, activities that substantially alter, divert, or obstruct flow or that deposit materials that may enter a river, lake, or stream may also be regulated by CDFW under Section 1602 of the California Fish and Game Code through a Lake and Streambed Alteration Agreement.

9.1.1.3.2 Freshwater Aquatic Vegetation

The open portions of aquatic communities typically lack vegetation; however, the borders of these features contain freshwater emergent vegetation. Parts of the study area are covered by floating mats of vegetation dominated by mosquito fern (*Azolla* spp.) and water primrose (*Ludwigia* spp.) wetlands. These areas are dominated by plant species considered highly invasive by Cal-IPC, meaning they can have severe ecological impacts to plant and animal communities and moderate-to-high rates of dispersal and establishment, and are widely distributed ecologically (Cal-IPC 2017). They can outcompete native plants, clog natural waterways, and provide habitat for mosquitos (Sawyer et al. 2009). These vegetated areas are found along Tule Pond, the seasonal wetland adjacent to Tule Pond, Tule Canal, and along the old river oxbow.

Submerged aquatic plants have leaves and stems that are fully submerged for all or nearly all their life cycle, and they often have root systems reduced to minimal anchorage structures in pond or river beds. Many native submerged aquatic species, including pondweeds, such as sago pondweed (*Stuckenia pectinata*) and stoneworts (*Chara* spp.), green algae structurally similar to vascular plants), are highly valuable food plants for waterfowl and provide nursery habitat for aquatic invertebrates and fish. Submerged aquatic vegetation can form patches or beds of extensive bottom "canopy" habitat.

Freshwater aquatic vegetation communities are considered waters of the United States and activities involving dredging, excavation, filling, or other modifications are regulated by the USACE under Section 404 of the CWA and under Section 10 of the Rivers and Harbors Act (applies to navigable waters). These communities are also considered waters of the State subject to regulation by the RWQCB under Section 401 of the CWA and under the Porter-Cologne Water Quality Control Act. When this community is associated with a river, lake, or stream, activities that substantially alter, divert, or obstruct flow or that deposit materials that may enter a river, lake, or stream may also be regulated by CDFW under Section 1602 of the California Fish and Game Code through a Lake and Streambed Alteration Agreement.

9.1.1.4 Freshwater Emergent Marshes and Seeps

Freshwater emergent marshes and seeps include seasonally and permanently saturated wetlands dominated by emergent plant species, some of which can tolerate permanent saline or brackish conditions, including hardstem bulrush (*Schoenoplectus californicus*), which dominates the edges of Tule Pond and the seasonal wetland adjacent to Tule Pond. Some of these seasonal wetlands dry up in late summer naturally (such as areas adjacent to Tule Pond) or are managed to do so (such as many of the duck clubs at the southern end of the floodway, south of I-80). These communities occur along the edges of Tule Pond, throughout riparian woodland, and in the seasonal marsh adjacent to Tule Pond. Shallow emergent wetlands (water less than 3 feet deep) are dominated by thick, tall, highly productive stands of tules (*Schoenoplectus* spp.) and cattails (*Typha* spp.) (DWR 2013). The freshwater emergent marsh communities in the study area are stable areas characterized by very little hydrologic or physical disturbance. Mapped freshwater emergent marsh and seep communities in the study area include California and hardstem bulrush marsh, Douglas' mugwort patches, and managed annual wetland vegetation. These communities are described below.

9.1.1.4.1 California and Hardstem Bulrush Marsh

California and hardstem bulrush marsh is a freshwater marsh community dominated by California bulrush (*Schoenoplectus californicus*) and hardstem bulrush (*Schoenoplectus acutus*). These marshes occur along the eastern part of the FWWA. Broad, deeply flooded areas that are covered by open water most of the year and that develop emergent mud beds late in the growing season effectively alternate between seasonal ponds and freshwater marshes. Common physical disturbances to this community throughout its range are either direct, such as channel dredging (which can impact giant garter snake and Tricolored Blackbird), or indirect, resulting from adjacent agricultural, commercial, or residential activities. Disturbed freshwater emergent marshes that occur in ditches support a higher proportion of cattails than do undisturbed freshwater emergent marshes. Characteristic forbs and grass-like species associated with these communities include a mix of native and non-native species such as cocklebur, curly dock, knotweed (*Polygonum* spp.), common spikerush (*Eleocharis palustris*), annual rabbit's-foot grass, and dallis grass (*Paspalum dilatatum*). In addition, large stands of sedge (*Carex* sp.) are dominant in parts of the study area and included in the areas mapped as California and hardstem bulrush marsh. The higher-elevation edges of freshwater marsh gradients might be characterized by abrupt transitions to terrestrial vegetation, or they might transition into vegetated seasonal wetlands or riparian woodland (DWR 2013).

Freshwater emergent marshes provide important foraging, breeding, and winter roosting habitat for a variety of wildlife species; dense emergent vegetation provides concealment from predators. Reptiles and amphibians associated with this community include giant garter snake, Pacific chorus frog (*Pseudacris regilla*), and bullfrog. Within the study area, this habitat is used by locally common to abundant wading birds, such as egrets and herons (subfamily Ardeinae); waterfowl, such as ducks, geese, and swans (*Cygnus* spp.); shorebirds, such as rails, plovers, and sandpipers; and perching birds such as Red-Winged Blackbird (*Agelaius phoeniceus*), Tricolored Blackbird, Marsh Wren (*Cistothorus palustris*), and Common Yellowthroat (*Geothlypis trichas*).

Freshwater emergent marshes, including California hardstem and bulrush marsh are considered wetland waters of the United States, and activities involving dredging, excavation, filling, or other modifications are regulated by the USACE under Section 404 of the CWA. These marshes are also considered waters of the State subject to regulation by the RWQCB under Section 401 of the CWA and under the Porter-Cologne Act. When this community is associated with a river, lake, or stream, activities that substantially alter, divert, or obstruct flow or that deposit materials that may enter a river, lake, or stream may also be regulated by CDFW under Section 1602 of the California Fish and Game Code through a Lake and Streambed Alteration Agreement.

9.1.1.4.2 Douglas' Mugwort Patches

Douglas' mugwort patches are characterized by the predominance of Douglas' mugwort (*Artemisia douglasiana*) in the herbaceous layer and the absence of an overstory tree canopy layer. These patches occur adjacent to riparian forest and riparian woodland in the western part of the FWWA, south of the old river oxbow. Douglas' mugwort also occurs in the understory of these riparian forest and woodland communities.

9.1.1.4.3 Managed Annual Wetland Vegetation

Managed wetlands consist of areas that are intentionally flooded and managed during specific seasonal periods to enhance habitat values for specific wildlife species. Many managed wetlands are created through the Natural Resources Conservation Service Wetlands Reserve Program and United States Fish and Wildlife Service (USFWS) grants to provide habitat for overwintering migratory waterfowl. Managed wetlands within YBWA were funded with North American Wetlands Conservation Act grants matched by state funds. The typical hydrologic management regime includes flooding during the winter arrival of migratory birds, followed by a slow drawdown to manage plant seed production and control mosquito populations. Summer irrigation may also be conducted to grow forage for overwintering waterfowl and provide habitat for summer migrants. In the study area, managed wetlands are found at Agricultural Road Crossing 1, the proposed north and south water control structures, and primarily south of the FWWA throughout most of the Yolo Bypass, near the proposed channels for Alternative 5 south of I-80. Although Appendix H1 shows managed wetlands as occurring in the FWWA near the old river oxbow and at the southeastern extent of the FWWA, these areas are not actively managed for waterfowl or other wildlife.

The managed wetland community is characterized by the presence of robust, perennial emergent vegetation and annual-dominated, moist-soil grasses and forbs in freshwater areas. Vegetation that is important to waterfowl includes smartweed (*Polygonum* spp.), bulrush (*Bolboschoenus, Schoenoplectus,* or *Scirpus* spp.), brass buttons (*Cotula* spp.), knotweed, barnyard grass (*Echinochloa crus-galli*), and burhead (*Echinodorus berteroi*.). During periods when water is drained from the habitat, a variety of annual grasses and forbs germinate and grow beneath and in the space around clumping emergent plants such as cattails and hardstem bulrush (DWR 2013).

Wetlands that are managed are often done so specifically to provide habitat for wintering waterfowl species such as Northern Pintail (*Anas acuta*), Mallard, American Wigeon (*Anas americana*), Green-Winged Teal (*Anas carolinensis*), Northern Shoveler (*Anas clypeata*), Gadwall, Cinnamon Teal (*Anas cyanoptera*), Ruddy Duck, Canvasback (*Aythya collaris*), White-Fronted Goose (*Anser albifrons*), and Canada Goose. Some wetlands are also managed for breeding waterfowl, especially mallards. In the southern portion of the study area, wetlands are managed to provide habitat for the high diversity of shorebirds that rely on these wetlands during winter and long-distance migrations. Species regularly observed during these periods include Western Sandpiper (*Calidris mauri*), Least Sandpiper (*Calidris minutilla*), Long-Billed Dowitcher (*Limnodromus scolopaceus*), Short-Billed Dowitcher (*Limnodromus griseus*), Dunlin (*Calidris alpina*), Greater Yellowlegs (*Tringa melanoleuca*), Lesser Yellowlegs (*Tringa flavipes*), Whimbrel (*Numenius phaeopus*), Long-Billed Curlew (*Numenius americanus*), and Wilson's Phalarope (*Phalaropus tricolor*) (DWR 2013).

Many managed wetlands qualify as wetland waters of the United States and activities involving dredging, excavation, filling, or other modifications are regulated by the USACE under Section 404 of the CWA. These communities are also considered waters of the State subject to regulation by the RWQCB under Section 401 of the CWA and under the Porter-Cologne Water Quality Control Act. This community is also of special interest to the resource agencies, such as CDFW, that are responsible for managing waterfowl and shorebird populations in California.

9.1.1.5 Riparian Forest/Woodland

The study area supports winter-deciduous, broadleaved trees up to 60 feet in height in the riparian forest/woodland community where the canopy cover ranges from relatively open to very dense. At present, riparian forest/woodland communities dominated by tree species occur in the interior portion of the FWWA and along channels, rivers, the old river oxbow, and interspersed with California and hardstem bulrush marsh in the study area (DWR 2013).

Riparian forest/woodland communities in the study area include black willow thickets, box elder forest, Fremont cottonwood forest, mixed hardwood forest, and valley oak woodland. Tree species observed in these communities include hardwood species such as Fremont cottonwood (*Populus fremontii*), Oregon ash (*Fraxinus latifolia*), valley oak (*Quercus lobata*), black willow (*Salix gooddingii*), California sycamore (*Platanus racemosa*), walnut (*Juglans* spp.), and box elder (*Acer negundo*). The community name is determined by the dominant plant species within the tree layer (e.g., black willow thickets are dominated by black willows, whereas mixed hardwood forests are characterized by a codominance of two or more trees such as Fremont cottonwood and black willow). These communities often have a shrubby understory consisting of buttonbush (*Cephalanthus occidentalis*), California grape (*Vitis californica*), California rose (*Rosa californica*), coyote brush (*Baccharis piluaris*), blue elderberry (*Sambucus nigra* ssp. *caerulea*), sandbar willow (*Salix exigua*), poison oak (*Toxicodendron diversilobum*), red willow (*Salix laevigata*), tree of heaven (*Ailanthus altissima*), and Himalayan blackberry (*Rubus armeniacus*). In addition, annual species, such as ryegrass, mustard, bromes, and yellow star thistle, are intermixed in the understory layer.

Riparian forest/woodland communities support a wide variety of wildlife species. Deer thrive in this environment and are a heavily targeted game species. Riparian trees are used for nesting, roosting, foraging, and protective cover by many bird species, including Swainson's Hawk, Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*), Least Bell's Vireo (*Vireo bellii pusillus*), Tricolored Blackbird, Wild Turkey (*Meleagris gallopavo*), Black-Headed Grosbeak (*Pheucticus melanocephalus*), Tree Swallow (*Tachycineta bicolor*), Bewick's Wren (*Thryomanes bewickii*), and Cooper's Hawk (*Accipiter cooperii*). Riparian communities provide foraging habitat for common mammals such as western gray squirrel (*Sciurus griseus*) and day and night roosting and foraging habitat for bats. Understory shrubs provide cover for mammals, such as cottontail, and ground-nesting birds, such as Spotted Towhee (*Pipilo maculatus*), that forage among the vegetation and leaf litter. Mammals, such as bats, raccoons, and opossums, benefit from the variety of berries, invertebrates, small mammals, and bird eggs that provide food. Drier, open areas of forest and woodland can provide suitable foraging and denning habitat for American badger.

Riparian forest/woodland communities are subject to CDFW regulations under California Fish and Game Code Section 1602 and Fish and Game Code Section 3503 when nesting birds are present. These woodlands are also considered sensitive natural communities by CDFW because they have sustained considerable losses throughout the State.

9.1.1.6 Riparian Scrub

Riparian scrub communities in the study area include non-native Himalayan blackberry brambles and native sandbar willow thickets. These communities occur near the old river oxbow, along

Tule Canal, and along the Sacramento River. Himalayan blackberry is considered an invasive plant with a high rating by Cal-IPC (Cal-IPC 2017).

Riparian scrub supports a variety of wildlife species, many of which are common to riparian forest/woodland. Wildlife species that are commonly associated with riparian scrub are Least Bell's Vireo, Tricolored Blackbird, Black-crowned Night Heron (*Nycticorax nycticorax*), California Quail (*Callipepla californica*), and Yellow-Breasted Chat (*Icteria virens*).

Riparian scrub communities are subject to CDFW regulations under California Fish and Game Code Section 1602 and Fish and Game Code Section 3503 when nesting bird species are present.

9.1.2 Special-Status Species

Special-status species are defined as species that are legally protected or that are otherwise considered sensitive by Federal, State, or local resource agencies. Special-status species are species, subspecies, or varieties that fall into one or more of the following categories, regardless of their legal or protection status:

- Officially listed by the USFWS or CDFW as endangered, threatened, or rare
- A candidate for Federal or State listing as endangered, threatened, or rare
- Taxa (i.e., taxonomic categories or groups) that meet the criteria for listing even if they are not currently included on any list, as described in California Code of Regulations (CCR) Section 15380 of the State CEQA Guidelines
- Species identified by CDFW as Species of Special Concern (SSC)
- Species protected under the Migratory Bird Treaty Act of 1918 (MBTA)
- Species afforded protection under local planning documents
- Taxa considered by CDFW to be "rare, threatened, or endangered in California" and assigned a California Rare Plant Rank (CRPR) by the California Native Plant Society (CNPS). This system includes six rarity and endangerment ranks for categorizing plant species of concern, which are summarized as follows:
  - CRPR 1A: Plants presumed extirpated in California and either rare or extinct elsewhere
  - CRPR 1B: Plants rare, threatened, or endangered in California and elsewhere
  - CRPR 2A: Plants presumed extirpated in California but more common elsewhere
  - CRPR 2B: Plants that are rare, threatened, or endangered in California but more common elsewhere
  - CRPR 3: Plants about which more information is needed—a review list
  - CRPR 4: Plants of limited distribution—a watch list[1]

[1] CDFW recommends that CRPR 1A, 1B, 2B, and 3 species be addressed in CEQA projects. In general, CRPR 4 species do not meet the definition of endangered, rare, or threatened pursuant to CEQA Section 15380; however, these species may be evaluated on a case-by-case basis to determine significance criteria under CEQA if they are considered locally important.

CDFW considers all plants with a CRPR to be "special plants." The term "special plants" is a broad term used by CDFW to refer to all the plant taxa inventoried in CDFW's California Natural Diversity Database (CNDDB), regardless of their legal or protection status (CDFW 2018).

The term "California Species of Special Concern" is applied by CDFW to animals that are not listed under CESA but that are declining at a rate that could result in listing, or that historically occurred in low numbers and there are currently known threats to their persistence. CDFW's fully protected status was California's first attempt to identify and protect animals that were rare or facing extinction. Most species listed as fully protected were eventually listed as threatened or endangered under CESA; however, some species remain listed as fully protected but do not have simultaneous listing under CESA. Fully protected species may not be taken or possessed at any time, and no take permits can be issued for these species except for scientific research purposes or for relocation to protect livestock.

The Lead Agencies for this EIS/EIR developed a list of special-status species that are known to occur or that could occur in the study area or immediate vicinity through a review of previously prepared environmental documents, the USFWS's Information for Planning and Conservation system, CDFW's CNDDB Rarefind 5 online application, and CNPS's Online Inventory of Rare and Endangered Vascular Plants of California (Appendices H2 and H3; CNPS 2018; USFWS 2016a, 2018). The team compiled a comprehensive list of regionally occurring special-status species and sensitive natural communities for the following 7.5-minute United States Geological Survey (USGS) topographic quadrangles that cover the Project area and the surrounding Project vicinity:

- Sacramento West
- Clarksburg
- Davis
- Grays Bend
- Knights Landing
- Liberty Island
- Rio Vista
- Saxon
- Taylor Monument
- Verona
- Sutter Causeway
- Nicolaus

9.1.2.1 Field Surveys

In 2014, DWR and HDR field-verified the vegetation classifications using the *Fine-Scale Riparian Vegetation Mapping of the Central Valley Flood Protection Plan Area Final Report* (CDFW 2013) and mapped the locations of elderberry shrubs, which provide suitable habitat for

valley elderberry longhorn beetles (*Desmocerus californicus dimorphus*). Exit holes on elderberry shrubs were not assessed during these surveys.

DWR conducted habitat assessments for special-status plant species in 2014 and 2015 (DWR 2014a, 2015a). Botanical surveys were conducted in accordance with rare plant survey protocols from CNPS (2001) and CDFW (2009).

Habitat assessments for giant garter snake, western pond turtle, and special-status bat species were conducted in 2014 and 2015 (DWR 2014b, 2014c, 2015b, and 2015c). Habitat assessments for special-status bird species were conducted in 2015, with all bird species, including nesting observations, recorded (DWR 2015d).

All field surveys focused on areas of potential ground disturbance, including along Fremont Weir, Tule Canal, and Agricultural Road Crossing 1. Areas of private property were not surveyed because access was restricted. Detailed information for each of these surveys, including specific survey dates and the results of the field surveys, is provided below.

9.1.2.2 Special-Status Plants

The Lead Agencies identified 35 special-status plant species during database queries (Appendix H2). Of these species, two are known to occur in the construction study area (Northern California black walnut [*Juglans hindsii*] and woolly rose-mallow), and 11 have the potential to occur in the construction study area because of the presence of suitable soils and habitat (e.g., freshwater marsh and alkaline grassland). These species, their sensitivity statuses, and their potential for occurrence in the construction and operations study areas are shown in Table 9-3. Additional information on these species' habitat requirements and special-status plant species that were determined to not have any potential to occur in the construction and/or operations study areas are included in Appendix H4.

Table 9-3. Special-Status Plant Species with the Potential to Occur in the Construction Study Area or in the Operations Study Area

Common Name Scientific Name	Status (Federal/State/CRPR)	Potential for Occurrence	Study Area
Baker's navarretia *Navarretia leucocephala* ssp. *bakeri*	-/-/1B.1	Known from Tule Ranch in the YBWA	Operations
Bearded popcornflower *Plagiobothrys hystriculus*	–/–/1B.1	Known from Tule Ranch in the YBWA	Operations
Boggs Lake hedge-hyssop *Gratiola heterosepala*	-/SE/1B.2	Suitable habitat at Tule Ranch in the YBWA	Operations
Bristly sedge *Carex comosa*	-/-/2B.1	Suitable habitat in the FWWA	Construction
California alkali grass *Puccinellia simplex*	-/-/1B.2	Suitable habitat in the FWWA and at Tule Ranch in the YBWA	Construction + Operations
Colusa grass *Neostapfia colusana*	FT/SE/1B.1	Suitable habitat occurs at Tule Ranch in the YBWA	Operations

Common Name Scientific Name	Status (Federal/State/CRPR)	Potential for Occurrence	Study Area
Delta tule pea *Lathyrus jepsonii* var. *jepsonii*	-/-/1B.2	Suitable habitat in the FWWA Known from the Yolo Bypass, south of I-80	Construction + Operations
Dwarf downingia *Downingia pusilla*	-/-/2B.2	Suitable habitat at Tule Ranch in the YBWA	Operations
Ferris' milkvetch *Astragalus tener* var. *ferrisiae*	-/-/1B.1	Known from Tule Ranch in the YBWA	Operations
Heartscale *Atriplex cordulata* var. *cordulata*	-/-/1B.2	Suitable habitat in the FWWA	Construction
Heckard's pepper grass *Lepidium latipes*	-/-/1B.2	Suitable habitat in the FWWA Known from Tule Ranch in the YBWA	Construction + Operations
Hogwallow starfish *Hesperevax caulescens*	–/–/4.2	Known from Tule Ranch in the YBWA	Operations
Jepson's coyote-thistle *Eryngium jepsonii*	--/--/1B.2	Known from Tule Ranch in the YBWA	Operations
Legenere *Legenere limosa*	-/-/1B.1	Known from Tule Ranch in the YBWA	Operations
Little mousetail *Myosurus minimus*	–/–/3.1	Known from Tule Ranch in the YBWA	Operations
Northern California black walnut *Juglans hindsii*	-/-/1B.1	Calflora FWWA record from 2014	Construction
Parry's rough tarplant *Centromadia parryi* ssp. *rudis*	-/-/4.2	Suitable habitat occurs at Tule Ranch in the YBWA	Operations
Peruvian dodder *Cuscuta obtusiflora* var. *glandulosa*	-/-/2B.2	Suitable habitat in the FWWA	Construction
Saline clover *Trifolium hydrophilum*	-/-/1B.2	Suitable habitat in the FWWA	Construction
San Joaquin spearscale *Extriplex joaquinana*	-/-/1B.2	Known from the Yolo Bypass south of I-80	Construction + Operations
Sanford's arrowhead *Sagittaria sanfordii*	-/-/1B.2	Suitable habitat in the FWWA	Construction
Solano grass [also called Crampton's tuctoria] *Tuctoria mucronata*	FE/SE/1B.1	Suitable habitat occurs at Tule Ranch in the YBWA	Operations
Suisun Marsh aster *Symphyotrichum lentum*	-/-/1B.2	Suitable habitat in the FWWA Known from the Yolo Bypass south of I-80	Construction + Operations
Vernal pool smallscale *Atriplex persistens*	-/-/1B.2	Suitable habitat at Tule Ranch in the YBWA	Operations

Common Name Scientific Name	Status (Federal/State/CRPR)	Potential for Occurrence	Study Area
Woolly rose-mallow *Hibiscus lasiocarpus* var. *occidentalis*	-/-/1B.2	Observed in the FWWA and at Agricultural Road Crossing 1 during 2014 and 2015 surveys	Construction
Wright's trichocoronis *Trichocoronis wrightii* var. *wrightii*	-/-/2B.1	Suitable habitat occurs at Tule Ranch in the YBWA	Operations

Key: CRPR = California Rare Plant Rank; FE = Federally endangered; FT = Federally threatened; FC = Federal candidate for listing; FWWA = Fremont Weir Wildlife Area; SE = State endangered; ST = State threatened; SR = State rare; YBWA = Yolo Bypass Wildlife Area

CNPS Rare Plant Ranks (California Rare Plant Ranks are assigned by a committee of government agency and non-governmental botanical experts and are not official state designations of rarity status): 1A = presumed extinct in California; 1B = rare, threatened, or endangered in California and elsewhere; and 2B = rare, threatened, or endangered in California but more common elsewhere. Threat Ranks: 0.1 = seriously threatened in California (over 80 percent of occurrences threatened/high degree and immediacy of threat); 0.2 = moderately threatened in California (20 to 80 percent occurrences threatened/moderate degree and immediacy of threat); and 0.3 = not very threatened in California (less than 20 percent of occurrences threatened/low degree and immediacy of threat or no current threats known).

Field surveys for special-status plants with the potential to occur in the study area were conducted by DWR along Fremont Weir, from the old river oxbow along the western extent of the FWWA, across the northern part of the FWWA, along the eastern extent of the FWWA and Tule Canal, and downstream at Agricultural Road Crossing 1. These surveys that focused on areas of potentially suitable habitat were conducted by DWR on 536 acres on August 27, 2014; between March 2 and March 26, 2015; and between July 8 and July 30, 2015 (DWR 2014a, 2015a). These focused special-status plant species surveys were conducted following several years of drought; therefore, these surveys might not have captured some of the annual species with the potential to occur in the study area. Only one of these species, woolly rose-mallow, was observed during the surveys.

Not included in the 2014 and 2015 survey areas were alkaline grasslands in the central portion of the FWWA in the study area for Alternatives 2 through 6 that provide potentially suitable habitat for heartscale (*Atriplex cordulata* var. *cordulata*), San Joaquin spearscale (*Extriplex joaquinana*), Heckard's pepper grass (*Lepidium latipes*), California alkali grass (*Puccinellia simplex*), and saline clover (*Puccinellia simplex*).

Figure 9-1 provides the locations of the special-status species that were observed during field surveys in relation to the combined Project footprint of all alternatives.

Figure 9-1. Special-Status Plant and Wildlife Species Observations

9.1.2.3 Special-Status Wildlife

A total of 61 special-status wildlife species were identified during database queries (Appendix H2). Of these species, 13 are known from the construction study area or the immediate vicinity, and 30 have the potential to occur in the construction study area due to the presence of suitable habitat, but were not observed during surveys. These species, their sensitivity statuses, and their potential for occurrence in the construction and operations study areas are shown in Table 9-4. Additional information on these species' habitat requirements and special-status wildlife species that were determined to not have the potential to occur in the construction and/or operations study areas are included in Appendix H4.

Table 9-4. Special-Status Wildlife Species with the Potential to Occur in the Construction Study Area or the Operations Study Area

Common Name Scientific Name	Status (Federal/State/Other)	Potential for Occurrence	Study Area
Invertebrates			
Conservancy fairy shrimp *Branchinecta conservatio*	FE/--/--	Known from Tule Ranch in the YBWA	Operations
Vernal pool fairy shrimp *Branchinecta lynchi*	FT/--/--	Known from Tule Ranch in the YBWA	Operations
Midvalley fairy shrimp *Branchinecta mesovallensis*	--/--/--	Known from Tule Ranch in the YBWA	Operations
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	FT/--/--	Suitable habitat (elderberry host plant) in the FWWA Known from the Yolo Bypass	Construction + Operations
Vernal pool tadpole shrimp *Lepidurus packardi*	FE/--/--	Suitable habitat at Tule Ranch in the YBWA	Operations
Amphibians			
California tiger salamander *Ambystoma californiense*	FT/ST/SSC	Suitable habitat at Tule Ranch in the YBWA	Operations
Western spadefoot toad *Spea hammondii*	--/--/SSC	Suitable habitat at Tule Ranch in the YBWA	Operations
Reptiles			
Western pond turtle *Emys marmorata*	--/--/SSC	Suitable habitat in the construction study area Known from Wallace Weir in the Yolo Bypass	Construction + Operations
Giant garter snake *Thamnophis gigas*	FT/ST/--	Suitable habitat in the construction study area Known from the Yolo Bypass	Construction + Operations

Common Name Scientific Name	Status (Federal/State/Other)	Potential for Occurrence	Study Area
Birds			
Sharp-shinned Hawk *Accipiter striatus*	--/--/SSC	Foraging habitat along Putah Creek and Sacramento River levee toe drains	Operations
Cooper's Hawk *Accipiter cooperii*	--/--/SSC	Known from the FWWA and throughout the Yolo Bypass	Construction + Operations
Tricolored Blackbird *Agelaius tricolor*	UR/--/SSC	Suitable nesting and foraging habitat in the construction study area; observed at the FWWA Known from the Yolo Bypass	Construction + Operations
Grasshopper Sparrow (nesting) *Ammodramus savannarum*	--/--/SSC	Suitable nesting habitat in the construction study area Known breeder in the YBWA	Construction + Operations
Greater Sandhill Crane *Antigone canadensis tabida*	--/ST/FP	Suitable winter foraging habitat in the construction study area Winter visitor to the Central Valley; the YBWA is managed to provide habitat for this species	Construction + Operations
Golden Eagle *Aquila chrysaetos*	--/--/FP	Suitable foraging habitat in the construction study area Known to forage throughout the Yolo Bypass in winter	Construction + Operations
Great Egret *Ardea alba*	--/--/--	Suitable foraging habitat in the construction study area; breeding colonies documented adjacent to the FWWA Known from the Yolo Bypass south of I-80	Construction + Operations
Great Blue Heron *Ardea herodias*	--/--/--	Suitable nesting and foraging habitat in the construction study area; breeding colonies documented adjacent to the FWWA Known breeder and forager in the Yolo Bypass	Construction + Operations
Short-eared Owl *Asio flammeus*	--/--/SSC	Suitable nesting and foraging habitat in the construction study area Winter visitor to and rare nesting species in the Yolo Bypass	Construction + Operations
Burrowing Owl *Athene cunicularia*	--/--/SSC	Suitable habitat present in the construction study area Known from the Yolo Bypass south of I-80	Construction + Operations

Common Name Scientific Name	Status (Federal/State/Other)	Potential for Occurrence	Study Area
Redhead *Aythya americana*	--/--/SSC	Suitable nesting and foraging habitat in the construction study area Known from the Yolo Bypass	Construction + Operations
Ferruginous Hawk *Buteo regalis*	--/--/SSC	Suitable winter foraging habitat in the construction study area Winter visitor to the Central Valley	Construction + Operations
Swainson's Hawk *Buteo swainsoni*	--/ST/--	Suitable nesting habitat in the construction study area; known from the FWWA Known from the Yolo Bypass	Construction + Operations
Mountain Plover *Charadrius montanus*	--/--/SSC	Suitable wintering habitat in the construction study area Suitable wintering habitat in the Yolo Bypass	Construction + Operations
Black Tern *Chlidonias niger*	--/--/SSC	Suitable habitat in the construction study area during spring migration Known from the Yolo Bypass primarily during migration	Construction + Operations
Northern Harrier *Circus cyaneus*	--/--/SSC	Suitable nesting and foraging habitat in the construction study area; observed at Agricultural Road Crossing 1 Known from the Yolo Bypass	Construction + Operations
Western Yellow-billed Cuckoo *Coccyzus americanus occidentalis*	FC/SE/--	Suitable nesting and foraging habitat in the construction study area; known from the FWWA during migration Known from the Yolo Bypass	Construction + Operations
California Yellow Warbler *Dendroica petechia brewsteri*	--/--/SSC	Suitable habitat in the construction study area Known from the Yolo Bypass only during migration	Construction + Operations
Snowy Egret *Egretta thula*	--/--/--	Suitable nesting and foraging habitat in the construction study area; observed at the FWWA and Agricultural Road Crossing 1 Suitable habitat in the Yolo Bypass	Construction + Operations

Common Name Scientific Name	Status (Federal/State/Other)	Potential for Occurrence	Study Area
White-tailed Kite *Elanus leucurus*	--/--/FP	Suitable nesting and foraging habitat in the construction study area; observed at the FWWA Known from the Yolo Bypass	Construction + Operations
Little Willow Flycatcher *Empidonax traillii brewsteri*	--/SE/--	Suitable foraging habitat in the construction study area Migrates through the Yolo Bypass during spring and fall	Construction + Operations
California Horned Lark *Eremophila alpestris actia*	--/--/SSC	Suitable foraging habitat in the construction study area Known to be a year-round resident in the Yolo Bypass	Construction + Operations
Merlin *Falco columbarius*	--/--/SSC	Suitable winter foraging habitat in the construction study area Winter visitor to the Yolo Bypass	Construction + Operations
Prairie Falcon *Falco mexicanus*	--/--/SSC	Suitable winter foraging habitat in the construction study area Non-breeding winter visitor to the Yolo Bypass	Construction + Operations
American Peregrine Falcon *Falco peregrinus anatum*	--/SE/FP	Suitable foraging habitat in the construction study area Nonbreeding visitor to the Yolo Bypass	Construction + Operations
Bald Eagle *Haliaeetus leucocephalus*	FD/SE/BCC, FP	Suitable winter foraging habitat in the construction study area Winter visitor to the Yolo Bypass	Construction + Operations
Yellow-breasted Chat *Icteria virens*	--/--/SSC	Suitable nesting habitat in the construction study area Known from the Yolo Bypass	Construction + Operations
Least Bittern *Ixobrychus exilis*	--/--/SSC	Suitable nesting and foraging habitat in the construction study area Known breeder in the YBWA	Construction + Operations
Loggerhead Shrike *Lanius ludovicianus*	--/--/SSC	Suitable nesting and foraging habitat in the construction study area; known from the FWWA Known to nest and forage at Tule Ranch in the YBWA	Construction + Operations

Common Name Scientific Name	Status (Federal/State/Other)	Potential for Occurrence	Study Area
California Gull *Larus californicus*	--/--/SSC	Suitable foraging habitat in the construction study area Known to forage year-round in the Yolo Bypass, especially during winter floods	Construction + Operations
California Black Rail *Laterallus jamaicensis coturniculus*	--/ST/FP	Nests in high portions of salt marshes, shallow freshwater marshes, wet meadows, and flooded grassy vegetation Known from east of Yolo Bypass and southwest of Yolo Bypass	Operations
Song Sparrow (Modesto population) *Melospiza melodia*	--/--/SSC	Suitable nesting and foraging habitat in the construction study area; observed at the FWWA and Agricultural Road Crossing 1 Known from the Yolo Bypass	Construction + Operations
Long-billed Curlew *Nemenius americanus*	--/--/SSC	Suitable foraging habitat in the construction study area Known from the Yolo Bypass	Construction + Operations
Black-crowned Night-heron *Nycticorax nycticorax*	--/--/--	Suitable nesting and foraging habitat in the construction study area Known from the Yolo Bypass	Construction + Operations
Osprey *Pandion haliaetus*	--/--/SSC	Suitable foraging habitat in the construction study area, especially during winter floods; observed at the FWWA Known from the Yolo Bypass	Construction + Operations
American White Pelican *Pelecanus erythrorhynchos*	--/--/SSC	Known to forage in the construction study area, especially in mid-summer; observed at the FWWA Known from the Yolo Bypass	Construction + Operations
White-faced Ibis *Plegadis chihi*	--/--/SSC	Suitable nesting and foraging habitat in the construction study area; observed at the FWWA and Agricultural Road Crossing 1 Known from the Yolo Bypass	Construction + Operations
Double-crested Cormorant *Phalacrocorax auritus*	--/--/SSC	Suitable foraging habitat in the construction study area; observed at the FWWA and Agricultural Road Crossing 1 Known from the Yolo Bypass	Construction + Operations

Common Name Scientific Name	Status (Federal/State/Other)	Potential for Occurrence	Study Area
Purple Martin *Progne subis*	--/--/SSC	Suitable nesting and foraging habitat in the construction study area Suitable nesting habitat in the Yolo Bypass	Construction + Operations
Bank Swallow *Riparia riparia*	--/ST/--	Suitable nesting and foraging habitat in the construction study area; colony observed along banks of the Sacramento River opposite the Fremont Weir Known from the Yolo Bypass	Construction + Operations
Least Bell's Vireo *Vireo bellii pusillus*	FE/SE/--	Suitable nesting and foraging habitat in the construction study area Known from the South Fork of Putah Creek	Construction + Operations
Yellow-headed Blackbird *Xanthocephalus xanthocephalus*	--/--/SSC	Suitable nesting and foraging habitat in the construction study area Suitable habitat in the Yolo Bypass	Construction + Operations
Mammals			
Pallid bat *Antrozous pallidus*	--/--/SSC	Suitable roosting and foraging habitat in the construction study area Suitable habitat in the Yolo Bypass	Construction + Operations
Townsend's big-eared bat *Corynorhinus townsendii*	--/--/SSC	Suitable foraging habitat in the construction study area Suitable habitat in the Yolo Bypass	Construction + Operations
Silver-haired bat *Lasionycteris noctivagans*	--/--/--	Suitable roosting and foraging habitat in the construction study area Suitable habitat in the Yolo Bypass	Construction + Operations
Western red bat *Lasiurus blossevillii*	--/--/SSC	Suitable roosting and foraging habitat in the construction study area Suitable habitat in the Yolo Bypass	Construction + Operations

Common Name Scientific Name	Status (Federal/State/Other)	Potential for Occurrence	Study Area
Hoary bat *Lasiurus cinereus*	--/--/--	Suitable roosting and foraging habitat in the construction study area Suitable habitat in the Yolo Bypass	Construction + Operations
American badger *Taxidea taxus*	--/--/SSC	Suitable burrowing and foraging habitat in the construction study area Suitable habitat in the Yolo Bypass	Construction + Operations

Key: BCC = Federal Bird of Conservation Concern; FC = Federal candidate for listing; FD = Federally delisted; FE = Federally endangered; FT = Federally threatened; FWWA = Fremont Weir Wildlife Area; SE = State endangered; SFP = State Fully Protected under the California Fish and Game Code; SSC = Species of Special Concern by CDFW; ST = State threatened; UR = under review for listing; YBWA = Yolo Bypass Wildlife Area.

9.1.3 Wildlife Movement Corridors

Wildlife movement corridors, also called dispersal corridors or landscape linkages, are linear features whose primary wildlife function is to connect at least two habitat areas (Beier and Loe 1992). These corridors increase connectivity between patches that have become isolated by habitat fragmentation, caused primarily by urbanization, agriculture, and forestry. They function by facilitating the movement of individuals through dispersal and migration to maintain gene flow and diversity between local populations. Other definitions of corridors and linkages are as follows:

- A corridor is a specific route that is used for movement and migration of species. A corridor might be different from a "linkage" because it represents a smaller or narrower avenue for movement.
- A linkage is a habitat area that provides connectivity between habitat patches and year-round foraging, reproduction, and dispersal habitat for resident plants and animals. "Linkage" shall mean an area of land that supports or contributes to the long-term movement of wildlife and genetic material.

Wildlife corridors and linkages are important features in the landscape, and the viability and quality of a corridor or linkage depends on site-specific factors. Topography and vegetative cover are important factors for corridors and linkages. These factors should provide cover for both predator and prey species. They should direct animals to areas of contiguous open space or resources and away from humans and development. The corridor or linkage should be buffered from human encroachment and other disturbances (e.g., light, loud noises, and domestic animals) associated with developed areas that have caused habitat fragmentation (Schweiger et al. 2000). Wildlife corridors and linkages can function at various levels, depending on these factors and, for this reason, the most successful wildlife corridors and linkages will accommodate all or most of the necessary life requirements of predator and prey species.

Width and connectivity are assumed to be the primary factors of an effective corridor and with that connectivity should also include the concept of stepping stone reserves for pollinators, seed dispersers, and other flying species such as birds, bats, and insects (Soulé 2003). The level of

connectivity needed to maintain a population of a species will vary with the demography of the population, including population size, survival and birth rates, and genetic factors such as the level of inbreeding and genetic variance (Rosenberg et al. 1997). Areas not considered as functional wildlife dispersal corridors or linkages are typically obstructed or isolated by concentrated development and heavily traveled roads, known as chokepoints. One of the worst scenarios for dispersing wildlife occurs when a large block of habitat leads animals into "cul-de-sacs" of habitat surrounded by development. These habitat cul-de-sacs frequently result in increased human-animal interactions in which humans, domesticated wildlife, and native wildlife could be harmed or killed.

The study area is adjacent to a natural waterway (Sacramento River) that is likely used by resident and migratory birds as a wildlife corridor, although it is narrow and leads directly into urban areas and roadways downstream. The Yolo Bypass serves as an important wildlife movement corridor that provides connectivity for resident and migratory wildlife throughout the region, including serving as part of the Pacific flyway for migratory birds. Federally and State-listed terrestrial species that might use this movement corridor include valley elderberry longhorn beetle, giant garter snake, Least Bell's Vireo, and Western Yellow-Billed Cuckoo. In addition, the Yolo Bypass is expected to serve as a corridor for SSCs, birds protected under the MBTA, and common wildlife species.

9.1.4 Sensitive Habitats

Sensitive habitat types include those that are of special concern to CDFW or that are afforded specific consideration through CEQA, Section 1602 of the California Fish and Game Code, the Porter-Cologne Act, and/or Section 404 of the CWA, as discussed in Section 9.2, *Regulatory Setting*. Sensitive habitats might be of special concern to regulatory agencies and conservation organizations for a variety of reasons, including their locally or regionally declining status or because they provide important habitat to common and special-status plant and wildlife species.

CDFW maintains a list of plant communities native to California. Within that list, CDFW identifies *special-status plant communities* (also known as sensitive natural communities), which it defines as communities that are of limited distribution statewide or within a county or region and that are often vulnerable to the environmental effects of projects (CDFW 2009). These communities might or might not contain special-status species or their suitable habitat characteristics. Special-status plant communities are tracked in the CNDDB, a statewide inventory of the locations and conditions of the State's rarest plant and animal taxa and vegetation types. Many wetland and riparian plant communities are included on CDFW's list of special-status plant communities, and the importance of protecting and preserving riparian and oak woodland habitats is recognized in Yolo County's General Plan policies.

The following vegetation communities are in the study area and are considered sensitive habitats:

- Black willow thickets
- Box elder forest
- California and hardstem bulrush marsh
- Fremont cottonwood forest
- Mixed hardwood forest

- Sandbar willow thickets
- Valley oak woodland

9.1.5 Wetlands and Other Waters of the United States and Waters of the State

DWR conducted a wetland delineation in May 2016 for a nearby project (Fremont Weir Adult Fish Passage Modification Project). This wetland delineation was conducted over a small portion of the study area for the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project. To the extent that these data overlapped with the study area, they were used to determine USACE jurisdiction. For the remainder of the study area, vegetation community mapping, National Wetlands Inventory data, and United States Forest Service historical topographic maps were used to make a comparison among the Project alternatives.

The following vegetation communities are considered waters of the United States subject to regulation by USACE and RWQCB under Sections 404 and 401 of the CWA, respectively, because they are hydrologically connected to the Sacramento River. These vegetation communities are also considered waters of the State subject to regulation by RWQCB under the Porter-Cologne Act:

- California and hardstem bulrush marsh
- Managed annual wetland vegetation
- Temperate freshwater floating mat
- Open water
- Water primrose wetlands

The following vegetation communities were determined by the Lead Agencies to potentially be under CDFW jurisdiction based on their association with riparian vegetation and their location within the Sacramento River floodplain:

- Black willow thickets
- Box elder forest
- California and hardstem bulrush marsh
- Fremont cottonwood forest
- Himalayan blackberry brambles
- Managed annual wetland vegetation
- Mixed hardwood forest
- Open water
- Sandbar willow thickets
- Temperate freshwater floating mat
- Valley oak woodland
- Water primrose wetlands

The actual limits of jurisdiction are determined by each regulatory agency.

Table 9-5 identifies the potential extent of jurisdictional wetlands of the United States, other waters of the United States, CDFW riparian (vegetated communities listed above), and CDFW unvegetated streambed (open water) in the study area. RWQCB jurisdiction is not included in Table 9-5 because, for 401 certifications, RWQCB jurisdiction coincides with Federal waters, but they do not have a clear definition for jurisdictional limits of state waters under the Porter-Cologne Act and may extend their limits to coincide with CDFW riparian habitat limits in addition to adding isolated wetlands.

Table 9-5. Potential USACE and CDFW Jurisdictional Areas in the Construction Study Area by Alternative

Potential Jurisdictional Acreages[a]	Alt. 1 (acres)	Alt. 2 (acres)	Alt. 3 (acres)	Alt. 4 (acres)	Alt. 5 (acres)	Alt. 6 (acres)
USACE Wetlands	**15.7**	**15.9**	**17.3**	**55.3**	**8.1**	**17.8**
California and hardstem bulrush marsh	11.6	10.9	10.9	10.9	5.4	11.1
Managed annual wetland vegetation	0.0	<0.001	1.4	39.2	<0.001	1.4
Temperate freshwater floating mat	1.8	1.8	1.8	1.8	1.0	1.8
Water primrose wetlands	2.2	3.2	3.2	3.4	1.7	3.5
USACE Non-wetland Waters of the United States	**0.7**	**7.3**	**1.6**	**10.9**	**6.1**	**2.9**
Open water	0.7	7.3	1.6	10.9	6.1	2.9
TOTAL USACE Jurisdiction	**16.4**	**23.2**	**18.9**	**66.2**	**14.2**	**20.7**
CDFW Riparian	**38.7**	**38.6**	**46.1**	**100.6**	**27.2**	**52.6**
Black willow thickets	<0.1	0.1	0.1	5.1	1.5	0.1
Box elder forest	0.0	0.0	0.7	0.7	0.0	1.4
California and hardstem bulrush marsh	11.6	10.9	10.9	10.9	5.4	11.1
Fremont cottonwood forest	17.7	17.1	21.3	32.2	15.0	25.5
Himalayan blackberry brambles	0.0	0.4	0.0	0.0	0.4	0.0
Managed annual wetland vegetation	<0.001	<0.001	1.4	39.2	<0.001	1.4
Mixed hardwood forest	0.0	0.0	0.0	0.6	0.0	0.0
Sandbar willow thickets	0.0	0.0	0.0	0.0	0.0	0.0
Temperate freshwater floating mat	1.8	1.8	1.8	1.8	1.0	1.8
Valley oak woodland	5.4	5.1	6.7	6.7	2.2	7.8
Water primrose wetlands	2.2	3.2	3.2	3.4	1.7	3.5
CDFW Unvegetated Streambed	**0.7**	**7.3**	**1.6**	**10.9**	**6.1**	**2.9**
Open water	0.7	7.3	1.6	10.9	6.1	2.9
TOTAL CDFW Jurisdiction	**39.4**	**45.9**	**47.7**	**111.5**	**33.3**	**55.5**

[a] These acreages represent a preliminary effort at determining the jurisdictional boundaries in the absence of a formal jurisdictional delineation, using the most recent regulations, policy, and guidance from the regulatory agencies. However, only the regulatory agencies can make a final determination of jurisdictional boundaries.

Key: CDFW = California Department of Fish and Wildlife; USACE = United States Army Corps of Engineers

9.2 Regulatory Setting

This section discusses specific Federal, State, and local laws, regulations, policies, plans, or executive orders that affect, or could affect, how terrestrial biological resources would be impacted, used, or managed during implementation of the Project alternatives.

9.2.1 Federal Plans, Policies, and Regulations

Federal Endangered Species Act. USFWS and the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS) enforce the provisions stipulated in the Federal Endangered Species Act of 1973 (ESA (16 United States Code [USC] Section 1531 et seq.). Threatened and endangered species on the Federal list (50 Code of Federal Regulations [CFR] Parts 17.11 and 17.12) are protected from *take*. Take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." Through regulations, the term "harm" is defined as "an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering." During consultation, USFWS and NMFS determine whether take would occur.

Pursuant to the requirements of the ESA, an agency reviewing a proposed action within its jurisdiction must determine whether any Federally listed species might be present in the project site and determine whether the proposed action could adversely affect such species. Under the ESA, habitat loss is considered an impact to a species. In addition, the agency is required to determine whether the project is likely to jeopardize the continued existence of any species that is proposed for listing under the ESA or to result in the destruction or adverse modification of critical habitat proposed or designated for such species (16 USC Section 1536[3] and [4]).

Executive Order 11990: Protection of Wetlands. Executive Order 11990, signed May 24, 1977, directs Federal agencies to refrain from assisting in or giving financial support to projects that encroach on publicly or privately-owned wetlands. It further requires that Federal agencies support a policy to minimize the destruction, loss, or degradation of wetlands. A project that encroaches on wetlands may not be undertaken unless the agency has determined that there are no practicable alternatives to construction and the project includes all practicable measures to minimize harm to wetlands affected.

Fish and Wildlife Coordination Act. The Fish and Wildlife Coordination Act (FWCA) ensures that fish and wildlife receive equal consideration with water resources development during planning and construction of Federal water projects by requiring that the Federal agencies consult with USFWS and the State wildlife resources agency before the waters of any stream or other body of water are impounded, diverted, deepened, or otherwise controlled or modified. The FWCA requires that the views of USFWS and the State agency be considered when evaluating impacts and determining mitigation needs. NEPA regulations further require that an EIS meet the consultation requirements of the FWCA.

Clean Water Act, Sections 404 and 401. Wetlands and other waters of the United States are protected under Section 404 of the CWA. Any activity that involves any discharge of dredged or fill material into waters of the United States, including wetlands, is subject to regulation by USACE. *Waters of the United States* is defined to encompass navigable waters of the United

States; interstate waters; all other waters where their use, degradation, or destruction could affect interstate or foreign commerce; tributaries of any of these waters; and wetlands that meet any of these criteria or are adjacent to any of these waters or their tributaries. *Wetlands* are defined under Section 404 as those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Jurisdictional wetlands must meet three wetland delineation criteria:

- They support hydrophytic vegetation (i.e., plants that grow in saturated soil).
- They have hydric soil types (i.e., soils that are wet or moist enough to develop anaerobic [oxygen-free] conditions).
- They have wetland hydrology (i.e., conditions of flooding, inundation, or saturation that support wetland communities).

The extent of USACE's jurisdiction extends to the ordinary high-water mark—the line on the shore established by fluctuations of water and indicated by a clear, natural line impressed on the bank, shelving, changes in soil character, destruction of terrestrial vegetation, and/or the presence of litter and debris.

To support a Section 404 permit from USACE, the project proponent submits a wetland delineation report to be verified by USACE and subsequently submits a permit application.

Activities requiring a Section 404 permit must obtain certification from the government of the state in which the discharge would originate or, if appropriate, from the interstate water pollution control agency with jurisdiction over affected waters at the point where the discharge would originate pursuant to Section 401 of the CWA. For the Project, the Central Valley RWQCB would have to issue such certification prior to the alteration of or discharge to waters of the United States and waters of the State (i.e., work involving bridge crossings of jurisdictional waters).

The Clean Water Rule: Definition of "Waters of the United States" was published in the Federal Register on June 29, 2015[2]. The rule became effective on August 28, 2015. Since publication of the rule in the Federal Register, numerous lawsuits were filed challenging the regulation, and on October 9, 2015, a Federal appeals court (6th Circuit) issued a nationwide stay of the 2015 Clean Water Rule. The United States Environmental Protection Agency (USEPA) and USACE issued a joint memorandum on November 16, 2015 (USEPA and USACE 2015), stating that "[d]uring the pendency of the stay, as the agencies implement the prior regulatory definition of 'waters of the United States' as clarified by the 2008 *Rapanos* Guidance, the agencies should follow the 2007 Army-EPA joint memorandum on coordination[3] as modified by the January 2008 Corps of

[2] June 29, 2015 Clean Water Rule: Definition of "Waters of the United States," available at https://www.federalregister.gov/documents/2015/06/29/2015-13435/clean-water-rule-definition-of-waters-of-the-united-states

[3] June 5. 2007, Army-USEPA joint guidance clarifying coordination on CWA jurisdiction after *Rapanos*. http://www.usace.army.mil/Portals/2/docs/civilworks/regulatory/cwa_guide/rapanos_guide_memo.pdf.

Engineers memorandum.[4]" Subsequently, in response to the February 28, 2017 Executive Order on Restoring the Rule of Law, Federalism, and Economic Growth by Reviewing the "Waters of the United States" Rule[5], the USEPA and USACE published a proposed rule on July 27, 2017[6] to rescind the 2015 Clean Water Rule and return to prior regulatory language and practice. The agencies have also begun deliberations and outreach regarding a re-evaluation and revision of the definition of "waters of the United States" in accordance with the Executive Order that may result in a revised definition being proposed at an indeterminate time in the future. The jurisdictional limits proposed herein are consistent with current guidance and the proposed rule.

Rivers and Harbors Act. Under Section 10 of the Rivers and Harbors Act of 1899, construction of any structure in or over any navigable waters of the United States requires advance authorization from USACE. This act applies to dredging, excavation, filling, or other modifications to navigable waters of the United States, including installation of or changes to structures and bank protection (e.g., riprap).

North American Wetlands Conservation Act (NAWCA). Enacted on December 13, 1989, the NAWCA provides funding for the North American Waterfowl Management Plan and the Tripartite Agreement on wetlands between the U.S., Canada, and Mexico, which provide for the long-term protection of wetlands and associated upland habitats used by waterfowl and other migratory birds. The North American Wetlands Conservation Council recommends projects to be funded under the NAWCA to the Migratory Bird Conservation Commission. Since its enactment, the NAWCA has funded over 2,800 projects and protected over 33 million acres of habitat.

Executive Order 13186: Migratory Bird Treaty Act. Under the MBTA of 1918 (16 USC Sections 703 to 712), migratory bird species and their nests and eggs are protected from injury or death; these species are identified on the Federal Migratory Bird Treaty Act Protected Bird Species list (50 CFR Part 10.13). This prohibition includes both direct and indirect acts although harassment and habitat modification are not included unless they result in direct loss of birds, nests, or eggs.

The current list of species protected by the MBTA can be found in the March 1, 2010 Federal Register (75 Federal Register 9281). This list contains several hundred species, including essentially all United States native birds. Permits for take of nongame migratory birds can be issued only for specific activities such as scientific collecting, rehabilitation, propagation, education, taxidermy, and protection of human health and safety and of personal property. USFWS publishes a list of birds of conservation concern (BCC) to identify migratory nongame birds that are likely to become candidates for listing under the ESA without additional

[4] January 28, 2008, USACE memorandum modifying EPA/USACE jurisdiction coordination after *Rapanos*, available at http://www.usace.army.mil/Portals/2/docs/civilworks/regulatory/cwa_guide/jd_coord_proc_28jan08.pdf.

[5] February 28, 2017, Presidential Executive Order on Restoring the Rule of Law, Federalism, and Economic Growth by Reviewing the "Waters of the United States" Rule, available at https://www.whitehouse.gov/the-press-office/2017/02/28/presidential-executive-order-restoring-rule-law-federalism-and-economic

[6] July 27, 2017. Definition of "Waters of the United States" – Recodification of Pre-Existing Rules, available at https://www.federalregister.gov/documents/2017/07/27/2017-13997/definition-of-waters-of-the-united-states-recodification-of-pre-existing-rules.

conservation actions. The BCC list is intended to stimulate coordinated and collaborative conservation efforts among Federal, State, tribal, and private parties.

Executive Order 13112: Invasive Species Prevention. On February 3, 1999, Executive Order 13112[7] was signed, establishing the National Invasive Species Council. Executive Order 13112 required that each Federal agency identify actions they take that could affect the status of invasive species. In addition, subject to the availability of appropriations, each Federal agency was tasked with using relevant programs and authorities to: "(i) prevent the introduction of invasive species, (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner, (iii) monitor invasive species populations accurately and reliably, (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded, (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species, and (vi) promote public education on invasive species and the means to address them." Executive Order 13112 also required that each Federal Agency "not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions."

On December 5, 2016, an executive order was issued to maintain the original intent of Executive Order 13112 regarding Federal prevention and invasive species control efforts. It also expanded the membership of the Invasive Species Advisory Committee, clarifying the operations of the National Invasive Species Council and incorporating additional considerations of climate change and technological innovation to address threats from invasive species. On September 29, 2017, an executive order was issued to continue the Invasive Species Advisory Committee through September 30, 2019[8].

9.2.2 State Plans, Policies, and Regulations

California Endangered Species Act. CESA of 1970 (Fish and Game Code Section 2050 et seq. and CCR Title 14, Subsections 670.2 and 670.5) prohibits the take of species listed under CESA (CCR Title 14, Subsections 670.2 and 670.5). Take as defined by Fish and Game Code Section 86 is defined as to hunt, pursue, catch, capture, or kill or attempt to hunt, pursue, catch, capture or kill. Consultation ensures that proposed projects or actions do not have a negative effect on State-listed species. CDFW can authorize take of a State-listed species under Sections 2080.1 and 2081(b) of the Fish and Game Code in those cases where it is demonstrated that the impacts are minimized and mitigated. Take that is authorized under either 16 USC Section 1536 (d) or under Fish and Game Code Section 2081(b) must be minimized and fully mitigated.

[7] February 3, 1999, Executive Order 13112, available at https://www.gpo.gov/fdsys/pkg/FR-1999-02-08/pdf/99-3184.pdf.

[8] September 29, 2017. Presidential Executive Order on the Continuance of Certain Federal Advisory Committees, available at https://www.whitehouse.gov/the-press-office/2017/09/29/presidential-executive-order-continuance-certain-federal-advisory.

A CESA permit must be obtained if a project would result in the *take* of listed species, either during construction or over the life of the project. Under CESA, the Fish and Game Commission established a list of threatened and endangered species designated under State law (CDFG Code 2070). CDFW also maintains lists of SSCs, which serve as watch lists.

California Environmental Quality Act. CEQA of 1970 requires that the state lead agency consult with and obtain comments from each responsible agency, trustee agency, and public agency with jurisdiction by law with respect to a proposed project and its potential impacts on rare, threatened, or endangered species. These *special-status* species are defined under CEQA Guidelines Subsections 15380(b) and (d) as those listed under the ESA and the CESA and species that are not currently protected by statute or regulation but would be considered rare, threatened, or endangered under these criteria or by the scientific community. Pursuant to the requirements of CEQA, a State or local agency reviewing a proposed project within its jurisdiction must determine whether any state-listed species might be present in the biological survey area and determine whether the proposed project would have a potentially significant impact to such species.

Although threatened and endangered species are protected by specific Federal and State statutes, CEQA Guidelines Section 15380(d) provides that a species that is not Federally or State-listed could be considered rare or endangered if it can be shown to meet certain specified criteria. These criteria have been modeled after the definition in the Federal ESA. Section 15380(d) allows a public agency to undertake a review to determine whether a significant effect would occur on species that have not yet been listed by either USFWS or CDFW (i.e., candidate species). Thus, CEQA provides an agency with the ability to protect a species from the potential impacts of a project until the respective government agency has an opportunity to designate the species as protected, if warranted. Plants with a 1A, 1B, 2A, and 2B designation meet the standards for rarity under CEQA Section 15380(b).

Porter-Cologne Water Quality Control Act. Under the Porter-Cologne Act definition, *waters of the State* are "any surface water or groundwater, including saline waters, within the boundaries of the state." Although all waters of the United States that are within the borders of California are also waters of the State, the reverse is not true. Therefore, the State of California retains authority to regulate discharges of waste into any waters of the State, regardless of whether USACE has concurrent jurisdiction under Section 404 of the CWA, and defines *discharges to receiving waters* more broadly than the CWA does.

Waters of the State fall under the jurisdiction of the nine RWQCBs. Under this act, each RWQCB must prepare and periodically update water quality control basin plans. Each basin plan sets forth water quality standards for surface water and groundwater as well as actions to control nonpoint and point sources of pollution. California Water Code Section 13260 requires any person discharging waste, or proposing to discharge waste, in any region that could affect the waters of the State to file a report of discharge (an application for waste discharge requirements) with the applicable RWQCB. California Water Code Section 13050 authorizes the State Water Board and the affiliated RWQCB to regulate biological pollutants. One example of this kind of pollutant is aquatic invasive plants discharged to receiving waters. Construction and restoration activities associated with a project that might discharge wastes into the waters of the State must meet the discharge control requirements of the Porter-Cologne Act.

Sensitive Habitats. Sensitive habitat types include those that are of special concern to CDFW or that are afforded specific consideration through CEQA as indicated by State rarity rankings,[9] Section 1602 of the California Fish and Game Code, the Porter-Cologne Act, and/or Section 404 of the CWA. Sensitive habitats might be of special concern to regulatory agencies and conservation organizations for a variety of reasons, including their locally or regionally declining status or because they provide important habitat to common and special-status species.

California Fish and Game Code (Lake and Streambed Alteration). The California Fish and Game Code was enacted in 1957. Many of its provisions are derived from the 1947 former Fish and Game Code as well as older statutes under the former Penal and Political codes originally enacted in 1872. The new statutes relating to more modern topics, such as endangered species, were added later.

Sections 1602 and 1611 of the California Fish and Game Code require notifying CDFW prior to any project activity that would substantially divert or obstruct the natural flow of any river, stream, or lake; substantially change or use any material from the bed, channel, or bank of any river, stream, or lake; or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it could pass into any river, stream, or lake. This requirement includes ephemeral streams, desert washes, and watercourses with a subsurface flow. It could also apply to work undertaken in the floodplain of a body of water.

California Fish and Game Code (Bird and Nest Protection). California Fish and Game Code Subsections 3503, 3503.5, and 3800 prohibit the possession, incidental take, or needless destruction of birds, their nests, and eggs.

California Fish and Game Code (Invasive Species). CDFW is one of the primary State agencies responsible for State efforts to prevent the introduction of new invasive species, detect and respond to introductions when they occur, and manage and prevent the spread of established invasive species. This responsibility is derived from California Fish and Game Code Sections 2116 to 2127, 2150 to 2157, 2185 to 2195, 2270 to 2272, 2300 to 2302, 6400 to 6403, and 15000 et seq. These sections relate to the importation, transfer, and possession of live wild animals, aquatic plants, and fish into the State; the placement of live aquatic animals and plants in State waters; and the operation of aquaculture industries.

California Fully Protected Species. California Fish and Game Code Section 3511 lists birds that are “fully protected” as those that may not be taken or possessed except under specific permit. Sections 4700, 5050, and 5515 of the California Fish and Game Code prohibit take or possession of other fully protected species and do not provide for authorization of incidental take except for take of fully protected mammal, reptiles, amphibians, or fish for necessary scientific research, including efforts to recover fully protected, threatened, or endangered species.

California Native Plant Protection Act. The California Native Plant Protection Act of 1977 (CDFG Code Sections 1900 to 1913) directed the Fish and Game Commission to use their authority to designate plants as rare or endangered to “preserve, protect, and enhance” these species. Under Section 1901, a species is *endangered* when its prospects for survival and reproduction are in immediate jeopardy from one or more causes. A species is *rare* when, although not threatened with immediate extinction, it exists in such small numbers throughout its range that it could become endangered if its present environment worsens. The Fish and Game

[9] All alliances with state ranks of S1 to S3 are considered to be highly imperiled.

Commission has designated 64 species, subspecies, and varieties of plants that are protected as rare under the California Native Plant Protection Act (Title 14 CCR Section 670.2the). Take of rare plants can only be authorized under Title 14 CCR Section 786.9.

Delta Protection Act of 1992. The Delta Protection Act of 1992 (Water Code Section 12220) established the Delta Protection Commission (DPC) to prepare and oversee a comprehensive Land Use and Resources Management Plan (LURMP) for the Delta Primary Zone. The Primary Zone consists of the lands in the Delta's central portion that were not within either the urban limit line or sphere of influence line of any local government's general plan or studies as of January 1, 1992. The Primary Zone encompasses 487,625 acres (about 66 percent of the statutory Delta) of varied land uses, waterways, and levees in parts of Contra Costa, Sacramento, San Joaquin, Solano, and Yolo counties, including portions of Yolo Bypass south of I-80. The remaining areas of the legal Delta are designated as the Secondary Zone and are not under DPC land use jurisdiction (DPC 2010).

In 1995, the DPC adopted a LURMP for the Primary Zone to guide projects impacting land use and resource management, including agriculture, wildlife habitat, and recreation. Emphasis was placed on agriculture, which was designated by the Delta Protection Act as the primary use of this zone. In 2000, the LURMP policies were adopted as regulations (CCR Title 14, Division 9, Chapter 3: *Regulations Governing Land Use and Resources Management in the Primary Zone of the Sacramento-San Joaquin Delta*); the plan was revised and reprinted in 2002.

The Delta Protection Act was amended in 2009 by the Sacramento-San Joaquin Delta Reform Act (Senate Bill [SB] 1 X7), which modified DPC's composition and responsibilities. DPC has since adopted an updated LURMP, which became effective on November 6, 2010. It contains policies to protect the Delta's unique character, expand public access and recreation, and locate new transmission lines and utilities within existing corridors to minimize impacts (DPC 2010). These policies are required to be incorporated into the local general plans of the counties with jurisdiction over portions of the Primary Zone. Local planning decisions may be appealed to DPC for a determination of consistency with the LURMP.

Delta Plan. Signed by the governor of California in 2009, the Sacramento-San Joaquin Delta Reform Act (Water Code Section 85000 et seq.) created a new Delta Stewardship Council (DSC) and gave this body broad oversight of Delta planning and resource management. DSC was tasked with developing and implementing a long-term, comprehensive management plan (Delta Plan) that emphasizes the coequal goals of "providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem" (Water Code Section 85300[a]) as the foundation for State decisions regarding Delta management.

Among other things, the Reform Act contains three specific mandates for the DSC:

- Include measures in the Delta Plan to promote statewide water conservation, water use efficiency, sustainable use of water, and improvements to water conveyance/storage and operation, to achieve the coequal goals.
- Include measures in the Delta Plan that attempt to reduce risks to people, property, and State interests in the Delta by promoting effective emergency preparedness, appropriate land uses, and strategic levee investments.
- Determine whether State or local agency projects are consistent with the Delta Plan.

In addition, the Reform Act requires the Delta Plan to cover five topic areas and goals:

- Increased water supply reliability
- Restoration of the Delta ecosystem
- Improved water quality
- Reduced risks of flooding in the Delta
- Protection and enhancement of the Delta

The final Delta Plan was adopted on May 16, 2013, and DSC is still preparing the associated EIR. Following adoption of the Delta Plan, covered actions are required to be consistent with that plan.

Yolo Bypass Wildlife Area Land Management Plan. The YBWA Land Management Plan was finalized in June 2008 (CDFG 2008). The plan is a general policy guide to CDFW management of YBWA and is intended to contribute to habitat management that uses natural processes to create a sustainable system over the long term. The policies are based on an ecosystem approach to habitat management consistent with the principles of the Ecosystem Restoration Program included in CALFED as implemented by the California Bay-Delta Authority and CDFW.

Central Valley Joint Venture Implementation Plan. This joint venture was formed under the North American Waterfowl Management Plan (Central Valley Joint Venture 2006). Originally developed in 1990 to achieve partnership-based waterfowl conservation in the nine basins in the Central Valley, this plan was updated in 2006 based on research, monitoring data, and input from professionals to include conservation objectives for shorebirds, waterbirds, and riparian songbirds. Conservation goals are achieved through habitat protection, restoration, and enhancement. An update to this plan is expected to be released in 2018.

9.2.3 Regional and Local Plans, Policies, and Regulations

The Project alternatives are in unincorporated Yolo County; therefore, the county's policies pertaining to terrestrial biological resources are discussed in further detail below.

9.2.3.1 Yolo County General Plan

The following goals and policies of the Conservation and Open Space Element of the *2030 Countywide General Plan* (County of Yolo 2009) are applicable to the terrestrial biological resources that could be affected by the Project alternatives:

- **Policy CO-2.1.** Consider and maintain the ecological function of landscapes, connecting features, watersheds, and wildlife movement corridors.
- **Policy CO-2.2.** Focus conservation efforts on high priority conservation areas (core reserves) that consider and promote the protection and enhancement of species diversity and habitat values and contribute to sustainable landscapes connected to each other and to regional resources.
- **Policy CO-2.3.** Preserve and enhance those biological communities that contribute to the county's rich biodiversity, including blue oak and mixed oak woodlands, native grassland

prairies, wetlands, riparian areas, aquatic habitat, agricultural lands, heritage valley oak trees, remnant valley oak groves, and roadside tree rows.

- **Policy CO-2.4.** Coordinate with other regional efforts (for example, Yolo County Habitat Conservation Plan [HCP]/ Natural Community Conservation Plan [NCCP]) to sustain or recover special-status species populations by preserving and enhancing habitats for special-status species.
- **Policy CO-2.9.** Protect riparian areas to maintain and balance wildlife values.
- **Policy CO-2.10.** Encourage the restoration of native habitat.
- **Policy CO-2.11.** Ensure that open space buffers are provided between sensitive habitat and planned development.
- **Policy CO-2.13.** Promote the use of oak woodland conservation banks to mitigate for losses due to development impacts and provide carbon sequestration for greenhouse gas emissions under applicable State programs.
- **Policy CO-2.14.** Ensure no net loss of oak woodlands, alkali sinks, rare soils, vernal pools, or geological substrates that support rare endemic species, with the exception that limited loss of blue oak woodland and grasslands may be acceptable where the fragmentation of large forests exceeding 10 acres is avoided and where losses are mitigated.
- **Policy CO-2.16.** Existing native vegetation shall be conserved where possible and integrated into new development if appropriate.
- **Policy CO-2.17.** Emphasize and encourage the use of wildlife-friendly farming practices within the county's agricultural districts and with private landowners, including:
  - Establishing native shrub hedgerows and/or tree rows along field borders
  - Protecting remnant valley oak trees
  - Planting tree rows along roadsides, field borders, and rural driveways
  - Creating and/or maintaining berms
  - Winter flooding of fields
  - Restoring field margins (filter strips), ponds, and woodlands in non-farmed areas
  - Using native species and grassland restoration in marginal areas
  - Managing and maintaining irrigation and drainage canals to provide habitat, support native species, and serve as wildlife movement corridors
  - Managing winter stubble to provide foraging habitat
  - Discouraging the conversion of open ditches to underground pipes, which could adversely affect giant garter snakes and other wildlife that rely on open waters
  - Widening watercourses, including the use of setback levees
- **Policy CO-2.18.** Coordinate with the Yolo County Resource Conservation District, Natural Resources Conservation Service, University of California Cooperative Extension, and other

farm organizations to encourage farming practices and the management of private agricultural land that is supportive of wildlife habitat values.

- **Policy CO-2.20.** Encourage the use of wildlife-friendly best management practices to minimize unintentional killing of wildlife, such as restricting mowing during nesting season for ground-nesting birds or draining of flooded fields before fledging of wetland species.
- **Policy CO-2.22.** Prohibit development within a minimum of 100 feet from the top of banks for all lakes, perennial ponds, rivers, creeks, sloughs, and perennial streams. A larger setback is preferred. The setback will allow for fire and flood protection, a natural riparian corridor (or wetland vegetation), a planned recreational trail where applicable, and vegetated landscape for stormwater to pass through before it enters the water body. Recreational trails and other features established in the setback should be unpaved and located along the outside of the riparian corridors whenever possible to minimize intrusions and maintain the integrity of the riparian habitat. Exceptions to this action include irrigation pumps, roads and bridges, levees, docks, public boat ramps, and similar uses, so long as these uses are sited and operated in a manner that minimizes impacts to aquatic and riparian features.
- **Policy CO-2.23.** Support efforts to coordinate the removal of non-native, invasive vegetation within watersheds and replace with native plants.
- **Policy CO-2.24.** Promote floodplain management techniques that increase the area of naturally inundated floodplains and the frequency of inundated floodplain habitat, restore some natural flooding processes-river meanders, and widen riparian vegetation, where feasible.
- **Policy CO-2.25.** Support efforts to reduce water temperatures in streams for fish via habitat restoration (for example, increase shading vegetation) and water management (for example, control of flows) that are compatible with the Integrated Regional Water Management Plan.
- **Policy CO-2.26.** Coordinate with local watershed stewardship groups to identify opportunities for restoring or enhancing watershed, instream, and riparian biodiversity.
- **Policy CO-2.27.** Evaluate the need for additional water to support future riparian enhancement efforts, including the benefits of conjunctive management of groundwater and surface water resources.
- **Policy CO-2.28.** Balance the needs of aquatic and riparian ecosystem enhancement efforts with flood management objectives.
- **Policy CO-2.29.** Promote native perennial grass habitat restoration and controlled fire management in grazing lands to reduce invasive species cover and enhance rangeland forage.
- **Policy CO-2.30.** Protect and enhance streams, channels, seasonal and permanent marshland, wetlands, sloughs, riparian habitat, and vernal pools in land planning and community design.
- **Policy CO-2.31.** Protect wetland ecosystems by minimizing erosion and pollution from grading, especially during grading and construction projects.
- **Policy CO-2.33.** Create partnerships with landowners, non-government organizations, and other public agencies to implement the *Yolo County Oak Woodland Conservation and Enhancement Plan*.

- **Policy CO-2.34.** Recognize, protect, and enhance the habitat value and role of wildlife migration corridors for the Sacramento River, Putah Creek, Willow Slough, the Blue Ridge, the Capay Hills, the Dunnigan Hills, and Cache Creek.
- **Policy CO-2.35.** Consider potential effects of climate change on the locations and connections between wildlife migration routes.
- **Policy CO-2.36.** Habitat preserved as a part of any mitigation requirements shall be preserved in perpetuity through deed restrictions, conservation easement restrictions, or other methods to ensure that the habitat remains protected. All habitat mitigation must have a secure, ongoing funding source for operation and maintenance.
- **Policy CO-2.37.** Where applicable in riparian areas, ensure that required State and Federal permits/approvals are secured prior to development of approved projects.
- **Policy CO-2.38.** Avoid adverse impacts to wildlife movement corridors and nursery sites (for example, nest sites, dens, spawning areas, and breeding ponds). Preserve the functional value of movement corridors to ensure that essential habitat areas do not become isolated from one another due to the placement of either temporary or permanent barriers within the corridors. Encourage avoidance of nursery sites during periods when the sites are actively used and that nursery sites, which are used repeatedly over time, are preserved to the greatest feasible extent or fully mitigated if they cannot be avoided.
- **Policy CO-2.41.** Require that impacts to species listed under the California or Federal Endangered Species Acts, or species identified as special-status by the resource agencies, be avoided to the greatest feasible extent. If avoidance is not possible, fully mitigate impacts consistent with applicable local, State, and Federal requirements.

9.2.3.2 Yolo County Oak Woodland Conservation and Enhancement Plan

The Yolo County Board of Supervisors has adopted the *Yolo County Oak Woodland Conservation and Enhancement Plan* (Yolo County 2007). This voluntary program encourages the protection and growth of oak woodlands by providing financial incentives to landowners and establishing public outreach and educational programs. The plan coordinates the voluntary oak woodland conservation and enhancement efforts, guides oak woodland mitigation, provides access to State funding, and assists with State efforts to conserve and enhance oak woodlands in California. The system helps identify areas with the highest oak woodland resource values as well as those that would benefit from enhancement efforts. The system uses criteria that reflect values such as stand size, composition and distribution, tree cover and density, plant and wildlife habitat, invasive species presence and abundance, erosion control, contribution to air quality, water quality and flood protection, historical and cultural significance, and recreational opportunities.

9.2.3.3 Yolo Habitat Conservation Plan/Natural Community Conservation Plan

The Yolo HCP/NCCP was finalized in April 2018 by the Yolo Habitat Conservancy (YHC 2018), whose members include the County of Yolo and the Cities of Davis, West Sacramento, Winters, and Woodland. The consistency of this Project with the Yolo HCP/NCCP is presented in this EIS/EIR.

The Yolo HCP/NCCP includes the following proposed covered species that may be present or are known to be present in the study area:

- Bank Swallow (*Riparia riparia*)
- Burrowing Owl (*Athene cunicularia*)
- Giant garter snake
- Least Bell's Vireo
- Swainson's Hawk
- Tricolored Blackbird
- Valley elderberry longhorn beetle
- Western pond turtle
- Western Yellow-Billed Cuckoo
- White-tailed Kite (*Elanus leucurus*)

The Yolo HCP/NCCP includes the following natural communities that are present in the study area:

- Annual grasslands
- Field crops
- Fresh emergent wetlands
- Grain/hay crops
- Rice
- Valley foothill riparian
- Valley oak woodland
- Water

9.3 Environmental Consequences

This section describes environmental consequences related to terrestrial vegetation, jurisdictional wetlands and waters, and wildlife resources, including direct (temporary, permanent, and temporal), potential indirect, and potential cumulative effects on terrestrial biological resources that could result from each Project alternative. This section also covers the methods that were used to determine the effects of the Project alternatives and the thresholds of significance. Effects from construction, operations, and maintenance are also addressed. This section also includes avoidance, minimization, and mitigation measures for effects considered adverse under NEPA and impacts considered significant under CEQA. Detailed descriptions of the alternatives evaluated in this section are provided in Chapter 2, *Description of Alternatives*.

9.3.1 Methods for Analysis

The analysis of impacts to terrestrial biological resources is arranged by resource type: vegetation communities, Federally and/or State-listed plant and wildlife species, other special-status plant and wildlife species, wildlife movement corridors and linkages, sensitive habitats, waters of the United States, waters of the State, and compliance with Federal, State, local, and regional plans, policies, and regulations.

The Lead Agencies used the following data sources to analyze impacts to terrestrial biological resources:

- Vegetation community and land cover acreages were obtained using the GIS data included in the *Fine-Scale Riparian Vegetation Mapping of the Central Valley Flood Protection Plan Area Final Report* CDFW (2013) and updated by field surveys conducted by DWR and HDR in 2014.
- Locations of special-status plant and wildlife species in the study area were based on focused surveys conducted by DWR and HDR in 2014 and 2015.
- Locations and dates of special-status plant and wildlife species occurrence information from CNDDB and CNPS were used to determine impacts to suitable habitat for special-status species for which no recent survey data were available.
- A jurisdictional delineation conducted by DWR in 2016 was used to determine the extent of wetlands, non-wetland waters of the United States, and waters of the State (this delineation covered only a small portion of the study area).
- Vegetation community mapping (CDFW 2013), National Wetlands Inventory data, and USGS historical topographic maps were used to determine the area potentially subject to USACE and CDFW jurisdiction where formal delineation data were unavailable.

To identify potential construction-related direct and indirect impacts to biological resources, the Lead Agencies identified a study area. This biological resources study area includes all areas within the proposed footprint for each alternative (including construction footprints for all Project components—intake habitat shelf, headworks structure, outlet channel, transport channel, downstream channel improvements, the Tule Canal floodplain improvement area, notches, water control structures, engineered embankments, pedestrian bridges, cutoff walls, and fish passage structures; spoils sites; access roads; and temporary staging and construction areas) as well as a buffer area for the assessment of indirect impacts (typically 100 feet for vegetation communities, jurisdictional areas, and special-status plant species, and up to 500 feet for certain special-status wildlife species such as birds). To assess operations impacts, the study area includes the entirety of the Yolo Bypass. However, only the part of the study area associated with construction impacts is shown in the figures in this chapter.

Direct effects are changes in the physical environment caused by a project that are immediately related to the project; they occur in the same time and place as the project (e.g., grading associated with construction of a project or permanent conversion of habitat to another use). Indirect effects are changes to the physical environment that occur later in time or are farther removed in distance than direct effects (e.g., long-term changes in water quality or offsite impacts from noise, dust, lights). Both direct and indirect effects could be considered temporary or permanent, depending on the situation.

Temporary impacts to vegetation communities typically include those of short duration (less than one year) in areas that are subject to disturbance during construction but that can be recontoured and revegetated following construction. Temporary impacts that cover a period longer than one year are typically considered long-term temporary impacts and could involve additional mitigation measures to account for the loss of habitat function during construction. Because construction of all alternatives is anticipated to take about one year to complete, long-term temporary impacts are not anticipated.

Temporary impacts to wildlife species can include indirect effects such as noise or disturbance from operating construction equipment. Permanent impacts to vegetation communities include those that involve placing materials, such as concrete or rock, which would result in converting one vegetation community to another. Permanent impacts to wildlife include those that convert suitable habitat to the extent that it is no longer suitable for wildlife or cause mortality to individuals.

Direct effects on vegetation communities (including sensitive natural communities), special-status plant and wildlife species, and jurisdictional areas can include vegetation clearing, site grading, excavating, paving, placing fill, and stockpiling. Indirect effects on vegetation communities (including sensitive natural communities), special-status plant and wildlife species, and jurisdictional areas can include soil compaction, dust, runoff, the introduction and spread of invasive plant species, construction noise and lighting, habitat conversion, and changes in hydrology.

The Lead Agencies determined the effects under NEPA of each Project alternative on terrestrial biological resources by comparing each alternative with the effects of the future No Action Alternative (the NEPA baseline). The Lead Agencies determined the impacts and their level of significance under CEQA of each alternative to terrestrial biological resources by comparing each alternative to existing biological conditions (the CEQA baseline). For this analysis, the NEPA and CEQA terrestrial biological baselines are equivalent because without a project to alter inundation within the study areas, there are not anticipated to be any changes to terrestrial biological resources for the future No Action compared to current terrestrial biological conditions. Therefore, the analysis compares the impacts of the action alternatives only to existing conditions.

If the Lead Agencies identify a significant effect under CEQA or adverse effects under NEPA, the section includes mitigation measures that could reduce, avoid, or minimize the effect. It is recognized that the mitigation measures may be refined as part of ESA/CESA permitting; this will be subject to final design, further coordination with resource agencies, and additional modeling maps specific to the species that may be developed.

The Lead Agencies determined the cumulative effects of each alternative by assessing the effects of the alternative in combination with other past, present, and probable or reasonably foreseeable future projects on a resource. The purpose of the cumulative effects analysis is twofold: to determine whether the overall long-term effects of all such projects would be cumulatively adverse and to determine whether the Project itself would cause a “cumulatively considerable” (and thus adverse) incremental contribution to any such cumulatively adverse effects (see the State CEQA Guidelines [CCR Title 14, Sections 15064(h), 15065(c), 15130(a), 15130(b), and 15355(b)]). In other words, the required analysis first creates a broad context in which to assess the Project’s incremental contribution to anticipated cumulative effects, viewed on a geographic

scale well beyond the Project itself. The analysis then determines whether the Project's incremental contribution to any adverse cumulative effects from all projects is itself adverse (i.e., "cumulatively considerable").

9.3.2 Thresholds of Significance – CEQA

The Lead Agencies used the following thresholds of significance identified in Appendix G of the State CEQA Guidelines and modified them based on thresholds used for other projects and conservation plans in the region (e.g., the Bay-Delta Conservation Plan /California WaterFix—refer to Chapter 2, *Description of Alternatives*, for a description of these projects) to determine the effects under CEQA of each Project alternative. These thresholds also encompass the factors considered under NEPA to determine the context and the intensity of an action's impacts.

An alternative would result in a significant impact under CEQA on terrestrial biological resources if it would:

- Have a substantial adverse effect, either through direct mortality or through habitat modifications, including designated critical habitat, on any terrestrial plant or wildlife species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by USFWS or CDFW, including substantially reducing the number or restricting the range of an endangered, threatened, or rare species. An adverse effect would be substantial if it would result in:
  - The adverse modification of critical habitat designated by the USFWS
  - A permanent reduction in the acreage and quality of suitable habitat for special-status plant species
  - A permanent reduction in the acreage and quality of suitable foraging and/or nesting habitat for special-status wildlife species
  - A permanent reduction in the acreage and quality of known occupied habitat for special-status plant or wildlife species
  - A permanent reduction in the availability of mature trees that provide suitable nesting or roosting habitat for special-status bird or bat species
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in Federal, State, local, or regional plans, policies, or regulations by USFWS or CDFW. An effect would be substantial if it would result in a permanent reduction in the acreage or function of the sensitive natural community.
- Conflict with any local policies or ordinances protecting biological resources, such as a tree-preservation policy or ordinance, including the goals and policies of the Conservation and Open Space Element of the *2030 Countywide General Plan* (County of Yolo 2009) and the *Yolo County Oak Woodland Conservation and Enhancement Plan*.
- Have a substantial adverse effect on Federally or State-protected wetlands as regulated under Section 404 of the CWA or the Porter-Cologne Act, including, but not limited to, marshes, vernal pools, and coastal wetlands through their direct removal, filling, hydrological interruption, or other means. An effect would be substantial if it would result in the permanent reduction in acreage or function of the wetland.

- Interfere substantially with the movement of any native resident or migratory wildlife species or with established native resident or migratory wildlife corridors or linkages or impede the use of native wildlife nursery sites.
- Conflict with the provisions of an adopted or impending HCP, NCCP, or other approved local, regional, or state habitat conservation plan.
- Result in effects on terrestrial biological resources that are individually limited but cumulatively considerable.

9.3.3 Effects and Mitigation Measures

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

9.3.3.1 No Action Alternative

Under the No Action Alternative (see Section 2.2, *No Action and No Project Alternative*), no construction activities would occur to increase seasonal floodplain inundation in the lower Sacramento River Basin or improve fish passage through the Yolo Bypass. The Yolo Bypass would continue to be inundated during overtopping events at Fremont Weir. Additional flows would not pass through Fremont Weir when the Sacramento River is below the weir. There would be no construction impacts to terrestrial biological resources, including vegetation communities, special-status species, wildlife movement corridors, sensitive habitats, waters of the United States, and waters of the State.

The No Action Alternative would not result in changed conditions for terrestrial biological resources because there would not be any construction or changes to hydrology in the Yolo Bypass. Therefore, there would be no adverse effects to:

- Terrestrial plant or wildlife species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by USFWS or CDFW
- Riparian habitat or other sensitive natural community identified in Federal, State, local, or regional plans, policies, or regulations by USFWS or CDFW
- Federally or State-protected wetlands as regulated under Section 404 of the CWA or the Porter-Cologne Act
- The movement of any native resident or migratory wildlife species, established native resident or migratory wildlife corridors or linkages, or native wildlife nursery sites
- Local policies or ordinances protecting biological resources
- Provisions of an adopted or impending HCP, NCCP, or other approved local, regional, or state habitat conservation plan

CEQA Conclusion

The No Action Alternative would result in no changes to vegetation, wetland, or wildlife resources in the study area; therefore, this alternative would have **no impact** on terrestrial biological resources.

9.3.3.2 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. During operations, Alternative 1 would allow water through the headworks once Sacramento River water elevation exceeds 15 feet, into the eastern channel, through the transport channel, and past Agricultural Road Crossing 1. The gated notch would be closed when the river water elevation falls below 14 feet. The gated notch and associated water conveyance structures would be operated remotely from a control building between approximately November 1 and March 15, with gates potentially remaining partially open after March 15 to allow adult fish passage at limited flows up to the available Tule Canal capacity (about 300 cfs). See Section 2.4 for more details on the alternative features.

Implementation of Alternative 1 would result in direct and indirect construction effects on suitable and/or occupied habitat for State- or Federally listed wildlife species, including 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 [*Carex comosa*], Peruvian dodder [*Cuscuta obtusiflora* var. *glandulosa*], Delta tule pea [*Lathyrus jepsonii* var. *jepsonii*], Sanford's arrowhead [*Sagittaria sanfordii*], and Suisun Marsh aster [*Symphyotrichum lentum*]), 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 potential effects on these biological resources and proposed avoidance, minimization, and mitigation measures are discussed below.

Vegetation community impacts for Alternative 1 are shown on Figures 9-2a and 9-2b. Vegetation community impacts for all Project alternatives are listed in Table 9-6. To assess construction-related direct and indirect effects, the study area includes the area of temporary and permanent impacts plus a 100-foot buffer. To assess operations effects from an increase in the frequency and duration of inundation, the study area includes the entirety of the Yolo Bypass.

Areas within the permanent construction footprint would be graded and converted to rock-lined channels or concrete structures associated with the headworks. Areas within the temporary construction footprint would be graded and used during construction for vehicle access, spoils storage, and other construction activities and might be available for revegetation following construction.

During operations of Alternative 1, vegetation could establish within the rock-lined channels. The Lead Agencies anticipate that smaller plants, such as grasses and herbaceous plants, which do not impede fish passage, might be left in place. However, larger, woodier vegetation, such as

shrubs and trees, would be removed from the channels only if it is determined that such vegetation is impeding fish passage and would be disposed of at an approved offsite landfill during maintenance.

During operations, Alternative 1 generally would result in an overall increased number of wet days within the Yolo Bypass of one week (with localized areas in the east experiencing an increased average number of wet days of up to three weeks and some areas in the west experiencing no change). Inundation data were obtained from Appendix H5 and Figures 13-4 through 13-6 in Chapter 13, *Recreation*, and Figure 11-5 in Chapter 11, *Land Use and Agriculture*). Areas in the western and northwestern portions of the FWWA would experience a reduction in the number of wet days. In general, areas in the eastern part of the Yolo Bypass would experience a greater increase in the number of wet days than the western part of the Yolo Bypass where some areas would see no effect. Within the Tule Ranch Unit of the YBWA, which provides habitat for special-status vernal pool plants and vernal pool crustaceans, there would be no change to up to one additional week of wet days in the western part of Tule Ranch to one to two additional weeks of wet days in the eastern part of Tule Ranch (see Figure 13-6 in Chapter 13, *Recreation*). Impacts to vernal pool plants resulting from operations are discussed under Impact-TERR-1. The increased inundation within Tule Ranch is not expected to result in substantial impacts on vernal pool crustaceans because this inundation would occur during the rainy season when the fairy shrimp hatch and would not interfere with the formation of cysts at the end of the rainy season. Therefore, vernal pool crustaceans are not discussed further for this alternative.

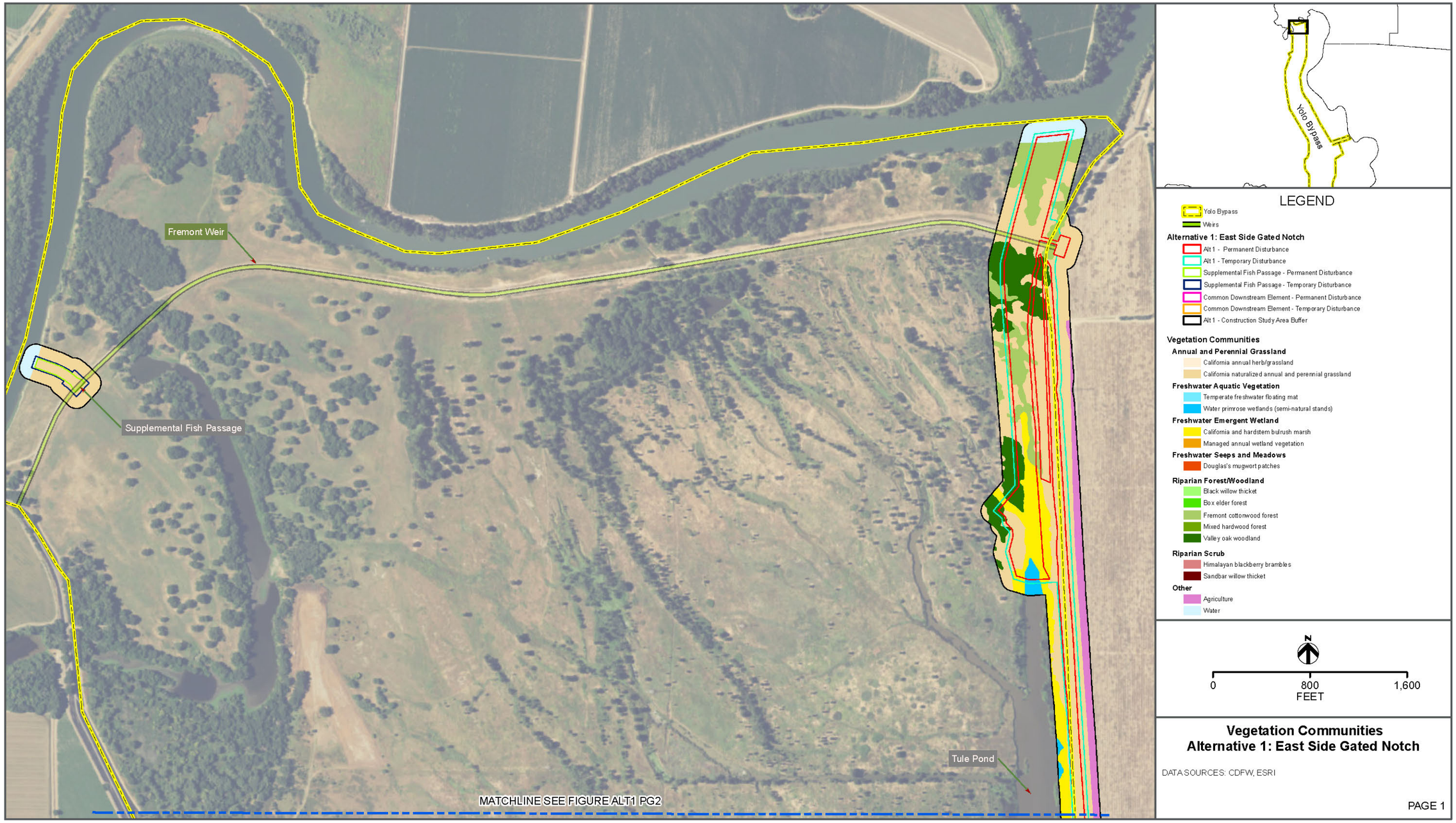

Figure 9-2a. Alternative 1 Construction Impacts to Vegetation Communities

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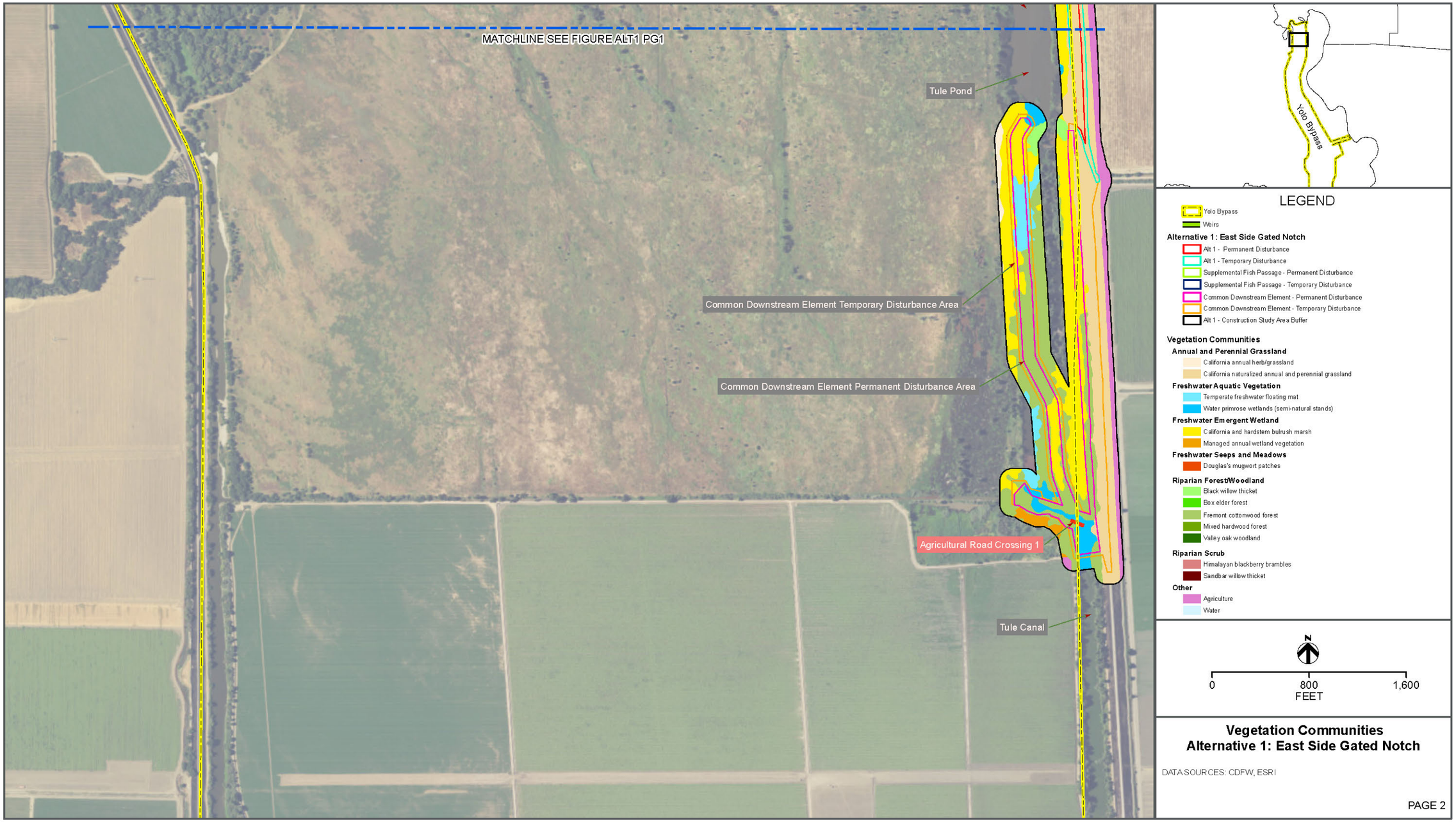

Figure 9-2b. Alternative 1 Construction Impacts to Vegetation Communities

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Table 9-6. Construction Impacts to Vegetation Communities and Cover Types by Alternative

Vegetation Community	Alt. 1 Temp. (acres)	Alt. 1 Perm. (acres)	Alt. 2 Temp. (acres)	Alt. 2 Perm. (acres)	Alt. 3 Temp. (acres)	Alt. 3 Perm. (acres)	Alt. 4 Temp. (acres)	Alt. 4 Perm. (acres)	Alt. 5 Temp. (acres)	Alt. 5 Perm. (acres)	Alt. 6 Temp. (acres)	Alt. 6 Perm. (acres)
Annual and Perennial Grassland	**17.9**	**19.3**	**20.8**	**49.3**	**19.6**	**42.8**	**64.4**	**65.7**	**20.0**	**71.6**	**20.6**	**60.2**
California annual herb/grassland	0.0	0.0	4.9	14.1	5.7	15.8	5.7	15.8	8.5	29.6	6.0	32.5
California naturalized annual and perennial grassland	17.9	19.3	15.9	35.2	13.9	27.0	58.7	49.9	11.5	42.0	14.6	27.7
Freshwater Aquatic Vegetation	**0.9**	**3.1**	**1.0**	**4.0**	**1.0**	**4.0**	**1.2**	**4.0**	**0.1**	**2.6**	**1.0**	**4.3**
Temperate freshwater floating mat	0.5	1.3	0.5	1.3	0.5	1.3	0.5	1.3	0.1	0.9	0.5	1.3
Water primrose wetlands (semi-natural stands)	0.4	1.8	0.5	2.7	0.5	2.7	0.7	2.7	0.0	1.7	0.5	3.0
Freshwater Emergent Marsh	**3.0**	**8.7**	**1.6**	**9.3**	**2.2**	**10.0**	**25.9**	**24.2**	**0.5**	**4.9**	**2.0**	**10.5**
California and hardstem bulrush marsh	3.0	8.7	1.6	9.3	1.6	9.2	1.6	9.3	0.5	4.9	1.6	9.5
Managed annual wetland vegetation	<0.001	0.0	<0.001	0.0	0.6	0.8	24.3	14.9	0.0	<0.001	0.4	1.0
Marsh/Seep	**0.0**	**0.0**	**0.0**	**0.0**	**0.9**	**4.0**	**0.9**	**4.0**	**0.0**	**0.0**	**0.6**	**5.4**
Douglas' mugwort patches	0.0	0.0	0.0	0.0	0.9	4.0	0.9	4.0	0.0	0.0	0.6	5.4
Riparian Forest/Woodland	**7.1**	**16.0**	**6.0**	**16.5**	**8.8**	**20.1**	**20.6**	**24.7**	**7.2**	**11.9**	**8.1**	**26.8**
Black willow thicket	<0.1	<0.1	<0.1	0.1	<0.1	0.1	4.2	0.9	0.1	1.4	<0.1	0.1
Box elder forest	0.0	0.0	0.0	0.0	0.2	0.6	0.1	0.6	0.0	0.0	0.1	1.3
Fremont cottonwood forest	5.7	12.0	5.4	11.8	7.0	14.3	14.3	17.9	6.6	8.8	6.7	18.9
Mixed hardwood forest	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.2	0.0	0.0	0.0	0.0

Vegetation Community	Alt. 1 Temp. (acres)	Alt. 1 Perm. (acres)	Alt. 2 Temp. (acres)	Alt. 2 Perm. (acres)	Alt. 3 Temp. (acres)	Alt. 3 Perm. (acres)	Alt. 4 Temp. (acres)	Alt. 4 Perm. (acres)	Alt. 5 Temp. (acres)	Alt. 5 Perm. (acres)	Alt. 6 Temp. (acres)	Alt. 6 Perm. (acres)
Valley oak woodland	1.4	4.0	0.6	4.6	1.6	5.1	1.6	5.1	0.5	1.7	1.2	6.5
Riparian Scrub	**0.0**	**0.0**	**0.1**	**0.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**0.3**	**0.0**	**0.0**
Himalayan blackberry brambles	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.0
Other	**0.3**	**0.4**	**1.5**	**5.8**	**0.8**	**0.8**	**25.8**	**23.4**	**<0.1**	**5.0**	**1.5**	**1.5**
Agriculture	<0.01	0.0	0.0	<0.01	0.0	<0.1	17.9	20.5	0.0	0.0	0.1	<0.1
Open water	0.3	0.4	1.5	5.8	0.8	0.8	7.9	2.9	<0.1	5.0	1.4	1.4
Total	**29.2**	**47.5**	**31.0**	**85.2**	**33.3**	**81.7**	**138.8**	**146.0**	**27.9**	**96.3**	**33.8**	**108.7**

Key: Perm. = permanent impacts; Temp. = temporary impacts.

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

The construction study area for Alternative 1 provides suitable habitat (marsh and riparian areas) for seven special-status plant species, all considered rare, threatened, or endangered by CNPS, but none are State or Federally listed. These special-status plant species include woolly rose-mallow, northern California black walnut, bristly sedge, Peruvian dodder, Delta tule pea, Sanford's arrowhead, and Suisun Marsh aster. Construction of Alternative 1 would result in direct adverse effects on suitable habitat for the following special-status plant species known to occur in FWWA: woolly rose-mallow (associated with freshwater marsh and levees) and northern California black walnut (associated with riparian areas). The woolly rose-mallow plant identified during 2015 surveys near Agricultural Road Crossing 1 might be directly impacted by construction during site-grading activities. The other woolly rose-mallow plants and northern California black walnut tree would not be directly impacted because they are outside the construction area for this alternative.

Indirect effects on woolly rose-mallow could result from dewatering, sedimentation, generation of dust, accidental leaks or spills of fuel or oil, the accidental introduction of invasive plant species carried as seeds on construction equipment or personnel, or the spread of invasive plant species through soil disturbance (which tends to promote growth of non-natives). Invasive plant species can outcompete native plant species and reduce habitat complexity and quality for both special-status plant and wildlife species. Invasive plant species are already present in the Project area. However, construction activities could introduce new invasive plant species to the Project area.

The Lead Agencies do not expect construction activities in wet or ponded portions of the Project area (including freshwater marsh) or in grassland portions of the Project area (including seeps within grasslands) for Alternative 1 to adversely affect any other special-status plant species because none of the other species were observed during field surveys.

Alternative 1 would have the lowest construction impacts to suitable and occupied habitat for special-status plant species of all the proposed alternatives.

The Lead Agencies do not anticipate operations under Alternative 1 to result in substantial mortality or loss of habitat for special-status plant species mentioned above or those known to occur or with the potential to occur within other areas of the Yolo Bypass (including Baker's navarretia [*Navarretia leucocephala* ssp. *bakeri*], bearded popcornflower [*Plagiobothrys hystriculus*], Ferris' milkvetch [*Astragalus tener* var. *ferrisiae*], Heckard's pepper grass, hogwallow starfish [*Hesperevax caulescens*], Jepson's coyote-thistle [*Eryngium jepsonii*], legenere [*Legenere limosa*], little mousetail [*Myosurus minimus*], Boggs Lake hedge-hyssop [*Gratiola heterosepala*], California alkali grass, Colusa grass [*Neostapfia colusana*], dwarf downingia [*Downingia pusilla*], Parry's rough tarplant [*Centromadia parryi* ssp. *rudis*], Solano grass [*Tuctoria mucronata*], vernal pool smallscale [*Atriplex persistens*], Wright's trichocoronis [*Trichocoronis wrightii* var. *wrightii*], and San Joaquin spearscale). The small expected increase in the average number of wet days under Alternative 1 is not expected to result in significant operations impacts to special-status plant species, which are tolerant of moist soils and have evolved in an area that is subject to regular inundation. Similarly, operations activities are not expected to result in a dramatic change in the abundance of invasive plant species.

Routine maintenance of the new intake channel, headworks, transport channel, outtake channel, and west supplemental fish passage facility could require the removal of woody vegetation and sediment that has built up within the channels if a qualified biologist determines that such vegetation and sediment is detrimental to fish passage. However, except for woolly rose-mallow, Delta tule pea, and Suisun Marsh aster, the Lead Agencies do not expect special-status plant species to colonize this rock-lined environment. Woolly rose-mallow, Delta tule pea, and Suisun Marsh aster, all non-woody, herbaceous plants, are not expected to reduce water flow like woody vegetation might, so these plants would not be subject to removal. Vegetation removal conducted as part of routine maintenance that does not consider proper control methods for invasive plant species that may colonize the channel environment may inadvertently encourage the spread of such species.

Woolly rose-mallow is the only special-status plant species known to occur in and near the study area for Alternative 1. One individual woolly rose-mallow plant at Agricultural Road Crossing 1 could be impacted out of five observed during surveys in 2014 and 2015. There is suitable habitat for six other special-status plant species in the study area for Alternative 1. However, these species were not observed during plant surveys conducted in areas of suitable habitat during these species' flowering periods.

CEQA Conclusion

Construction and maintenance of Alternative 1 could result in a **significant** impact on special-status plant species or their habitat through the introduction or spread of invasive plant species. Under 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.

Mitigation Measure MM-TERR-1: Implement BMPs for the Management of Invasive Plants

The Project biologist shall monitor the Project site immediately prior to and during construction to identify the presence of invasive plants (those identified by Cal-IPC as having a moderate or high level of invasiveness or plants considered locally invasive) and recommend measures to avoid their inadvertent spread in association with construction and maintenance. The Project biologist shall prepare an invasive plant management plan based on the results of this field survey. The contractor shall be responsible for implementing the recommendations in the management plan. In addition, the contractor shall implement the following BMPs to prevent the introduction and spread of invasive plant species during construction and maintenance:

- All construction and maintenance equipment shall be washed and cleaned of debris prior to entering the Project area to prevent entry of new invasive plant species to the Project area.
- Straw bales and other vegetative materials used for erosion control shall be certified weed-free.
- All revegetation materials (e.g., seed mixes and mulches) shall consist of native plant species from the Yolo Bypass, certified weed-free, and all seeds and container plants shall be obtained from locally adapted genetic stock that is also free from fungal pathogens (*Phytopthora* spp.)

- In areas requiring weed control, effective methods for removal may vary depending on the species that is being controlled (typical methods include hand removal, mowing, or herbicide application). Herbicides shall be used consistent with Federal, State, and local requirements (including requirements or restrictions on the use of herbicides that are specified by resource agencies to prevent impacts to aquatic habitats, listed plant or wildlife species, or their habitat). All herbicides shall be used under the advisement of a certified Pesticide Control Advisor and shall be applied by an operator with a Qualified Applicator's License.
- Insecticides, herbicides, fertilizers, and other chemicals that could harm special-status plant species or plants that provide habitat for special-status wildlife species shall not be used within 100 feet of such species and shall not be used without prior approval from the Lead Agencies.
- Affected areas shall be replanted with native vegetation approved by the Lead Agencies.

Implementation of Mitigation Measure MM-TERR-1 would reduce construction and maintenance impacts on special-status plant species and suitable habitat to **less than significant**.

9.3.3.2.2 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 1, including construction, staging, and spoils areas, does not contain any elderberry shrubs, which are the host plant for the valley elderberry longhorn beetle (Table 9-7). The elderberry shrub mapped during 2014 surveys that is closest to Alternative 1 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 9-2a).

However, elderberry shrubs could have grown in the construction disturbance area since 2014 or could grow in that area prior to construction. If elderberry shrubs are found during pre-construction surveys, construction of Alternative 1 could result in direct effects on the valley elderberry longhorn beetle through removal of its host plant and surrounding habitat; however, impacts cannot be quantified at this time. In addition, construction of Alternative 1 could result in indirect effects on this species if construction activities indirectly affect elderberry shrubs such as from construction-generated dust, root damage, or soil compaction.

Table 9-7. Potential Construction Impacts to Known Suitable Valley Elderberry Longhorn Beetle Habitat by Alternative

Alternative	Temporary Impact (acres)	Permanent Impact (acres)	Total Impact (acres)
Alternative 1[1]	0.0	0.0	**0.0**
Alternative 2[2]	0.0	0.0	**0.0**
Alternative 3	1.3	1.8	**3.1**
Alternative 4	1.3	1.8	**3.1**
Alternative 5[2]	0.0	0.0	**0.0**
Alternative 6	1.2	2.7	**3.9**

[1] Impacts shown reflect known elderberry shrub occurrences based on 2014 surveys plus a 165-foot buffer surrounding each shrub.

[2] Impacts of Alternatives 2 and 5 cannot be quantified at this time because surveys did not include the entirety of the study area for these alternatives.

Ongoing maintenance activities could result in the removal of elderberry shrubs from the channels. Any constructed channels would require clearing of elderberry shrubs during the construction period, and any new elderberry shrubs that are not removed during maintenance activities before they reach the size of one inch in diameter at ground level (i.e., before they provide suitable habitat for valley elderberry longhorn beetle) could be removed during maintenance. Such maintenance-related effects on valley elderberry longhorn beetle would be considered significant.

The Lead Agencies do not expect operations to result in substantial adverse effects on valley elderberry longhorn beetle or its elderberry host plant because the limited increase in the average number of wet days under Alternative 1 is not likely to lead to a type conversion of habitat that would prevent the reproduction and growth of elderberry shrubs.

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 resulting from the construction of Alternative 1 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 1 is not likely to lead to a type conversion of habitat that would prevent reproduction and growth of elderberry shrubs.

Mitigation Measure MM-TERR-2: Designate a Project Biologist

Prior to the commencement of construction or ongoing maintenance activities, the Lead Agencies shall designate a Project biologist (a person with, at minimum, a bachelor's degree in biology, ecology, or environmental studies with familiarity with particular species with the potential to be impacted by the Project, including valley elderberry longhorn beetle, giant garter snake, western pond turtle, Swainson's Hawk, Least Bell's Vireo, Western Yellow-Billed Cuckoo, and Bank Swallow) who shall be responsible for overseeing compliance with protective measures for terrestrial biological resources during clearing and work activities within and adjacent to areas of sensitive vegetation communities. The Project biologist shall be familiar with the local vegetation communities, plants, and wildlife and shall maintain communications with the contractor to ensure that issues relating to biological resources are appropriately and lawfully managed. The Project biologist may designate qualified biologists or biological monitors to help oversee Project compliance or conduct focused surveys for special-status species. These biologists shall have familiarity with the species for which they would be conducting focused surveys or monitoring construction activities.

The Project biologist or qualified biologist shall review final plans, designate areas that need temporary fencing, and monitor construction activities within and adjacent to areas with native vegetation communities or special-status plant and animal species. The qualified biologist shall monitor activities within designated areas during critical times, such as vegetation removal,

initial ground-disturbing activities, and the installation of BMPs and fencing to protect native species, and shall ensure that all avoidance and minimization measures are properly constructed and followed. The qualified biologist shall check construction barriers or exclusion fencing and shall provide corrective measures to the contractor to ensure the barriers or fencing are maintained throughout construction. The qualified biologist shall have the authority to stop work if a special-status wildlife species is encountered within the Project area during construction. Construction activities shall cease until the Project or qualified biologist determine(s) that the animal will not be harmed or that it has left the construction area on its own. The appropriate regulatory agency(ies) shall be notified within 24 hours of sighting of a special-status wildlife species. The Project or qualified biologist shall conduct pre-maintenance surveys as needed in sensitive habitat areas or areas that could support special-status plant or animal species.

Mitigation Measure MM-TERR-3: Implement a Worker Environmental Awareness Program

Prior to the start of construction, all Project personnel and contractors who will be on site during construction shall complete mandatory worker environmental awareness program training conducted by the Project biologist or a designated qualified biologist. Any new Project personnel or contractors that come onboard after the initiation of construction shall also be required to complete the mandatory worker environmental awareness before they commence with work. The training shall advise workers of potential impacts to sensitive vegetation communities and special-status plant and wildlife species and the potential penalties for impacts to such habitat and species. At a minimum, the program shall include the following topics: occurrences of the special-status species and sensitive vegetation communities in the Project area (including communities subject to USACE and CDFW jurisdiction), a physical description, life history, habitat requirements, sensitivity to human activities, legal protection and penalties for violations of Federal and State laws, reporting requirements, work features designed to reduce the impacts, and general plant- and wildlife-protection measures. Construction personnel shall be informed of the procedures to follow should a Federally or State-listed species be encountered during construction. Special-status species that should be covered in the training include valley elderberry longhorn beetle, giant garter snake, western pond turtle, special-status birds (Tricolored Blackbird, Bank Swallow, Swainson's Hawk, Least Bell's Vireo, Western Yellow-billed Cuckoo), migratory birds, special status bats, and American badger. Sensitive vegetation communities that should be covered in the training include black willow thickets, box elder forest, California and hardstem bulrush marsh, Fremont cottonwood forest, mixed hardwood forest, sandbar willow thickets, and valley oak woodland.

Included in this program shall be color photos of the special-status species and sensitive vegetation communities, which shall be shown to Project personnel. Following the education program, the photos shall be posted in the contractor and resident engineer's office, where the photos shall remain through the duration of construction work. Photos of the habitat in which special-status species are found shall also be posted on site. The contractor shall be required to provide the Lead Agencies with evidence of the employee training (e.g., a sign-in sheet) on request. Project personnel and contractors shall be instructed to immediately notify the Project biologist or designated biologist of any incidents that could affect sensitive vegetation communities or special-status species. Incidents could include fuel leaks or injury to any wildlife. The Project biologist shall be responsible for notifying the appropriate regulatory agency within 72 hours of any similar incident.

Mitigation Measure MM-TERR-4: Implement General Wildlife Protection Measures

The construction contractor and maintenance personnel shall implement the following general wildlife-protection measures during construction and maintenance:

- Limit construction and maintenance activities to daylight hours to the extent feasible. If nighttime activities are unavoidable, then workers shall direct all lights for nighttime lighting into the work area and shall minimize the lighting of natural habitat areas adjacent to the work area. Light glare shields shall be used to reduce the extent of illumination into sensitive habitats. If the work area is located near surface waters, the lighting shall be shielded such that it does not shine directly into the water.
- Both prior to construction and maintenance, clearing of vegetation, in areas with suitable habitat for special-status bird species shall not be conducted during the nesting season (February 15 through August 31) to avoid impacts on nesting birds, as feasible. If vegetation must be cleared between February 15 and August 31, then pre-construction surveys shall be conducted per MM-TERR-16.
- Confine clearing to the minimal area necessary to facilitate construction and maintenance activities. Dispose of cleared vegetation and spoils daily at a permanent offsite spoils location or at a temporary onsite location that will not create habitat for special-status wildlife species. Spoils and dredged material shall be disposed of at an approved site or facility in accordance with all applicable Federal, State, and local regulations.
- Maintain equipment to comply with noise standards (e.g., exhaust mufflers, acoustically attenuating shields, shrouds, or enclosures).
- Avoid wildlife entrapment by completely covering or providing escape ramps for all excavated steep-walled holes or trenches more than 1 foot deep at the end of each construction work day. The qualified biologist shall inspect open trenches and holes and shall remove or release any trapped wildlife found in the trenches or holes prior to filling by the construction and maintenance contractors.
- Special-status wildlife can be attracted to den-like structures such as pipes and may enter stored pipes and become trapped or injured. All construction pipes, culverts, or similar features; construction equipment; or construction debris left overnight in areas that may be occupied by special-status species that could occupy such structures shall be inspected by a qualified biologist prior to being used for construction. Such inspections shall occur at the beginning of each day's activities for those materials to be used or moved that day. If necessary, and under the direct supervision of the biologist, the structure may be moved up to one time to isolate it from construction activities, until the special-status species has moved from the structure of their own volition, has been captured and relocated, or has otherwise been removed from the structure.
- Capture and relocation of trapped or injured wildlife listed under ESA or CESA can only be performed by personnel with appropriate state and/or federal permits. Any sightings and any incidental take shall be reported to the Lead Agencies via email within one working day of the discovery. A follow-up report shall be sent to these agencies, including dates, locations, habitat description, and any corrective measures taken to protect special-status species encountered. For each special-status species encountered, the biologist shall submit a

completed CNDDB field survey form (or equivalent) to the Lead Agencies no more than 90 days after completing the last field visit to the Project site.

- The Lead Agencies shall be notified within one working day of the discovery of, injury to, or mortality of a special-status species that results from Project-related construction activities or is observed at the Project site. Notification shall include the date, time, and location of the incident or of the discovery of an individual special-status species that is dead or injured. For a special-status species that is injured, general information on the type or extent of injury shall be included. The location of the incident shall be clearly indicated on a USGS 7.5-minute quadrangle and/or similar map at a scale that will allow others to find the location in the field, or as requested by the Lead Agencies. The biologist is encouraged to include any other pertinent information in the notification.
- Minimize the spread of dust from work sites to sensitive natural communities or sensitive species habitats on adjacent lands by use of a water truck.
- Prior to the start of construction and maintenance activities each day, the Project biologist or designated biologist shall inspect the work area and any equipment or material left on site overnight for special-status wildlife species.
- Observe posted speed limit signs on local roads and observe a 15-mile-per-hour speed limit along ingress and egress routes. Extra caution shall be used on cool days when giant garter snakes may be basking on roads.
- Dispose of food-related and other garbage in wildlife-proof containers and remove the garbage from the Project area daily during the construction and maintenance periods. Vehicles carrying trash will be required to have loads covered and secured to prevent trash and debris from falling onto roads and adjacent properties.
- To avoid injury or death to wildlife, no firearms will be allowed on the Project site except for those carried by authorized security personnel or local, State, or Federal law enforcement officials.
- To prevent harassment, injury, or mortality of sensitive wildlife by dogs or cats, no canine or feline pets will be permitted in the active construction area.
- Plastic monofilament netting or similar material will not be used for erosion control because smaller wildlife may become entangled or trapped in it. Acceptable substitutes include coconut coir matting or tackifier hydroseeding compounds. This limitation shall be communicated to the contractor through specifications or special provisions included in the construction bid solicitation package.
- Rodenticides and herbicides shall be used in accordance with the manufacturer recommended uses and applications and in such a manner as to prevent primary or secondary poisoning of special-status fish, wildlife, and plant species and depletion of prey populations upon which they depend. All uses of such compounds shall observe label and other restrictions mandated by the USEPA, the California Department of Pesticide Regulation, and other appropriate State and Federal regulations, as well as additional Project-related restrictions imposed by the Lead Agencies.

- Retain a qualified biologist to be present or on call during construction and maintenance activities with the potential to affect sensitive biological resources. The qualified biologist shall conduct monitoring per MM-TERR-2.

Mitigation Measure MM-TERR-5: Establish Project Limits

All native or sensitive habitat areas outside of and adjacent to the designated Project limits of disturbance shall be designated as Environmentally Sensitive Areas on Project maps. Prior to construction, the Lead Agencies shall delineate the Project limits, including construction, staging, lay-down, and equipment storage areas, and erect the construction boundary, with fencing or flagging, along the perimeter of the identified construction area to protect adjacent sensitive habitats and sensitive plant populations. Environmentally Sensitive Areas shall be clearly delineated with fencing or flagging or other BMPs prior to construction to inform construction personnel where the Environmentally Sensitive Areas are located. The fences and flags shall be marked clearly in the field and confirmed by the Project biologist prior to any clearing, and the marked boundaries shall be maintained throughout the duration of construction work. No personnel, equipment, or debris shall be allowed within the Environmentally Sensitive Areas. Fences and flags shall be installed by the contractor in a manner that does not impact habitats to be avoided and such that it is clearly visible to personnel on foot and operating heavy equipment. Ten days prior to initiating construction, the contractor shall submit to Lead Agencies final plans for initial clearing and grubbing of habitat and Project construction. Temporary construction fences and markers shall be maintained in good repair by the contractor and shall be removed upon completion of Project construction.

No work activities, materials, or equipment storage or access shall be permitted outside the Project limits without permission from the Lead Agencies. All parking and equipment storage by the contractor related to the Project shall be confined to the Project limits. Undisturbed areas and sensitive habitat outside and adjacent to the Project limits shall not be used for parking or equipment storage. Project-related vehicle traffic shall be restricted to the Project limits and established roads and construction access points.

Mitigation Measure MM-TERR-6: Designate Construction Staging and Vehicle Use Requirements

All construction-related vehicles and equipment storage shall occur in the designated staging areas. These areas shall not contain native or sensitive vegetation communities and shall not support sensitive plant or wildlife species. Project-related vehicle traffic shall be restricted to established roads and the Project disturbance limits as described above and all motor vehicles operating within the Project limits shall observe a speed limit of 15 miles per hour to avoid striking giant garter snake or other special-status wildlife species. Dirt access roads, haul roads, and spoils areas shall be watered at least twice each day when being used during construction dry periods.

Mitigation Measure MM-TERR-7: Conduct Valley Elderberry Longhorn Beetle Habitat Surveys Prior to Construction and Maintenance

Prior to the start of construction activities, valley elderberry longhorn beetle habitat surveys shall be conducted by a qualified biologist that has been approved by the Lead Agencies in the Project

construction area and within 165 feet of the Project construction area. All elderberry shrubs with stems one inch or greater in diameter at ground level shall be recorded, tallied by diameter size class, and designated as to whether the elderberry shrub is in a riparian or non-riparian area. Exit hole surveys are not essential in riparian areas but shall be conducted in non-riparian areas. Elderberry shrubs shall be marked with flags for avoidance during construction, if feasible.

Prior to conducting maintenance activities, a qualified biologist shall determine if any elderberry shrubs that are one inch or greater at ground level are present within the maintenance area. If elderberry shrubs smaller than that size are present, they shall be removed or transplanted to an approved off-site mitigation area. If elderberry shrubs one-inch or greater at ground level are present, then the Lead Agencies shall consult with USFWS in accordance with MM-TERR-9 and MM-TERR-10.

Mitigation Measure MM-TERR-8: Establish and Maintain a Buffer Zone for Elderberry Shrubs

Elderberry shrubs mapped during pre-construction surveys shall be avoided to the extent practicable during construction activities. For all elderberry shrubs identified for avoidance, an avoidance buffer of 165 feet or more shall be established prior to construction activities. The avoidance buffer shall consist of a physical barrier, such as flags, exclusion fences, or K-Rail barriers, and shall be maintained for the duration of Project construction. The following protective measures shall be taken to ensure that elderberry shrubs in the buffer zone are not impacted:

- Prior to construction, all buffer areas surrounding elderberry shrubs to be avoided shall be fenced and/or flagged as close to the construction limits as feasible. In areas where encroachment of the 165-foot buffer has been approved by USFWS, a minimum setback of at least 20 feet from the drip-line of each elderberry shrub shall be provided to avoid damaging or killing the plant. A 20-foot avoidance buffer shall be established around all elderberry shrubs with stems one inch or greater in diameter at ground level during maintenance. These areas shall be avoided by all maintenance personnel and maintenance activities. Mowing shall not occur within five feet of any elderberry stem one inch or greater in diameter at ground level. Vegetation within five feet of any elderberry stem one inch or greater in diameter at ground level shall be removed by hand only.
- The contractor and all Project personnel and contractors that will be on site during construction shall be briefed regarding the status of the beetle and the need to protect its elderberry host plant, the need to avoid damaging elderberry shrubs and possible penalties for noncompliance with these requirements.
- To the extent feasible, all activities within 165 feet of an elderberry shrub shall be conducted outside of the valley elderberry longhorn beetle flight season (March-July).
- Signs shall be erected every 50 feet along the edge of the avoidance area with the following information: “This area is habitat of the valley elderberry longhorn beetle, a threatened species, and must not be disturbed. This species is protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment.” The signs shall be clearly readable from 20 feet and must be maintained for the duration of Project construction.

- If there is damage within the 165-foot buffer areas, erosion control measures and revegetation with appropriate native plant species shall be conducted with approval from USFWS.
- No insecticides, herbicides, fertilizers, or other chemicals that might harm the beetle or its elderberry host plant shall be used in the 165-foot buffer areas.
- The Lead Agencies shall provide a written description to USFWS regarding how the buffer areas are to be restored, protected, and maintained after construction is completed.

Mitigation Measure MM-TERR-9: Consult with USFWS Prior to Any Ground Disturbance within 165 Feet of Elderberry Shrubs

The Lead Agencies shall consult with USFWS prior to any ground disturbance within 165 feet of an elderberry shrub. In areas where encroachment into the 165-foot buffer zone is necessary, a minimum setback of at least 20 feet from the drip-line of the elderberry shrub shall be established per MM-TERR-8. The Lead Agencies shall provide USFWS with a map identifying the avoidance area and a list of proposed avoidance measures.

Mitigation Measure MM-TERR-10: Mitigate for Elderberry Shrubs That Cannot Be Avoided

The Lead Agencies shall identify measures to relocate (transplant) or replace elderberry shrubs with stems measuring one inch or greater in diameter at ground level if an adequate buffer cannot be provided, if trimming is required, if a shrub cannot be avoided during construction and must be removed, or if indirect effects will result in the death of stems or the entire shrub. The Lead Agencies shall prepare a mitigation plan for impacts to elderberry shrubs. This plan shall include transplantation procedures that comply with USFWS's *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle* (*Desmocerus californicus dimorphus*) (USFWS 2017). These procedures include requirements for a qualified biologist to perform exit-hole surveys prior to transplanting and to monitor elderberry shrub transplantation, information on timing of transplantation during the non-growing season (approximately November through mid-February), the need for compliance with the most current version of the American National Standards Institute A300 (Part 6) guidelines for transplanting (http://www.tcia.org/), and specific methods to follow during transplantation, including how far to cut back stems, how large a hole to excavate, and proper planting and watering techniques to minimize stress and maximize transplantation survival.

For unavoidable adverse impacts to valley elderberry longhorn beetle or its habitat, compensatory mitigation will be coordinated with USFWS. General guidelines require transplanting elderberry shrubs to designated mitigation areas at a mitigation ratio determined during consultation with USFWS (typically a minimum of 3:1 for acres of suitable riparian habitat that would be permanently impacted and a minimum of 1:1 for acres of occupied elderberry shrubs in non-riparian habitat). In addition, two credits at a USFWS-approved bank shall be purchased for each impacted shrub in riparian areas, and one credit shall be purchased for each impacted shrub in non-riparian areas. Associated native plant species might need to be planted to provide a more diverse native vegetation community at a mitigation ratio determined during consultation with USFWS. Planted and seeded areas might be subject to monitoring and performance standards. Alternatively, mitigation credits might be purchased from an approved

mitigation bank. The mitigation plan must be approved by USFWS during formal consultation and could include, but would not necessarily be limited to, identified locations for transplanted or replacement elderberry shrubs, appropriate replacement ratios, and success standards, monitoring, and reporting requirements (per USFWS 2017 guidelines). Consultation with USFWS shall be completed prior to removal, trimming, or thinning of any elderberry shrubs.

Mitigation Measure MM-TERR-11: Prepare and Implement a Compensatory Restoration Plan for Sensitive Vegetation Communities

Impacts to sensitive vegetation communities shall be mitigated through the establishment, enhancement, or preservation of habitat either in the FWWA or in the Yolo Bypass at a minimum 1:1 ratio based on either acreage or habitat function (riparian communities will be mitigated at a 3:1 ratio). Sensitive vegetation communities include habitats with potential to support Federally and/or State threatened or endangered species, USACE wetlands, and CDFW riparian areas (open water, temperate freshwater floating mat, water primrose wetlands, California and hardstem bulrush marsh, black willow thickets, box elder forest, Fremont cottonwood forest, mixed hardwood forest, and valley oak woodland). Final mitigation ratios will be determined in consultation with each relevant regulatory agency. USACE wetland habitat and valley oak woodland will require a minimum of 1:1 establishment or substantial restoration to comply with Federal wetland policy and local oak woodland policy. Establishment and enhancement will be provided on site where feasible. If sufficient suitable area is not available near the Project impact area, then offsite mitigation options will be pursued. Offsite options may include in-lieu fee payments or purchase of mitigation credits at a mitigation bank approved by the Lead Agencies, as applicable. A restoration plan shall be prepared for mitigation and onsite restoration of temporary impacts, including detailing of topsoil stockpiling for areas with native vegetation and/or seeds of special-status plants, as feasible. These plans will detail the communities to be restored, locations for restoration, container plant palettes and/or seed mixes, and maintenance and monitoring requirements. Seed mixes shall consist of plant species native to the Project area and shall be free from noxious weed species.

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

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

Construction of Alternative 1 would result in direct and indirect effects on suitable giant garter snake habitat (all suitable aquatic habitat and suitable upland habitat within 200 feet of aquatic habitat). Direct effects could occur through injury, mortality, or disturbance resulting from grading activities, vehicle strikes, or fuel or oil spills from construction equipment in aquatic areas (freshwater emergent aquatic and freshwater emergent marsh) associated with Tule Pond and Agricultural Road Crossing 1 as well as in adjacent upland habitat. Indirect effects could occur through noise and vibration from construction equipment or disturbance due to the presence of human activity.

Construction activities for Alternative 1 are proposed to occur over one season between April 15 and November 1. The active season for giant garter snakes is May 1 to October 1. Beginning

construction during the dormant period would increase the risk of direct mortality, although construction during the two-week period (April 15 to May 1) will be restricted, to the extent feasible, to areas that are not within suitable habitat for giant garter snake, thereby minimizing the potential for impacts to this species. The potential for direct mortality during the active season is lower than during the dormant period because snakes are underground less and may be able to move to avoid danger. Although construction activities would extend past October 1 (the end of the active season), continuous construction throughout the active season likely would deter giant garter snakes from the Project area and, therefore, reduce the likelihood of them using the area during the dormant period (USFWS 1997). Extending the construction period to November 1 should allow the alternative to be completed in a single year, thereby reducing potential impacts that would result from multi-year construction.

Temporary construction effects on giant garter snake aquatic habitat would result from earth removal associated with grading and general activities in the temporary construction area along Tule Pond and at Agricultural Road Crossing 1, including removing the cross canal earthen berm, construction of a bridge at the existing Agricultural Road Crossing 1, and construction of a new berm to the west of the top of Tule Canal with an inverted siphon beneath the new Tule Canal connection. Construction of Alternative 1 would temporarily affect 3.9 acres of suitable giant garter snake aquatic habitat (Table 9-8). This assessment was based on temporary construction impacts to all freshwater emergent aquatic and freshwater emergent marsh habitat. A detailed assessment during final plan review would include review of these areas for suitability as giant garter snake habitat and a removal of those areas that are deemed to not be suitable from the impact assessment; the effects on giant garter snake aquatic habitat are, therefore, expected to be less than what is disclosed in Table 9-8.

Permanent construction effects on giant garter snake aquatic habitat would result from the placement of engineered streambed material (rock slope protection and riprap) along the outlet channel. This would permanently alter the substrate of 11.8 acres of giant garter snake aquatic habitat, which would substantially reduce the quality of habitat for use by giant garter snakes (USFWS 2016b).

Table 9-8. Potential Construction Impacts to Suitable Giant Garter Snake Aquatic and Upland Habitat by Alternative[1]

Alternative	Habitat	Temporary Impact (acres)	Permanent Impact (acres)	Total Impact (acres)
Alternative 1	Aquatic	3.9	11.8	**15.7**
	Upland	20.5	21.4	**41.9**
Alternative 2	Aquatic	2.6	13.3	**15.9**
	Upland	12.7	11.9	**24.6**
Alternative 3	Aquatic	3.2	14.1	**17.3**
	Upland	15.9	15.7	**31.6**
Alternative 4	Aquatic	44.9	47.4	**92.3**
	Upland	71.7	43.7	**115.4**
Alternative 5	Aquatic	0.6	7.5	**8.1**
	Upland	0.6	8.6	**9.2**

Alternative	Habitat	Temporary Impact (acres)	Permanent Impact (acres)	Total Impact (acres)
Alternative 6	Aquatic	3.0	12.3	**15.3**
	Upland	17.1	16.5	**33.6**

[1] The permanent acreages in this table include giant garter snake habitat impacted at Tule Pond but do not account for the partial draining of Tule Pond, which is considered a construction impact for all alternatives except Alternative 5.

Temporary construction effects on suitable giant garter snake upland habitat would result from construction activities associated with vegetation removal. Vegetation and soils that are removed will be transported daily either to a temporary spoils site outside of giant garter snake upland habitat or to a permanent spoils site to prevent the creation of potential giant garter snake habitat in spoils piles. Construction of Alternative 1 would result in temporary disturbance to 20.5 acres of giant garter snake upland habitat. Placing rounded rock revetment on the channel bottom and angular rock on the bank slopes of the transport channel and at Agricultural Road Crossing 1 would permanently alter the substrate of 21.4 acres of giant garter snake upland habitat. Non-woody grasses and herbaceous vegetation would be allowed to re-colonize the area, and the rock-lined banks areas would still provide limited habitat value such as basking sites and refugia during colder months or during extreme heat. Although the altered habitat would represent a small portion of available upland habitat in the alternative's vicinity and upland areas would continue to provide limited habitat value for giant garter snakes, Alternative 1 would result in a net reduction in habitat quality and suitability for giant garter snakes.

Construction of Alternative 1 would partially drain Tule Pond, reducing the amount of giant garter snake aquatic habitat associated with Tule Pond as well as adjacent upland habitat out to 200 feet. This would be considered a permanent reduction in the availability of suitable giant garter snake aquatic and upland habitat that would be consistent across all alternatives except Alternative 5 and would be subject to additional compensation or mitigation separate from the impacts shown in Table 9-8, although some of this area is already accounted for in Table 9-8 as construction impacts resulting from grading.

During operations, changes in the duration of inundation under Alternative 1 would occur during the giant garter snake inactive period (October 1 to May 1) when these animals would be dormant in upland burrows. Although inundation of some occupied burrows located below the elevation of the floodwaters may result in the loss of giant garter snake individuals, these losses are not anticipated to be substantially greater than would occur under existing conditions in an environment that is subject to annual flooding. Direct or indirect adverse effects on giant garter snakes resulting from operations would be considered less than significant.

It is anticipated that ongoing maintenance activities would include the removal of debris, vegetation, and sediment along the Project channels and at Agricultural Road Crossing 1 to maintain fish passage. These activities would be conducted outside the flood season during the giant garter snake active season when snakes are better able to move out of harm's way and less subject to injury if present.

In summary, construction- and maintenance-related effects on giant garter snakes could result in the mortality or injury of individuals and a reduction in the quantity and quality of habitat available in the study area.

CEQA Conclusion

Direct or indirect impacts to giant garter snake resulting from the construction and maintenance of Alternative 1 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. Operations impacts would be **less than significant** because the limited increase in the average number of wet days under Alternative 1 is not likely to result in substantially greater mortality to giant garter snakes that are dormant in upland burrows than under existing conditions.

Mitigation Measure MM-TERR-12: Implement Giant Garter Snake Avoidance and Minimization Measures

The following measures shall be implemented to avoid or minimize impacts to giant garter snake and its aquatic and upland habitats:

- A qualified giant garter snake biologist approved by the Lead Agencies shall be present to monitor construction and maintenance activities in or within 200 feet of suitable giant garter snake aquatic or upland habitat. The qualified biologist shall be present during vegetation removal in giant garter snake habitat and shall walk ahead of the removal of emergent wetland and herbaceous upland vegetation.
- Disturbance to suitable aquatic and upland sites in or near the Project footprint shall be avoided to the extent feasible, and the loss of aquatic habitat and grassland vegetation shall be minimized through adjustments to Project design, as practicable.
- The qualified biologist shall conduct pre-construction surveys in suitable giant garter snake habitat for a period of three days prior to the installation of all Stormwater Pollution and Prevention Plan BMPs, vegetation clearing within or adjacent to aquatic habitat, and the establishment of staging areas within 200 feet of aquatic habitat. Within the Project footprint where burrows are present in upland habitat within 200 feet of suitable aquatic habitat, all burrows shall be avoided until the qualified biologist has conducted burrow monitoring for a period of three days and cleared the area. To the extent practicable, construction activities shall be avoided within 200 feet of the banks of giant garter snake aquatic habitat. Ground disturbance shall be confined to the minimal area necessary to facilitate construction activities. To the maximum extent feasible, movement of heavy equipment shall be confined to existing roads.
- The qualified biologist shall conduct giant garter snake surveys if construction activities stop for a period of two weeks or more.
- To the extent practicable, all construction activity in suitable giant garter snake habitat shall be conducted during the giant garter snake active period (May 1 to October 1) to lessen the risk of direct mortality. Only construction or maintenance activities within 200 feet of suitable giant garter snake habitat that have started prior to October 1 shall continue outside the active season, with Lead Agency approval. No new construction or maintenance work activities within 200 feet of suitable giant garter snake habitat shall be started after October 1.
- Prior to the start of construction activities and during the active period for giant garter snakes (beginning May 1), the qualified biologist shall determine where exclusion fencing will be

installed to protect giant garter snake habitat adjacent to the defined Project footprint and minimize the potential for giant garter snakes to enter the construction work area. The construction contractor shall install exclusion fences along the edges of construction areas that are within 200 feet of suitable giant garter snake aquatic habitat. Avoided habitat shall be designated as Environmentally Sensitive Areas on final construction plans. The exclusion fencing shall consist of a material that snakes cannot get through or become entangled in. The exclusion fence shall be buried at least six inches below ground to prevent animals from entering below the fence, with at least 20 inches exposed above ground. The fence shall be inspected daily prior to Project activity for maintenance and shall remain in place throughout the construction period. Maintenance shall include removal of vegetation and debris material that can be used to traverse the fence, patching any holes within the fence, ensuring the fence is intact and upright, and filling new burrows that go under the fence once a qualified biologist has inspected such burrows to ensure no special-status wildlife species are occupying them. Any necessary repairs shall be immediately addressed. If work extends beyond October 1, the exclusion fencing shall be maintained to prevent giant garter snakes from entering the construction limits and utilizing upland areas for overwintering.

- If exclusion fencing is found to be compromised, the qualified biologist shall conduct a survey immediately preceding construction activity that occurs in designated giant garter snake habitat or in advance of any activity that may result in take of the species. The biologist shall search along exclusion fences and in pipes and beneath vehicles before they are moved.
- If a giant garter snake is observed in the construction area, all construction activities shall cease and a qualified biologist shall be notified immediately. If possible, the snake should be allowed to leave on its own and activities shall not resume until the snake has moved out of the area on its own. Alternatively, the qualified biologist may capture and relocate the snake unharmed to suitable aquatic habitat a minimum of 200 feet outside of the work area in a location that is identified by the qualified biologist prior to commencement of construction. If the snake does not leave on its own and cannot be relocated unharmed, construction activities within 200 feet of the snake shall stop to prevent harm to the snake. The Lead Agencies shall be notified by telephone or email within 24 hours of a giant garter snake observation during construction activities.
- A qualified biologist shall be available on an on-call basis during maintenance activities with the potential to affect giant garter snake. If needed, a qualified biologist shall be maintained on site during maintenance activities to ensure protection of giant garter snake. The biologist shall have the authority to stop work if a giant garter snake is encountered within the maintenance area. If a giant garter snake is observed in the maintenance area, all activities within 200 feet of the snake will stop to prevent harm to the snake.
- After April 15, any dewatered habitat shall be allowed to dry (no standing water) for at least 15 consecutive days prior to excavating or filling of the dewatered habitat.

Mitigation Measure MM-TERR-13: Restore Temporarily Disturbed Giant Garter Snake Aquatic and Upland Habitat

After completion of construction activities, the construction contractor shall remove any temporary fill, construction debris, and stockpiled materials. Giant garter snake aquatic and

upland habitat subject to temporary disturbance shall be recontoured to pre-Project conditions as feasible, upland areas (grassland, riparian scrub, riparian forest, and riparian woodland) shall be reseeded with native seed mixes and/or container plant palettes approved by the Lead Agencies, and aquatic vegetation shall be allowed to recolonize. This restoration effort will require maintenance, monitoring, and achievement of success criteria per MM-TERR-11.

Mitigation Measure MM-TERR-14: Compensate for the Loss of Giant Garter Snake Aquatic and Upland Habitat

The permanent loss of giant garter snake aquatic and upland habitat resulting from Project construction shall be compensated for through a combination of onsite and/or offsite restoration, enhancement, and/or purchase of mitigation credits at a conservation bank approved by the Lead Agencies. A qualified biologist familiar with giant garter snake and its habitat and that has been approved by the Lead Agencies shall conduct focused habitat assessment surveys in the Project area when final plans and specifications have been completed for the selected alternative. The biologist shall conduct an assessment of the suitability of the habitat to support giant garter snake, including an evaluation of habitat suitability for burrows and foraging. The functions and values of the affected area shall also be evaluated to establish appropriate performance standards for the mitigation site, which shall be documented in a final habitat mitigation plan.

Implementation of Mitigation Measures MM-TERR-2 through MM-TERR-6, MM-TERR-11 through MM-TERR-14, MM-WQ-1 (*Implement a spill prevention, control, and countermeasure plan*), and MM-WQ-2 (*Implement a stormwater pollution and prevention plan*) (See Chapter 6, *Water Quality*) would reduce the impacts of Project construction and maintenance on giant garter snake and suitable habitat to **less than significant.**

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

Construction of Alternative 1 would result in direct and indirect effects on suitable western pond turtle aquatic habitat (marshes, ditches, and canals) and upland habitat (woodlands, forests, or grasslands) at Tule Pond and the southern portion of the common downstream element at the southeastern corner of the FWWA. One western pond turtle was observed outside the study area along the old river oxbow during the habitat assessment conducted in 2014 and 2015 (Figure 9-1). However, focused surveys have not been conducted in the study area for this species, which is known to occur in the FWWA (DWR 2015b) and assumed to be present in areas with ponding water in the study area.

Construction-related direct effects on western pond turtle could include disturbance, removal of suitable or occupied aquatic or upland habitat, vehicle strikes, or destruction of active pond turtle nests. Temporary effects on 3.0 acres of suitable western pond turtle aquatic habitat would result from grading associated with Project construction and regrading for channel improvements at Agricultural Road Crossing 1.

Temporary effects on 25.0 acres of suitable western pond turtle upland habitat would result from constructing staging areas and access routes, establishing borrow and spoil sites, modifying channels, modifying existing structures at Fremont Weir, removing the cross canal earthen berm, construction of a bridge at the existing Agricultural Road Crossing 1, and construction of a new

berm to the west of the top of Tule Canal with an inverted siphon beneath the new Tule Canal connection.

The placement of engineered streambed material (rock slope protection and riprap) along the outlet channel and the placement of rounded rock revetment on the transport channel bottom and angular rock on the transport channel bank slopes would permanently alter the substrate of 8.7 acres of suitable aquatic habitat and 35.3 acres of suitable upland habitat and habitat available for nesting along the transport channel. The removal of emergent woody debris would result in a temporal loss of basking sites before mats of floating vegetation and substrates suitable for basking such as partially submerged logs, rocks, and mud accumulate. In addition, non-woody grasses and herbaceous vegetation would be allowed to re-colonize the area, and upland areas would still provide habitat value.

Construction of Alternative 1 would partially drain Tule Pond. This would be considered a permanent reduction in the availability of suitable western pond turtle aquatic habitat that would be consistent across all alternatives except for Alternative 5 and would be subject to additional compensation/mitigation separate from the impacts shown in Table 9-6.

During operations, Alternative 1 is expected to result in conditions that are within the current range of natural variability of suitability of western pond turtle habitat in terms of inter-annual fluctuations in the duration and frequency of inundation in the Yolo Bypass. Therefore, no impacts would result from operations.

Ongoing maintenance activities are expected to include the removal of debris, vegetation, and sediment along the transport channel and at Agricultural Road Crossing 1 to maintain fish passage. These activities, in addition to vehicle strikes or nest destruction, could injure western pond turtles if they are present during maintenance. These impacts would be considered significant.

CEQA Conclusion

Direct and indirect impacts to western pond turtle resulting from the construction and maintenance of Alternative 1 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.**

Mitigation Measure MM-TERR-15: Conduct Surveys for Western Pond Turtle prior to Construction and Maintenance Activities

A qualified biologist shall conduct surveys for western pond turtle in suitable upland and aquatic habitat within 48 hours prior to the start of construction or maintenance activities. If there is a lapse in construction or maintenance activities of two weeks or more, the area shall be resurveyed within 24 hours prior to the recommencement of work. If western pond turtles are observed in the Project area during construction, construction activities in the vicinity shall cease until protective measures are implemented or a qualified biologist has determined that western pond turtles will not be harmed. A qualified biologist may move the western pond turtle(s) to a suitable location outside of the Project footprint. The Lead Agencies shall be notified if any western pond turtles are relocated. If western pond turtles are observed in the Project area during maintenance, activities shall be postponed until the turtles have left the work area on their own

accord or until a qualified biologist has relocated it to a suitable location outside the work area or determined the turtle will not be disturbed by maintenance activities.

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 on western pond turtle and suitable habitat to **less than significant**.

9.3.3.2.5 Impact TERR-5: Potential Disturbance or Mortality of Nesting Bird Species and Loss of Suitable Nesting and Foraging Habitat[10]

Implementation of Alternative 1 would result in direct and indirect construction effects 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 and pursuant to Fish and Game Code Section 3503.5 (see Appendix H4 for additional information on occurrences within the Yolo Bypass). Suitable nesting and foraging habitat for these birds includes grasslands, freshwater marsh, Fremont cottonwood forest, valley oak woodland, black willow thickets, open water, and agricultural fields. Construction in suitable nesting and foraging habitat during the nesting season could result in direct and indirect effects on State- and/or Federally listed bird species, special-status migratory birds, shorebirds, and raptors. Direct construction effects on nesting birds could include bird mortality or injury and grading of their nesting and foraging habitat. Indirect effects on nesting birds could result from disturbance from construction equipment, including exposure to noise from pile driving or other construction activities, vibration, and dust, which could lead to nest abandonment or failure.

White-Tailed Kite is the only CDFW fully protected species that is a potential breeder in the FWWA. It typically nests near the tops of dense oak, willow, or other trees 20 to 100 feet above ground (CDFW 2005). Because it is fully protected, construction activities that could result in the direct mortality of this species are prohibited. Avoidance of White-Tailed Kites during their nesting season (approximately February through September, with peak from May through July) is required.

The Lead Agencies anticipate construction activities for Alternative 1 to occur over one season (between April 15 and November 1), which would overlap with the nesting season for Swainson's Hawk (late March to August), Least Bell's Vireo (March 15 to August 31), Western Yellow-Billed Cuckoo (mid-June through August), Bank Swallow (early May to July), and many of the other special-status bird species. Construction and maintenance activities in and adjacent to suitable nesting and foraging habitat during the nesting season could result in direct and indirect effects on these species if they are present. These activities could result in the destruction of nests and eggs, mortality of nestlings, or nest abandonment. These potential impacts to nesting bird species would be significant.

Construction effects would include temporary impacts to 29.2 acres of suitable nesting and foraging habitat and permanent impacts to 47.5 acres of suitable nesting and foraging habitat for

[10] The Biological Assessment team will coordinate with agencies regarding how to balance potential avoidance measures for birds with those for giant garter snake as they relate to clearing vegetation (timing). It may be possible to allow vegetation clearing prior to bird nesting season while still being sensitive to concerns regarding giant garter snake during their inactive period.

these species (Table 9-6). 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 nesting birds.

Alternative 1 would have the lowest construction impacts to suitable nesting and foraging habitat for special-status bird species of all the Project alternatives.

Under Alternative 1, the Lead Agencies do not expect operations to result in adverse effects on suitable nesting habitat for special-status bird species because operations would extend the duration of inundation only between November and March, which is outside of the nesting season. Operational effects on foraging habitat may vary by species based on the effects of inundation on their prey. The small expected change in average number of wet days under Alternative 1 may reduce foraging habitat for some species, particularly in the eastern part of the Yolo Bypass; however, the effects on foraging habitat are not expected to be substantial. Ongoing maintenance activities could result in direct disturbance to nesting birds through vegetation removal if such activities were to occur during the nesting season.

CEQA Conclusion

Direct and indirect impacts on nesting bird species resulting from the construction and maintenance of Alternative 1 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**.

Mitigation Measure MM-TERR-16: Conduct Surveys Prior to Construction and Maintenance Activities for Nesting Birds, Establish Nest Buffers, and Monitor Active Nests

Preconstruction nesting bird surveys shall be conducted by a qualified avian biologist within 14 days prior to construction or maintenance activities in all suitable nesting habitats in the Project area if such activities will take place between February 1 and September 30. Nesting surveys shall be conducted in accordance with the recommended timing, methodology, and or/protocol for each Federally and/or State-listed bird species. A qualified biologist that has been approved by the Lead Agencies shall conduct passive surveys within 500 feet of proposed construction activities to determine the presence of Western Yellow-Billed Cuckoo, Least Bell's Vireo, Bank Swallow, and other nesting birds protected by the Migratory Bird Treaty Act or pursuant to Fish and Game Code Section 3503.5 during the nesting season. Surveys shall also include a 0.5-mile radius outside the Project area for Swainson's Hawk. If there is a break in construction of one week or more, surveys shall be conducted prior to the re-initiation of construction.

Nesting birds and offspring shall not be disturbed or killed, and nests and eggs shall not be destroyed. If nesting birds are found, the qualified avian biologist shall establish suitable buffers (no less than 500 feet from an active raptor nest or nest of a Federally or State-listed species and no less than 300 feet from other active special-status bird nests) prior to construction or maintenance activities to minimize indirect impacts. To prevent encroachment, the established buffer(s) shall be clearly marked by high visibility material. The precise buffer distance shall be determined based on the species, type of construction activities, and line of sight to the work area. No work shall be conducted within the buffer. The established buffer(s) shall remain in

effect until the young have fledged and are independent or the nest has been abandoned as confirmed by the qualified avian biologist. If non-listed special-status birds are showing signs of agitation within the established buffer(s) due to noise or other effects, the buffer(s) shall be expanded to prevent birds from abandoning their nest. The biologist shall have the authority to halt work if there are any signs of distress or disturbance that may lead to nest abandonment. Work will not resume until corrective measures have been taken or it is determined that continued activity would not adversely affect nest success. No construction or maintenance activities, including tree removal, shall occur in the buffer zone until the young have fledged or the nest is no longer active, as confirmed by the qualified biologist.

If active Western Yellow-billed Cuckoo or Least Bell's Vireo nests are identified within 500 feet of noise-generating construction or maintenance activities and noise is in excess of 60 dBA (decibel A weighted) hourly Leq (equivalent continuous noise level), or if noise is in excess of ambient noise levels if ambient noise levels exceed 60 dBA hourly Leq, measures will be implemented to reduce noise levels to 60 dBA hourly Leq or to ambient noise levels if ambient noise levels exceed 60 dBA hourly Leq at the nest location. Noise monitoring shall occur during the breeding season and shall be reported daily to the USFWS. A qualified biologist shall ensure that avoidance and minimization measures are implemented such that adverse effects to Western Yellow-billed Cuckoo and Least Bell's Vireo do not occur because of the adjacent construction activities (e.g., noise and lighting). If the qualified biologist suspects that avoidance and minimization measures are ineffective and Project activities may adversely affect Western Yellow-billed Cuckoo or Least Bell's Vireo, culpable activities will be suspended within 500 feet of active nesting territories until nesting activity is completed and fledglings are no longer in the area or until effective avoidance and minimization measures can be identified, implemented, and demonstrated to be effective. If measures cannot be identified, implemented, and demonstrated to be effective to avoid adverse effects to these species, then Project construction shall stop until consultation with the USFWS to address unanticipated impacts to these species has been completed.

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

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

Construction of Alternative 1 would result in direct and indirect effects on suitable habitat for special-status tree-roosting bats, including pallid bats and western red bats (See Appendix H4 for more detailed information for these species). Bats can occupy trees year-round and are particularly susceptible to disturbance during the maternity season and during hibernation. They roost in riparian trees and forage in adjacent riparian, grassland, and open water habitats. The FWWA is known to include highly suitable roosting habitat for these species. Construction activities are proposed to occur in these areas between April 15 and November 1, a timeframe that would overlap with the bat maternity season (generally April 15 to August 31). Tree removal could directly affect breeding and nonbreeding bats because of the loss of established roosts and potential roosting habitat. Indirect effects on breeding and nonbreeding bats could result from general disturbance, including exposure to noise, vibration, and dust.

Construction effects would include temporary impacts to 7.1 acres of suitable riparian habitat and 18.2 acres of suitable grassland and open-water roosting 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 tree-roosting bats. In addition, construction effects would include permanent loss of 16.0 acres of suitable riparian habitat and conversion of 19.7 acres of suitable grassland and open-water foraging habitat to primarily open-water habitat that is still suitable for foraging. Alternative 1 would have the lowest construction impacts to suitable foraging habitat for special-status bat species of all the Project alternatives.

Under Alternative 1, ongoing maintenance activities involving tree removal could result in disturbance to tree-roosting bats if such activities were to occur during the maternity season. The Lead Agencies do not expect operations to result in adverse effects on tree-roosting bats as the extent of riparian areas would not be reduced by operations.

CEQA Conclusion

Direct and indirect impacts to special-status tree-roosting bats, including pallid bats and western red bats, resulting from the construction and maintenance of Alternative 1 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**.

Mitigation Measure MM-TERR-17: Conduct Surveys for Special-Status Bat Species Prior to Construction and Maintenance Activities, Establish Buffers, and Implement Protective Measures

Surveys for roosting special-status bats (including pallid bat, western red bat, and other native bat species) shall be conducted in the Project area by a qualified bat biologist where suitable habitat that might be removed, altered, or indirectly impacted during construction or maintenance is present. A qualified biologist shall conduct a habitat assessment for potentially suitable bat habitat within six months prior to construction activities. In addition, focused bat surveys shall be conducted within 48 hours prior to the start of construction activities and tree removal, irrespective of the time of year construction is to start. If there is a lapse in construction activities of two weeks or greater, the area shall be resurveyed within 24 hours prior to recommencement of work. Surveys shall also be conducted within 48 hours prior to the start of maintenance activities. Locations with potential for roosting or that are suitable as a maternity roost shall be surveyed by a qualified bat biologist using an appropriate combination of structure inspection, exit counts, acoustic surveys, or other methods. Surveys shall be conducted during the appropriate season and time of the day or night to ensure detection of day- and night-roosting bats (i.e., preferably one daytime and one nighttime survey shall be conducted at each location with suitable roosting habitat during the maternity season, April 15 through August 31, if feasible).

If a bat roost is present in the Project area in a tree that does not need to be removed, a no-disturbance buffer (typically 300 feet) shall be established and maintained throughout construction or during maintenance. If a maternity roost is identified, a no-disturbance buffer

shall be established and maintained until a qualified biologist determines that the roost is no longer active.

If a bat roost is detected in a tree that needs to be removed, passive exclusion shall include monitoring the roost for three days to determine whether the roost is active. If the roost is determined by a qualified biologist to support a reproductive female with young, the roost shall be avoided until it is no longer active. If the roost remains active during the three monitoring days and observations confirm it is not a maternity colony, a temporary bat exclusion device shall be installed under the supervision of a qualified bat biologist. At the discretion of the qualified bat biologist, an alternative roosting structure(s) might be constructed and installed prior to installation of exclusion devices. Exclusion shall be conducted between August 31 and October 15 to avoid trapping flightless young inside during the summer months or torpid (overwintering) individuals during the winter. If it cannot be determined by a qualified biologist whether an active roost site supports a maternity colony, the roost site shall not be disturbed, and construction within 300 feet shall be postponed or halted until the roost is vacated and the young are able to fly.

Exclusion efforts shall be monitored on a weekly basis, continued for the duration of Project construction, and removed when no longer necessary. The following measures are also proposed to further reduce the potential for impacts to roosting and foraging special-status bats, including pallid bat and western red bat, and other native bat species, if present:

- All construction or maintenance work conducted near active roosts shall take place during the day to the extent feasible. If this is not feasible, impacts will be minimized by directing lighting and noise away from night roosting and foraging areas to the extent feasible.
- Combustion equipment (such as generators, pumps, and vehicles) shall not be parked or operated near an active roost. Construction and maintenance personnel shall not be present directly under a roosting colony. In addition, care will be taken to ensure that construction and maintenance activities do not severely restrict airspace access to the roosts.
- Tree trimming and/or tree removal associated with construction or maintenance in areas with suitable bat habitat shall only be conducted during seasonal periods of bat activity (from August 31 through October 15, a period prior to hibernation when young are self-sufficiently volant, and from March 1 to April 15 to avoid hibernating bats and prior to formation of maternity colonies), as feasible, under supervision of a qualified biologist.
- Trees shall be trimmed and/or removed in a two-phased removal system conducted over two consecutive days under the supervision of a qualified biologist. Prior to tree removal or trimming, each tree shall be shaken gently, and several minutes shall pass before felling trees or limbs to allow bats time to arouse and leave the tree. The biologist shall search downed vegetation for dead or injured bats and report any dead or injured special-status bats to the Lead Agencies. On the first day (in the afternoon), limbs and branches shall be removed by a tree cutter using chainsaws only. Limbs with cavities, crevices, or deep bark fissures shall be avoided, and only branches or limbs without those features shall be removed. On the second day, the entire tree shall be removed.
- Project proponents shall consult with a qualified bat biologist to determine suitable buffers around roost and/or hibernaculum sites. Buffers may vary depending on species and Project activity being performed.

- If bats are showing signs of distress, construction and maintenance activities shall be modified to prevent bats from abandoning their roost or altering their feeding behavior, as determined by a qualified biologist. At any time, the qualified biologist shall have the authority to stop work if there are any signs of distress or disturbance that could lead to roost abandonment. Construction and maintenance work shall not continue until corrective measures have been taken or it is determined by a qualified biologist that continued activity would not adversely affect roost success.

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

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

Construction of Alternative 1 would result in direct and indirect effects on suitable habitat (open, dry areas of grassland communities) for American badger. Construction activities would result in temporary impacts to 17.9 acres and permanent impacts to 19.3 acres of potentially suitable grassland habitat (Table 9-6). Based on average territory sizes of 395 to 593 acres, this alternative would permanently impact less than five percent of a single badger's territory.

Ground-disturbing construction activities and the use of vehicles or equipment in grassland habitat could harm, displace, or disturb an American badger and could destroy American badger dens. This impact would be considered significant.

Because maintenance activities would not occur in suitable grassland habitat, there are not expected to be maintenance effects.

Under Alternative 1, the Lead Agencies do not expect operations to result in adverse effects on American badger as they would extend the duration of flooding between only November and March, which is outside the mating and birthing season.

CEQA Conclusion

Direct and indirect impacts to American badger resulting from the construction of Alternative 1 would be **significant** because construction activities could result in injury or mortality. During operations and maintenance, there would be **no impact**.

Mitigation Measure MM-TERR-18: Conduct Preconstruction Surveys for American Badger

A qualified biologist shall conduct pre-construction surveys for American badger and badger dens in suitable habitat at least 48 hours prior to the start of construction activities. If there is a lapse in construction activities of two weeks or greater, the area shall be resurveyed within 24 hours prior to the recommencement of work. If a potential American badger den is identified in the Project area, an appropriate avoidance buffer shall be established and Project activities shall avoid American badger dens and associated habitat. If avoidance is not possible, then den exclusion shall take place between September 1 and January 1. The Project shall mitigate for the loss of habitat by preserving in perpetuity existing occupied habitat at a 1:1 ratio.

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

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

Construction of Alternative 1 would result in direct and indirect effects on sensitive natural communities as identified by CDFW or in the *2030 Countywide General Plan*, including freshwater marsh, riparian forest, and riparian woodland. These areas are designated as sensitive natural communities because of their decline statewide, high wildlife habitat value, or hydrologic function.

Implementation of Alternative 1 would be consistent with most of the policies of the Conservation and Open Space Element of the *2030 Countywide General Plan* applicable to terrestrial biological resources (refer to Section 9.2.3.1). Alternative 1 would conflict with General Plan policies addressing preservation and enhancement of wetlands and riparian areas (Policy CO-2.3), preservation and enhancement of habitat for special-status species (Policy CO-2.4), and no net loss of oak woodlands (Policy CO-2.14). In addition, the *Yolo County Oak Woodland Conservation and Enhancement Plan* encourages voluntary preservation of oak woodlands and valley oak trees in the county. Impacts to these resources absent mitigation would conflict with these provisions.

Construction effects on sensitive natural communities would include temporary impacts to 10.1 acres and permanent impacts to 24.7 acres of California hardstem and bulrush marsh, black willow thickets, Fremont cottonwood forest, and valley oak woodland (Table 9-6). Loss of riparian vegetation, including large trees, would reduce potential nesting and roosting habitat, including perch sites, for special-status wildlife species. Loss of shaded riverine aquatic habitat provided by riparian vegetation in the Project area would reduce habitat quality by eliminating cover and food. Periodic maintenance activities would include the annual removal of woody vegetation that has grown within the channels; however, these areas are included in the area of permanent impact.

Under Alternative 1, operations would not result in adverse effects on sensitive natural communities as the Lead Agencies do not expect the increase in the duration and extent of inundation to result in a type conversion of sensitive vegetation communities to non-sensitive vegetation communities (i.e., areas of marsh, black willow thickets, Fremont cottonwood forest, and valley oak woodland are expected to remain those community types).

CEQA Conclusion

Direct and indirect impacts to sensitive natural communities, including freshwater marsh, riparian forest, and riparian woodland, resulting from the construction of Alternative 1 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 on sensitive natural communities to **less than significant**.

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

Construction of Alternative 1 would result in direct and indirect impacts to non-wetland waters of the United States (open water), wetland waters of the United States (temperate freshwater floating mat, water primrose wetlands, and California and hardstem bulrush marsh), and CDFW riparian areas (temperate freshwater floating mat, water primrose wetlands, California and hardstem bulrush marsh, managed annual wetland vegetation, black willow thicket, Fremont cottonwood forest, and valley oak woodland), as shown on Figures 9-3a and 9-3b Table 9-9 and Table 9-10. RWQCB impacts are not included in these tables because for 401 certifications, RWQCB jurisdiction coincides with federal waters, but they do not have a clear definition for jurisdictional limits of state waters under the Porter-Cologne Act and may extend their limits to coincide with CDFW riparian habitat limits in addition to adding isolated wetlands.

Figure 9-3a. Alternative 1 Construction Impacts to Potential USACE and CDFW Jurisdictional Areas

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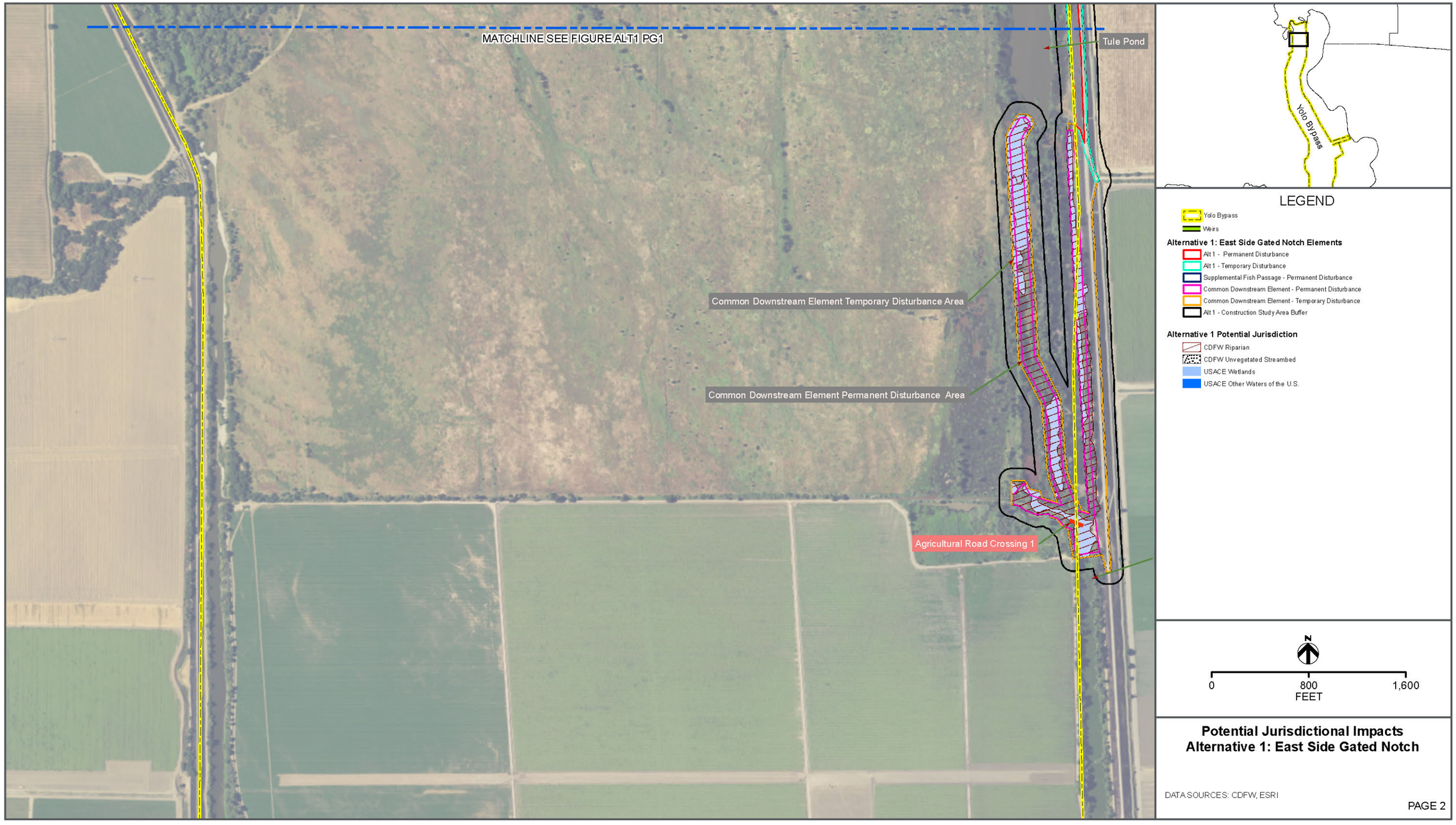

Figure 9-3b. Alternative 1 Construction Impacts to Potential USACE and CDFW Jurisdictional Areas

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Construction effects would include removal of these jurisdictional areas and replacement with concrete structures (associated with the headworks), rock-lined channels, and concrete abutments on each end of the new bridge at Agricultural Road Crossing 1 to span the Tule Canal. The channels might have volunteer plants, such as cattails and bulrush that grow up between the rocks, but there would not be active replanting of these areas. Therefore, the Lead Agencies expect that these areas would undergo a type conversion to predominantly open water and unvegetated streambed, but they would still be subject to USACE, CDFW, and RWQCB jurisdiction. As a result, the Lead Agencies do not anticipate a net loss of waters of the United States or unvegetated streambed; however, there would be a net loss of wetland and riparian habitats and the aquatic functions associated with each.

Construction effects of Alternative 1 would include temporary impacts to 3.8 acres of potential USACE wetlands and 0.3 acre of potential non-wetland waters of the United States and permanent impacts to 11.8 acres of potential USACE wetland and 0.3 acre of potential non-wetland waters of the United States. In addition, construction of Alternative 1 would result in temporary impacts to 11.0 acres of potential CDFW riparian habitat and 0.3 acre of potential CDFW unvegetated streambed, and permanent impacts to 27.9 acres of potential CDFW riparian habitat and 0.3 acre of potential CDFW unvegetated streambed. Potential construction effects also include degradation of water quality downstream of grading activities.

Alternative 1 would have the second-to-lowest permanent construction impacts to potential USACE wetlands and CDFW riparian habitat of all the Project alternatives. This alternative would involve excavation of 265,820 cubic yards of excess material (soils and vegetation) that would be disposed of at a DWR-purchased site located within two miles of the Project site. Fill material to be placed in areas subject to USACE and CDFW jurisdiction would consist of 66,860 tons of riprap and 68,618 tons of rock slope protection bedding.

Under Alternative 1, operations would not result in adverse effects on areas subject to USACE and CDFW jurisdiction as no fill materials would be placed in waters during operations.

Routine maintenance of the new concrete or rock-lined intake channel, headworks, transport channel, outtake channel, and west supplemental fish passage facility could require the removal of woody vegetation and sediment that has built up in the channels if it is determined by a qualified fish biologist that such vegetation and sediment is detrimental to fish passage. However, these activities would not result in impacts on the total acreage of USACE or CDFW jurisdiction but would impact the type of jurisdiction (e.g., CDFW riparian habitat would be converted to CDFW unvegetated streambed).

Table 9-9. Construction Impacts to Potential USACE Jurisdiction by Alternative

Potential USACE Jurisdiction	Alt. 1 Temp. (acres)[a]	Alt. 1 Perm. (acres)[a]	Alt. 2 Temp. (acres)[a]	Alt. 2 Perm. (acres)[a]	Alt. 3 Temp. (acres)[a]	Alt. 3 Perm. (acres)[a]	Alt. 4 Temp. (acres)[a]	Alt. 4 Perm. (acres)[a]	Alt. 5 Temp. (acres)[a]	Alt. 5 Perm. (acres)[a]	Alt. 6 Temp. (acres)[a]	Alt. 6 Perm. (acres)[a]
Wetlands	**3.8**	**11.8**	**2.6**	**13.3**	**3.2**	**14.1**	**27.1**	**28.2**	**0.6**	**7.5**	**2.9**	**14.8**
Temperate freshwater floating mat	0.5	1.3	0.5	1.3	0.5	1.3	0.5	1.3	0.1	0.9	0.5	1.3
Water primrose wetlands (semi-natural stands)	0.4	1.8	0.5	2.7	0.5	2.7	0.7	2.7	0.0	1.7	0.4	3.0
California and hardstem bulrush marsh	2.9	8.7	1.6	9.3	1.6	9.3	1.6	9.3	0.5	4.9	1.6	9.5
Managed annual wetland vegetation	<0.001	0.0	<0.001	0.0	0.6	0.8	24.3	14.9	0.0	<0.001	0.4	1.0
Non-wetland Waters of the United States	**0.3**	**0.3**	**1.5**	**5.8**	**0.8**	**0.8**	**7.9**	**3.0**	**1.1**	**5.0**	**1.5**	**1.4**
Open Water	0.3	0.3	1.5	5.8	0.8	0.8	7.9	3.0	1.1	5.0	1.5	1.4
Total	**4.1**	**12.1**	**4.1**	**19.1**	**4.0**	**14.9**	**35.0**	**31.2**	**1.7**	**12.5**	**4.4**	**16.2**

[a] These acreages represent a preliminary effort at determining the jurisdictional boundaries in the absence of a formal jurisdictional delineation, using the most recent regulations, policy, and guidance from the regulatory agencies. However, only the regulatory agencies can make a final determination of jurisdictional boundaries.

Key: CDFW = California Department of Fish and Wildlife; Perm. = permanent impacts; Temp. = temporary impacts; USACE = United States Army Corps of Engineers.

Table 9-10. Construction Impacts to Potential CDFW Jurisdiction by Alternative

Potential CDFW Jurisdiction	Alt. 1 Temp. (acres)[a]	Alt. 1 Perm. (acres)[a]	Alt. 2 Temp. (acres)[a]	Alt. 2 Perm. (acres)[a]	Alt. 3 Temp. (acres)[a]	Alt. 3 Perm. (acres)[a]	Alt. 4 Temp. (acres)[a]	Alt. 4 Perm. (acres)[a]	Alt. 5 Temp. (acres)[a]	Alt. 5 Perm. (acres)[a]	Alt. 6 Temp. (acres)[a]	Alt. 6 Perm. (acres)[a]
Riparian	**11.0**	**27.9**	**8.8**	**30.1**	**12.0**	**34.2**	**47.7**	**52.9**	**7.9**	**19.7**	**10.9**	**41.5**
Temperate freshwater floating mat	0.5	1.3	0.5	1.3	0.5	1.3	0.5	1.3	0.1	0.9	0.5	1.3
Water primrose wetlands (semi-natural stands)	0.4	1.8	0.5	2.7	0.5	2.7	0.7	2.7	0.0	1.7	0.4	3.0
California and hardstem bulrush marsh	2.9	8.7	1.6	9.3	1.6	9.3	1.6	9.3	0.5	4.9	1.6	9.5
Managed annual wetland vegetation	<0.001	0.0	<0.001	0.0	0.6	0.8	24.3	14.9	0.0	<0.001	0.4	1.0
Black willow thicket	<0.1	<0.1	<0.1	0.1	<0.1	0.1	4.2	0.9	0.1	1.4	<0.1	0.1
Box elder forest	0.0	0.0	0.0	0.0	0.1	0.6	0.1	0.6	0.0	0.0	0.1	1.3
Fremont cottonwood forest	5.7	12.0	5.4	11.8	7.0	14.3	14.3	17.9	6.6	8.8	6.6	18.8
Himalayan blackberry brambles	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.0
Mixed hardwood forest	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.2	0.0	0.0	0.0	0.0
Valley oak woodland	1.4	4.0	0.6	4.6	1.6	5.1	1.6	5.1	0.5	1.7	1.2	6.5
Unvegetated Streambed	**0.3**	**0.3**	**1.5**	**5.8**	**0.8**	**0.8**	**7.9**	**3.0**	**1.1**	**5.0**	**1.5**	**1.4**
Open Water	0.3	0.3	1.5	5.8	0.8	0.8	7.9	3.0	1.1	5.0	1.5	1.4
Total	**11.3**	**28.2**	**10.3**	**35.9**	**12.8**	**35.0**	**55.6**	**55.9**	**9.0**	**24.7**	**12.4**	**42.9**

[a] These acreages represent a preliminary effort at determining the jurisdictional boundaries in the absence of a formal jurisdictional delineation, using the most recent regulations, policy, and guidance from the regulatory agencies. However, only the regulatory agencies can make a final determination of jurisdictional boundaries.

Key: CDFW = California Department of Fish and Wildlife; Perm. = permanent impacts; Temp. = temporary impacts.

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 areas subject to RWQCB jurisdiction resulting from the construction of Alternative 1 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** on the total acreage of USACE or CDFW jurisdiction.

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 on USACE, RWQCB, and CDFW jurisdictional areas to **less than significant**.

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

Construction of Alternative 1 could interfere with local movement of native resident or migratory wildlife species. Channel grading during construction could temporarily disrupt amphibian and reptile movement, including that of western pond turtle and giant garter snake, but these construction activities would not substantially interfere with the movement of these animals because they could move through adjacent upland habitat to nearby, unaffected aquatic habitat (Figures 9-2a and 9-2b). Construction activities, including movement of equipment and personnel as well as vegetation removal, could interfere with movement of other terrestrial wildlife species such as large mammals or birds, but the Lead Agencies do not expect these activities to result in substantial effects on these species with respect to movement because they are mobile and can move away from construction activities to other areas not impacted by construction, although small mammals are less mobile and would incur some direct impacts during construction. Noise from construction activities could temporarily alter foraging patterns of resident wildlife species in the Project area. Construction would occur such that the entirety of the north-south transport channel would not all be constructed at once and would, therefore, not limit east-west movement of wildlife species.

The Lead Agencies do not expect operations activities associated with implementation of Alternative 1 to adversely affect movement within the Yolo Bypass. Operations may prove beneficial for movement of some wildlife species, such as amphibians and reptiles, including giant garter snake or western pond turtle, because these activities would enhance downstream connectivity to Tule Canal. In addition, the channeling of water into the eastern transport channel would provide the same beneficial effect that existing scour ponds provide on the movement of resident and migratory terrestrial wildlife, such as mammals or birds, by providing a water source adjacent to existing foraging habitat. The changes in the expected average number of wet days resulting from operations are not expected to adversely affect wildlife movement because different areas within the Yolo Bypass would experience differential effects (i.e., some areas would have a reduced number of wet days and some areas would have an increased number of wet days), and wildlife can move around to adapt to such environmental changes.

The Lead Agencies anticipate annual maintenance activities to include the removal of debris, woody vegetation, and sediment along the transport channel and at Agricultural Road Crossing 1 to maintain fish passage. These activities would be conducted either outside the flood season or after a Fremont Weir overtopping event. These activities are not expected to adversely affect movement of wildlife.

CEQA Conclusion

Impacts on wildlife movement resulting from the construction of Alternative 1 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 within the FWWA. During operations and maintenance, there would be **no impact**.

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

The study area is within the Yolo HCP/NCCP area (YHC 2018). Specifically, it lies within the North Yolo Bypass and South Yolo Bypass Planning Units. Implementation of Alternative 1 would not impact areas designated as priority conservation lands or suitable habitat for the species covered by the Yolo HCP/NCCP (YHC 2018). Therefore, Alternative 1 would not conflict with the provisions of the Yolo HCP/NCCP, and there would be no effect.

CEQA Conclusion

Alternative 1 is consistent with the provisions of the Yolo HCP/NCCP. Therefore, there would be **no impact** resulting from conflicts with this HCP/NCCP.

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

Implementation of Alternative 2 would result in direct and indirect construction effects on habitat for State- or Federally listed wildlife species, including valley elderberry longhorn beetle, giant garter snake, western pond turtle, Swainson's Hawk, Least Bell's Vireo, 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) other non-listed 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 2 would be similar to that described for Alternative 1.

Vegetation community impacts for Alternative 2 are shown in Table 9-6 and on Figures 9-4a and 9-4b.

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

Alternative 2 would temporarily impact approximately the same acreage of suitable and occupied habitat for special-status plant species during construction as described for Alternative 1, but Alternative 2 would have a greater permanent impact because it would affect suitable habitat for more special-status plant species (13 compared to seven for Alternative 1). Similar to Alternative 1, Alternative 2 would impact suitable riparian habitat for woolly rose-mallow, northern California black walnut, bristly sedge, Peruvian dodder, Delta tule pea, Sanford's arrowhead, and Suisun Marsh aster during construction. In addition, Alternative 2 would impact alkaline grassland habitat for heartscale, San Joaquin spearscale, Heckard's pepper grass, California alkali grass, and saline clover, all of which are CNPS sensitive plant species, during construction. 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). Freshwater marsh areas that provide suitable habitat for woolly rose-mallow, northern California black walnut, bristly sedge, Peruvian dodder, Delta tule pea, Sanford's arrowhead, and Suisun Marsh aster were adequately surveyed in 2014 and 2015, and no special-status plant species were observed other than one woolly rose-mallow plant.

Although there is abundant suitable habitat for heartscale, San Joaquin spearscale, Heckard's pepper grass, California alkali grass, and saline clover in the construction study area (over 200 acres of marsh, riparian, and grassland, Table 9-1), the presence of these species in the unsurveyed central transport channel alignment is unknown, and effects on these species cannot be determined at this time. Effects on one woolly rose-mallow plant would not be considered significant.

The effects of Alternative 2 operations and maintenance on special-status plant species and their suitable habitat would be the same as those described for Alternative 1.

Figure 9-4a. Alternative 2 Construction Impacts to Vegetation Communities

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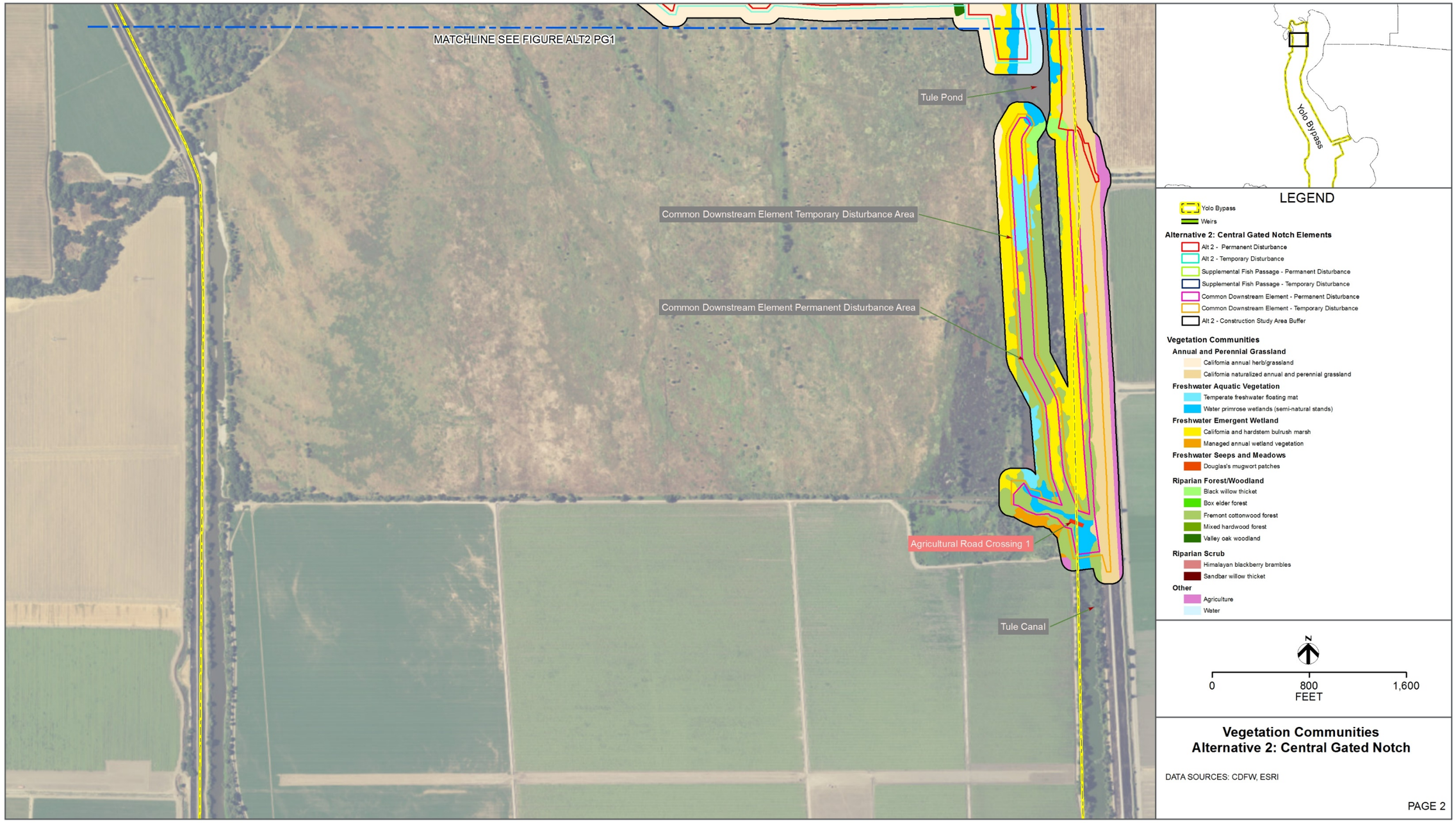

Figure 9-4b. Alternative 2 Construction Impacts to Vegetation Communities

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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 the construction and maintenance of Alternative 2 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. This would occur through direct effects 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.

Mitigation Measure MM-TERR-19: Conduct Pre-construction Surveys for Special-Status Plant Species in Alkaline Grasslands

A qualified biologist shall conduct pre-construction surveys for special-status plant species with the potential to occur in the alkaline grassland portions of the Project construction area (heartscale, San Joaquin spearscale, Heckard's pepper grass, California alkali grass, and saline clover). Surveys shall be conducted during the flowering period for each special-status plant species. If one or more special-status plant species are detected, then a qualified biologist shall flag populations that can be avoided, monitor activities near special-status plant species populations during construction, monitor collection of seeds from populations that cannot be avoided, monitor topsoil collection in areas with special-status plants (where feasible), and monitor replacement of topsoil and/or seeding of special-status plant species after construction is completed.

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

9.3.3.3.2 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 2, including construction, staging, and spoils areas, does not contain any elderberry shrubs, which is the host plant for valley elderberry longhorn beetle (Table 9-7). However, the 2014 surveys did not cover the entirety of the central transport channel alignment. The closest known elderberry shrub to Alternative 2 based on 2014 surveys 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 9-4a).

If elderberry shrubs are found during pre-construction surveys, construction of Alternative 2 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 2 could result in indirect effects on this species if construction activities indirectly affect elderberry shrubs such as from construction-generated dust, root damage, or soil compaction.

The operations and maintenance effects of Alternative 2 on valley elderberry longhorn beetle and its suitable habitat would be the same as those described for Alternative 1.

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 resulting from the construction of Alternative 2 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 2 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 on valley elderberry longhorn beetle and suitable habitat to **less than significant**.

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

Construction of Alternative 2 would result in temporary impacts to 2.6 acres and permanent impacts to 13.3 acres of suitable giant garter snake aquatic habitat (Table 9-8). In addition, construction of Alternative 2 would result in temporary disturbance to 12.7 acres and permanent impacts to 11.9 acres of suitable giant garter snake upland habitat. Alternative 2 would impact about the same total amount of suitable giant garter snake aquatic habitat as described for Alternative 1 (15.9 acres for Alternative 2 versus 15.7 acres for Alternative 1), but would impact less upland habitat (24.6 acres for Alternative 2 versus 41.9 acres for Alternative 1).

The operations and maintenance effects of Alternative 2 on giant garter snake and it suitable aquatic and upland habitat would be the same as those described for Alternative 1.

CEQA Conclusion

Direct or indirect impacts to giant garter snake resulting from the construction and maintenance of Alternative 2 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 on giant garter snake and suitable habitat to **less than significant.**

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

Construction of Alternative 2 would result in temporary impacts to 1.6 acres and permanent impacts to 9.3 acres of suitable western pond turtle aquatic habitat. In addition, construction of Alternative 2 would result in temporary disturbance to 26.8 acres and permanent impacts to 65.8 acres of suitable western pond turtle upland habitat. Alternative 2 would impact 0.8 fewer acre of suitable western pond turtle aquatic habitat than Alternative 1 (10.9 acres for Alternative 2 versus 11.7 acres for Alternative 1) and 32.3 more acres of suitable western pond turtle upland habitat (92.6 acres for Alternative 2 versus 60.3 acres for Alternative 1).

The operations and maintenance effects of Alternative 2 on western pond turtle and its suitable habitat would be the same as described for Alternative 1.

CEQA Conclusion

Direct and indirect impacts to western pond turtle resulting from the construction and maintenance of Alternative 2 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 on western pond turtle and suitable habitat to **less than significant**.

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

Construction effects of Alternative 2 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 and pursuant to Fish and Game Code Section 3503.5, would include temporary impacts to 31.0 acres of suitable nesting and foraging habitat and permanent impacts to 85.2 acres of suitable nesting and foraging habitat for these species (Table 9-6). Alternative 2 would temporarily impact 1.8 more acres than Alternative 1 (31.0 acres for Alternative 2 versus 29.2 acres for Alternative 1), but would permanently impact 37.7 more acres (85.2 acres for Alternative 2 versus 47.5 acres for Alternative 1) 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 2 on nesting bird species and their suitable nesting and foraging habitat is the same as that for Alternative 1.

The operations and maintenance effects of Alternative 2 on nesting bird species and their suitable nesting and foraging habitat would be the same as those described for Alternative 1.

CEQA Conclusion

Direct and indirect impacts on nesting bird species resulting from the construction and maintenance of Alternative 2 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 on nesting bird species and suitable nesting and foraging habitat to **less than significant**.

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

Construction effects of Alternative 2 on special-status bat species, potentially including pallid bat and western red bat, would include temporary impacts to 6.0 acres of suitable riparian and 22.3 acres of suitable grassland and open-water roosting and foraging habitat. In addition, construction effects would include permanent loss of 16.5 acres of suitable riparian habitat and conversion of 55.1 acres of suitable grassland and open-water foraging habitat to primarily open-water habitat that is still suitable for foraging (Table 9-6). Alternative 2 would temporarily impact 3.0 more acres of suitable roosting and foraging habitat than Alternative 1 (28.3 acres for Alternative 2 versus 25.3 acres for Alternative 1) and permanently impact 35.9 more acres of suitable roosting and foraging habitat than Alternative 1 (71.6 acres for Alternative 2 versus 35.7 acres for Alternative 1). 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 2 on special-status bat species and their suitable roosting habitat is the same as that for Alternative 1.

The operations and maintenance effects of Alternative 2 on special-status bat species and their suitable roosting habitat would be the same as those described for Alternative 1.

CEQA Conclusion

Direct and indirect impacts to special-status tree-roosting bats, including pallid bats and western red bats, resulting from the construction and maintenance of Alternative 2 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 on special-status bat species and suitable roosting habitat to **less than significant**.

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

Construction effects of Alternative 2 on suitable American badger foraging and denning habitat would include temporary impacts to 20.8 acres and permanent impacts to 49.3 acres of potentially suitable grassland habitat (Table 9-6). Alternative 2 would temporarily impact 2.9 more acres of suitable foraging and denning habitat for American badger than Alternative 1 (20.8 acres for Alternative 2 versus 17.9 acres for Alternative 1), but would permanently impact 30.0 more acres than Alternative 1 (49.3 acres for Alternative 2 versus 19.3 acres for Alternative 1).

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 2 on American badger and its suitable foraging and denning habitat is the same as that for Alternative 1.

The operations and maintenance effects of Alternative 2 to American badger and its suitable foraging and denning habitat would be the same as those described for Alternative 1.

CEQA Conclusion

Direct and indirect impacts to American badger resulting from the construction of Alternative 2 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 on American badger and suitable foraging and denning habitat to **less than significant**.

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

Construction effects of Alternative 2 on sensitive natural communities would include temporary impacts to 7.6 acres and permanent impacts to 25.8 acres of California hardstem and bulrush marsh, black willow thickets, Fremont cottonwood forest, and valley oak woodland (Table 9-6). Alternative 2 would temporarily impact 2.5 fewer acres than Alternative 1 (7.6 acres for Alternative 2 versus 10.1 acres for Alternative 1) and permanently impact 1.1 more acres than Alternative 1 (25.8 acres for Alternative 2 versus 24.7 acres for Alternative 1) of sensitive natural communities.

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 2 on sensitive natural communities is the same as that for Alternative 1.

The operations and maintenance effects of Alternative 2 would be the same as those described for Alternative 1.

CEQA Conclusion

Direct and indirect impacts to sensitive natural communities, including freshwater marsh, riparian forest, and riparian woodland, resulting from the construction of Alternative 2 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 on sensitive natural communities to **less than significant**.

9.3.3.3.9 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 the construction of Alternative 2 are shown on Figures 9-5a and 9-5b. Construction effects of Alternative 2 would include temporary impacts to 2.6 acres of potential USACE wetlands and 1.5 acres of potential non-wetland waters of the United States, and permanent impacts to 13.3 acres of potential USACE wetlands and 5.8 acres of potential non-wetland waters of the United States. In addition, construction of Alternative 2 would result in temporary impacts to 8.8 acres of potential CDFW riparian habitat and 1.5 acres of potential CDFW unvegetated streambed, and permanent impacts to 30.1 acres of potential CDFW riparian habitat and 5.8 acres of potential CDFW unvegetated streambed (Table 9-9 and Table 9-10). Compared to Alternative 1, Alternative 2 would temporarily impact the same amount of USACE jurisdiction (4.1 acres for both alternatives) and 1.0 less acre of CDFW jurisdiction (10.3 acres for Alternative 2 versus 11.3 acres for Alternative 1). In addition, Alternative 2 would permanently impact 7.0 more acres of USACE jurisdiction (19.1 acres for Alternative 2 versus 12.1 acres for Alternative 1) and 7.7 more acres of CDFW jurisdiction (35.9 acres for Alternative 2 versus 28.2 acres for Alternative 1).

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 2 on potential USACE, CDFW, and RWQCB jurisdictional areas is the same as that for Alternative 1.

The operations and maintenance effects of Alternative 2 on potential USACE, CDFW, and RWQCB jurisdictional areas would be the same as those described for Alternative 1.

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 areas subject to RWQCB jurisdiction resulting from the construction of Alternative 2 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 on USACE, RWQCB, and CDFW jurisdictional areas to **less than significant**.

Figure 9-5a. Alternative 2 Construction Impacts to Potential USACE and CDFW Jurisdictional Areas

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Figure 9-5b. Alternative 2 Construction Impacts to Potential USACE and CDFW Jurisdictional Areas

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

Construction, operation, and maintenance effects of Alternative 2 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 2 on the movement of native resident or migratory wildlife species is the same as that for Alternative 1.

CEQA Conclusion

Impacts on wildlife movement resulting from the construction of Alternative 2 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**.

9.3.3.3.11 Impact TERR-11: Potential 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 2 with provisions of adopted or other approved habitat conservation plans is the same as that for Alternative 1.

CEQA Conclusion

Alternative 2 is consistent with the provisions of the Yolo HCP/NCCP. Therefore, there would be **no impact** resulting from conflicts with this HCP/NCCP.

9.3.3.4 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.

Implementation of Alternative 3 would result in direct and indirect construction effects on habitat for State- or Federally listed wildlife species, including valley elderberry longhorn beetle, giant garter snake, western pond turtle, Swainson's Hawk, Least Bell's Vireo, 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.

The change in the average number of wet days within the Yolo Bypass under Alternative 3 would be very similar to that described for Alternative 1.

Vegetation community impacts for Alternative 3 are shown in Table 9-6 and on Figures 9-6a and 9-6b.

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

The construction footprint of Alternative 3 contains suitable habitat for the same special-status plant species as the footprint of Alternative 2, 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). Alternative 3 would have a slightly higher construction-related temporary impact to suitable and occupied habitat for special-status plant species than Alternatives 1 and 2 and a greater permanent impact than either alternative.

The analysis of the potential significance of construction direct and indirect effects of Alternative 3 on special-status plant species and their habitat is the same as for Alternative 2.

The operations and maintenance effects of Alternative 3 on special-status plant species and their habitat 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 the construction and maintenance of Alternative 3 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 on special-status species and suitable habitat to **less than significant**.

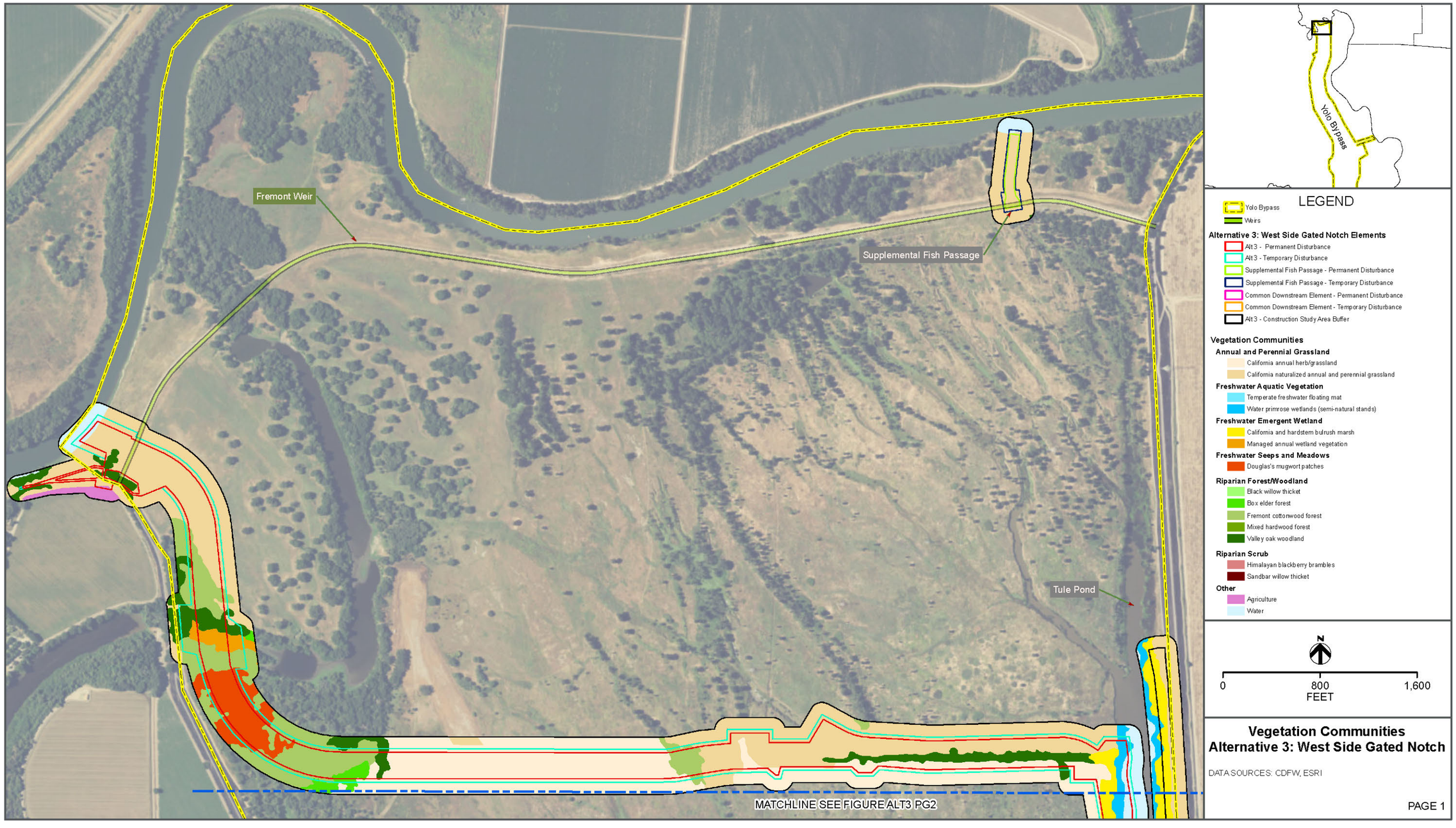

Figure 9-6a. Alternative 3 Construction Impacts to Vegetation Communities

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Figure 9-6b. Alternative 3 Construction Impacts to Vegetation Communities

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9.3.3.4.2 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 3, 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 footprint but within the study area for this alternative. Exit hole surveys of the elderberry shrubs were not conducted. However, because elderberry shrubs provide suitable habitat, this habitat is presumed to be occupied by valley elderberry longhorn beetle. In addition, the 2014 survey area did not cover the entirety of the Alternative 3 study area along the transport channel, and this unsurveyed area could include elderberry shrubs.

Construction of Alternative 3 would result in permanent effects on one elderberry shrub in riparian habitat and temporary effects on one elderberry shrub in non-riparian habitat. In addition, construction of Alternative 3 would result in permanent effects on 1.8 acres of suitable valley elderberry longhorn beetle habitat (all areas within 165 feet of an elderberry shrub) and temporary effects on 1.3 acres of suitable valley elderberry longhorn beetle habitat (Table 9-7). Therefore, construction of Alternative 3 could result in direct effects on the valley elderberry longhorn beetle through removal of its host plant and surrounding habitat. In addition, construction of Alternative 3 could result in indirect effects on this species if construction activities indirectly affect elderberry shrubs such as from construction-generated dust, root damage, or soil compaction. Due to the status of valley elderberry longhorn beetle (Federally threatened) and continued threats to this species throughout its range (including climate change, predation, pesticides, and invasive species), these direct and indirect impacts would be considered significant.

The analysis of the potential significance of construction direct and indirect effects of Alternative 3 on valley elderberry longhorn beetle and its suitable habitat is the same as for Alternative 2.

The operations and maintenance effects of Alternative 3 on valley elderberry longhorn beetle and its suitable habitat would be the same as those described for Alternative 2.

CEQA Conclusion

Construction impacts to valley elderberry longhorn beetle and its habitat would be **significant** because the construction of Alternative 3 would result in permanent effects on one elderberry shrub, temporary effects on one elderberry shrub, and additional permanent effects on 1.8 acres and temporary effects on 1.3 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. 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 suitable habitat to **less than significant**.

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

Construction of Alternative 3 would result in temporary impacts to 3.2 acres and permanent impacts to 14.1 acres of suitable giant garter snake aquatic habitat (Table 9-8.). In addition, construction of Alternative 3 would result in temporary disturbance to 15.9 acres and permanent impacts to 15.7 acres of suitable giant garter snake upland habitat. Alternative 3 would impact 1.6 more acre of suitable giant garter snake aquatic habitat than Alternative 1 (17.3 acres for Alternative 3 versus 15.7 acres for Alternative 1) and would impact 10.3 fewer acres of suitable upland habitat (31.6 acres for Alternative 3 versus 41.9 acres for Alternative 1).

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 3 on giant garter snake and its suitable aquatic and upland habitat is the same as that for Alternative 1.

The operations and maintenance effects of Alternative 3 on giant garter snake and its suitable aquatic and upland habitat would be the same as those described for Alternative 1.

CEQA Conclusion

Direct or indirect impacts to giant garter snake resulting from the construction and maintenance of Alternative 3 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 on giant garter snake and suitable habitat to **less than significant.**

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

Construction of Alternative 3 would result in temporary impacts to 2.2 acres and permanent impacts to 10.0 acres of suitable western pond turtle aquatic habitat. In addition, construction of Alternative 3 would result in temporary disturbance to 28.4 acres and permanent impacts to 62.9 acres of suitable western pond turtle upland habitat. Alternative 3 would impact 0.5 acre more suitable aquatic western pond turtle habitat than Alternative 1 (12.2 acres for Alternative 3 versus 11.7 acres for Alternative 1) and 31.0 more acres of suitable upland western pond turtle habitat than Alternative 1 (91.3 acres for Alternative 3 versus 60.3 acres for Alternative 1).

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 3 on western pond turtle and its suitable habitat is the same as that for Alternative 1.

The operations and maintenance effects of Alternative 3 on western pond turtle and its suitable habitat would be the same as those described for Alternative 1.

CEQA Conclusion

Direct and indirect impacts to western pond turtle resulting from the construction and maintenance of Alternative 3 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 suitable habitat to **less than significant**.

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

Construction effects of Alternative 3 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 and pursuant to Fish and Game Code Section 3503.5, would include temporary impacts to 33.3 acres of suitable nesting and foraging habitat and permanent impacts to 81.7 acres of suitable nesting and foraging habitat for these species (Table 9-6.). Alternative 3 would temporarily impact 4.1 more acres than Alternative 1 (33.3 acres for Alternative 3 versus 29.2 acres for Alternative 1) and would permanently impact 34.2 more acres than Alternative 1 (81.7 acres for Alternative 3 versus 47.5 acres for Alternative 1) 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 3 on nesting bird species and their suitable nesting and foraging habitat is the same as that for Alternative 1.

The operations and maintenance effects of Alternative 3 on nesting bird species and their suitable nesting and foraging habitat would be the same as those described for Alternative 1.

CEQA Conclusion

Direct and indirect impacts on nesting bird species resulting from the construction and maintenance of Alternative 3 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 on nesting bird species and suitable nesting and foraging habitat to **less than significant**.

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

Construction effects of Alternative 3 on special-status bat species, potentially including pallid bats and western red bats, would include temporary impacts to 8.8 acres of suitable riparian habitat and 20.4 acres of suitable grassland and open-water roosting and foraging habitat. In addition, construction effects would include the loss of 20.1 acres of suitable riparian habitat and conversion of 43.6 acres of suitable grassland and open-water foraging habitat to primarily open-water habitat still suitable for foraging (Table 9-6). Alternative 3 would temporarily impact 3.9 more acres of suitable roosting and foraging habitat than Alternative 1 (29.2 acres for Alternative 3 versus 25.3 acres for Alternative 1) and permanently impact 28 more acres of suitable roosting and foraging habitat than Alternative 1 (63.7 acres for Alternative 3 versus 35.7 acres for Alternative 1). 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 3 on special-status bat species and their suitable roosting habitat is the same as that for Alternative 1.

The operations and maintenance effects of Alternative 3 on special-status bat species and their suitable roosting habitat would be the same as those described for Alternative 1.

CEQA Conclusion

Direct and indirect impacts to special-status tree-roosting bats, including pallid bats and western red bats, resulting from the construction and maintenance of Alternative 3 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 suitable roosting habitat to **less than significant**.

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

Construction effects of Alternative 3 on suitable American badger foraging and denning habitat would include temporary impacts to 19.6 acres and permanent impacts to 42.8 acres of potentially suitable grassland habitat (Table 9-6). Alternative 3 would temporarily impact 1.7 more acres than Alternative 1 (19.6 acres for Alternative 3 versus 17.9 acres for Alternative 1) and permanently impact 23.5 more acres than Alternative 1 (42.8 acres for Alternative 3 versus 19.3 acres for Alternative 1) of suitable foraging and denning habitat for American badger.

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 3 on American badger and its suitable foraging and denning habitat is the same as that for Alternative 1.

The operations and maintenance effects of Alternative 3 on American badger and its suitable foraging and denning habitat would be the same as those described for Alternative 1.

CEQA Conclusion

Direct and indirect impacts to American badger resulting from the construction of Alternative 3 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 suitable foraging and denning habitat to **less than significant**.

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

Construction effects of Alternative 3 on sensitive natural communities would include temporary impacts to 10.4 acres and permanent impacts to 29.3 acres of California hardstem and bulrush marsh, black willow thickets, box elder forest, Fremont cottonwood forest, and valley oak woodland (Table 9-6). Alternative 3 would temporarily impact 0.3 more acre than Alternative 1 (10.4 acres for Alternative 3 versus 10.1 acres for Alternative 1) and permanently impact 4.6 more acres than Alternative 1 (29.3 acres for Alternative 3 versus 24.7 acres for Alternative 1) of sensitive natural communities.

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 3 on sensitive natural communities is the same as that for Alternative 1.

The operations and maintenance effects of Alternative 3 would be the same as those described for Alternative 1.

CEQA Conclusion

Direct and indirect impacts to sensitive natural communities, including freshwater marsh, riparian forest, and riparian woodland, resulting from the construction of Alternative 3 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 on sensitive natural communities to **less than significant**.

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

Impacts to potential USACE and CDFW jurisdiction resulting from construction of Alternative 3 are shown on Figures 9-7a and 9-7b. Construction effects of Alternative 3 would include temporary impacts to 3.2 acres of potential USACE wetlands and 0.8 acre of potential non-wetland waters of the United States and permanent impacts to 14.1 acres of potential USACE wetland and 0.8 acre of potential non-wetland waters of the United States. In addition, construction of Alternative 3 would result in temporary impacts to 12.0 acres of potential CDFW

riparian habitat and 0.8 acre of potential CDFW unvegetated streambed and permanent impacts to 34.2 acres of potential CDFW riparian habitat and 0.8 acre of potential CDFW unvegetated streambed (Table 9-9 and Table 9-10). Compared to Alternative 1, Alternative 3 would temporarily impact 0.1 acre less of USACE jurisdiction (4.0 acres for Alternative 3 versus 4.1 acres for Alternative 1) and 1.5 more acres of CDFW jurisdiction (12.8 acres for Alternative 3 versus 11.3 acres for Alternative 1). In addition, Alternative 3 would permanently impact 2.8 more acres of USACE jurisdiction (14.9 acres for Alternative 3 versus 12.1 acres for Alternative 1) and 6.8 more acres of CDFW jurisdiction (35.0 acres for Alternative 3 versus 28.2 acres for Alternative 1).

The analysis of the potential significance of construction and operations effects of Alternative 3 on potential USACE, CDFW, and RWQCB jurisdictional areas is the same as that for Alternative 1.

The operations and maintenance effects of Alternative 3 on potential USACE, CDFW, and RWQCB jurisdictional areas would be the same as those described for Alternative 1.

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 areas subject to RWQCB jurisdiction resulting from the construction of Alternative 3 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 on USACE, RWQCB, and CDFW jurisdictional areas to **less than significant**.

Figure 9-7a. Alternative 3 Construction Impacts to Potential USACE and CDFW Jurisdictional Areas

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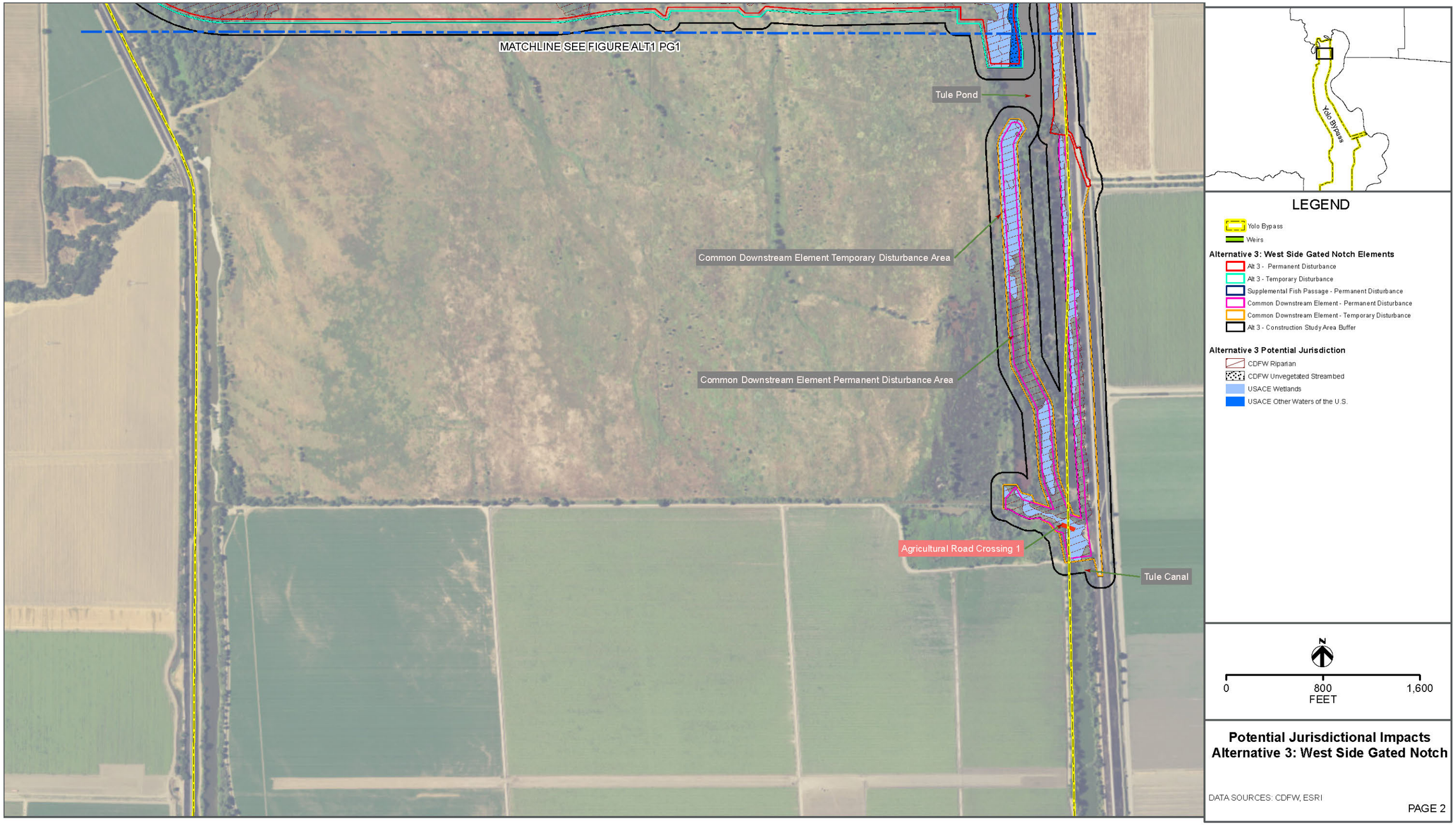

Figure 9-7b. Alternative 3 Construction Impacts to Potential USACE and CDFW Jurisdictional Areas

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

Construction, operation, and maintenance effects of Alternative 3 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 3 on the movement of native resident or migratory wildlife species is the same as that for Alternative 1.

CEQA Conclusion

Impacts on wildlife movement resulting from the construction of Alternative 3 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**.

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

Construction and maintenance of Alternative 3 would impact a very small portion of Priority 1 (higher priority) Lands in the FWWA. Because these areas represent such a small proportion of the total designated Priority 1 lands and implementation of Alternative 3 would not prevent successful implementation of the identified Yolo HCP/NCCP conservation measures, conservation strategy, or conservation reserve system, Alternative 3 does not conflict with the Yolo HCP/NCCP.

CEQA Conclusion

Alternative 3 is consistent with the provisions of the Yolo HCP/NCCP. Therefore, there would be **no impact** resulting from conflicts with this HCP/NCCP.

9.3.3.5 Alternative 4: West Side Gated Notch – Managed Flow

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. Alternative 4 has the same general alignment as Alternative 3; therefore, impact comparisons are made to Alternative 3.

Implementation of Alternative 4 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, Least Bell's Vireo, Western

Yellow-Billed Cuckoo, Bank Swallow, special-status plant species (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 4 would generally result in an overall increased number of wet days of three to four weeks north of I-80 and one week south of I-80 within the Yolo Bypass (with localized areas in the western part of the bypass experiencing no change). Areas in the western and northwestern portions of the FWWA would experience a reduction in the number of wet days compared to existing conditions (with localized areas experiencing an increased average number of wet days of up to four weeks) (see Figures 13-14 and 13-15 in Chapter 13, *Recreation*, and Figure 11-8 in Chapter 11, *Land Use and Agriculture*). Alternative 4 differs from Alternative 3 in that the extent of increased inundation would be greater for Alternative 4. However, within Tule Ranch, under Alternative 4, the extent of increased inundation (one to two weeks of increased wet days) would be less than that for Alternative 3 (See Figure 13-18 in Chapter 13, *Recreation*).

Vegetation community impacts for Alternative 4 are shown in Table 9-6 and on Figures 9-8a through 9-8h.

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

The construction footprint of Alternative 4 contains suitable habitat for the same special-status plant species as does the footprint of Alternative 3, 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). Alternative 4 would have the highest construction-related temporary and permanent impacts to suitable or occupied habitat for special-status plant species of all of the Project alternatives due to the water control structures.

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 4 on special-status species and their habitat is the same as that for Alternative 3.

The modeled change in average number of wet days under Alternative 4 is not expected to result in substantial operations impacts to special-status plant species, which are tolerant of moist soils and have evolved in an area that is subject to regular inundation. Therefore, the Lead Agencies expect the operations and maintenance effects of Alternative 4 would be the same as those described for Alternative 3.

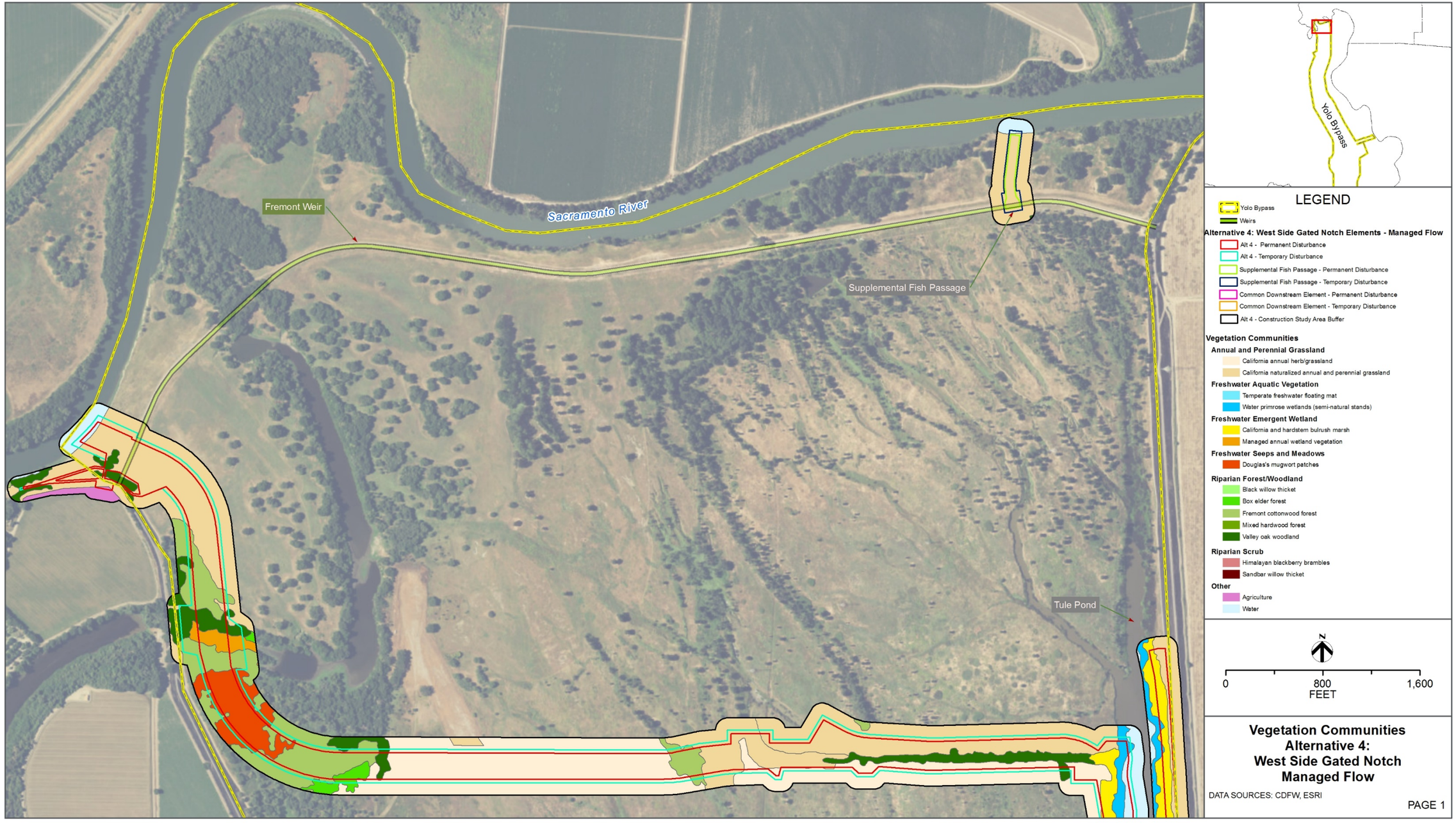

Figure 9-8a. Alternative 4 Construction Impacts to Vegetation Communities

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Figure 9-8b. Alternative 4 Construction Impacts to Vegetation Communities

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Figure 9-8c. Alternative 4 Construction Impacts to Vegetation Communities

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Figure 9-8d. Alternative 4 Construction Impacts to Vegetation Communities

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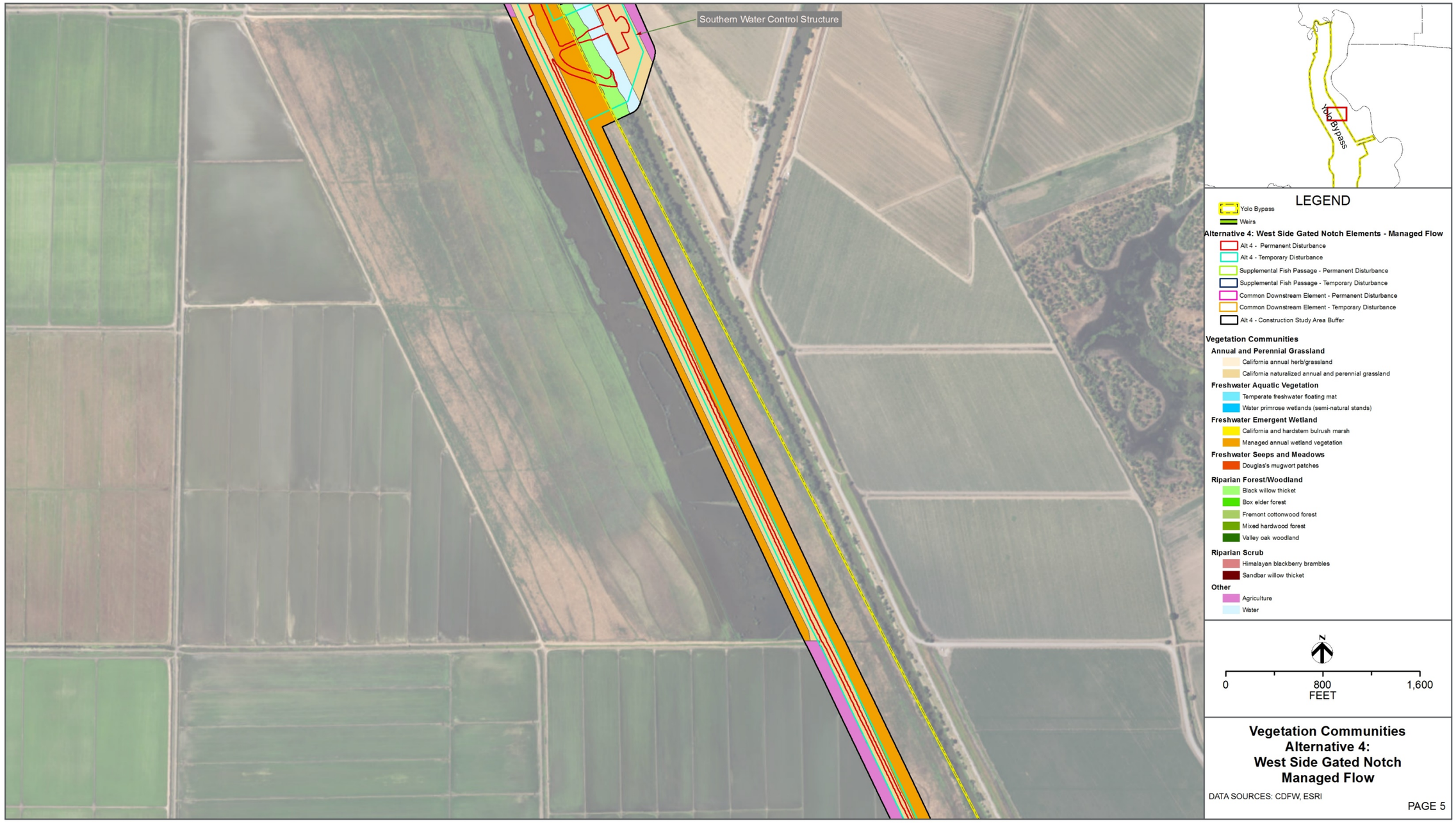

Figure 9-8e. Alternative 4 Construction Impacts to Vegetation Communities

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Figure 9-8f. Alternative 4 Construction Impacts to Vegetation Communities

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Figure 9-8g. Alternative 4 Construction Impacts to Vegetation Communities

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Figure 9-8h. Alternative 4 Construction Impacts to Vegetation Communities

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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 the construction and maintenance of Alternative 4 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 on special-status plant species and suitable habitat to **less than significant**.

9.3.3.5.2 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 4, 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 located in Fremont cottonwood forest (riparian). An additional elderberry shrub is located in California native annual and perennial grassland outside the footprint, but within the study area, for this alternative. In addition, the 2014 survey area did not cover the entirety of the Alternative 4 study area along the transport channel or the water control structures and this unsurveyed area could include elderberry shrubs.

Construction of Alternative 4 would result in permanent effects on two elderberry shrubs and temporary effects on one elderberry shrub. In addition, construction of Alternative 4 would result in permanent effects on 1.8 acres (the same as Alternative 3) and temporary effects on 1.3 acres (the same as 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 4 on valley elderberry longhorn beetle and its elderberry host plant is the same as that for Alternative 3.

The Lead Agencies expect the operations effects of Alternative 4 to be the same as those described for Alternative 3 because the areas of increased inundation under Alternative 4 do not occur in habitat that supports the valley elderberry longhorn beetle's elderberry host plant.

CEQA Conclusion

Construction impacts to valley elderberry longhorn beetle and its habitat would be **significant** because the construction of Alternative 4 would result in permanent effects on one elderberry shrub and temporary effects on one elderberry shrub and would result in permanent effects on 1.8 acres and temporary effects on 1.3 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. 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 suitable habitat to **less than significant**.

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

Construction of Alternative 4 would result in temporary impacts to 44.9 acres and permanent impacts to 47.4 acres of suitable giant garter snake aquatic habitat (Table 9-8). In addition, construction of Alternative 4 would result in temporary disturbance to 71.7 acres and permanent impacts to 44.9 acres of suitable giant garter snake upland habitat. Alternative 4 would impact the greatest amount of suitable giant garter snake aquatic and upland habitats of all the Project alternatives due to the larger footprint along the western transport channel and the inclusion of the north and south water control structures that provide suitable habitat.

The operations and maintenance effects of Alternative 4 on giant garter snake and its suitable aquatic and upland habitat would be the same as those described for Alternative 3, with the exception of additional managed flows of the north and south water control structures to provide juvenile fish rearing habitat. Alternative 4 would result in a greater extent of localized areas in the Yolo Bypass experiencing an increased average number of wet days of up to three to four weeks than Alternative 3.

The analysis of the potential significance of construction, operations, and maintenance effects of Alternative 4 on giant garter snake and its habitat is the same as that for Alternative 3.

CEQA Conclusion

Direct or indirect impacts to giant garter snake resulting from the construction and maintenance of Alternative 4 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 on giant garter snake and suitable habitat to **less than significant.**

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

Construction of Alternative 4 would result in temporary impacts to 25.9 acres and permanent impacts to 24.2 acres of suitable western pond turtle aquatic habitat. In addition, construction of Alternative 4 would result in temporary disturbance to 85.0 acres and permanent impacts to 90.4 acres of suitable western pond turtle upland habitat. Alternative 4 would have the greatest

impact to suitable aquatic and upland western pond turtle habitat of all the Project alternatives due to the larger footprint along the western transport channel and the water control structures.

In comparison to Alternative 3, which has the same general alignment but a smaller footprint, Alternative 4 would impact 37.9 more acres of suitable aquatic western pond turtle habitat (50.1 acres for Alternative 4 versus 12.2 acres for Alternative 3) and 84.1 more acres of suitable upland western pond turtle habitat (175.4 acres for Alternative 4 versus 91.3 acres for Alternative 3).

The analysis of the potential significance of construction-related direct and indirect effects of Alternative 4 on western pond turtle and its suitable habitat is the same as that for Alternative 3.

The operations and maintenance effects of Alternative 4 would be the same as those described for Alternative 3, with the exception of additional managed flows of the north and south water control structures to provide juvenile fish rearing habitat. The Lead Agencies do not expect these additional managed flows to result in adverse effects on western pond turtle or its habitat. Therefore, the impacts would be similar to those from Alternative 3.

CEQA Conclusion

Direct and indirect impacts to western pond turtle resulting from the construction and maintenance of Alternative 4 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 on western pond turtle and suitable habitat to **less than significant**.

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

Construction effects of Alternative 4 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 and pursuant to Fish and Game Code Section 3503.5, would include temporary impacts to 138.8 acres of suitable nesting and foraging habitat and permanent impacts to 146.0 acres of suitable nesting and foraging habitat for these species (Table 9-6). Alternative 4 would temporarily impact 105.5 more acres than Alternative 3 (138.8 acres for Alternative 4 versus 33.3 acres for Alternative 3) and would permanently impact 64.3 more acres than Alternative 3 (146.0 acres for Alternative 4 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, mixed hardwood 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 4 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 4 on nesting bird species would be the same as those described for Alternative 3.

CEQA Conclusion

Direct and indirect impacts on nesting bird species resulting from the construction and maintenance of Alternative 4 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 on nesting bird species and suitable nesting and foraging habitat to **less than significant**.

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

Construction effects of Alternative 4 on special-status bat species, potentially including pallid bats and western red bats, would include temporary impacts to 20.6 acres of suitable riparian habitat and 72.3 acres of suitable grassland and open-water roosting and foraging habitat. In addition, construction effects would include the loss of 24.7 acres of suitable riparian habitat and conversion of 68.6 acres of suitable grassland and open-water foraging habitat to primarily open-water habitat that is still suitable for foraging (Table 9-6). Alternative 4 would have the highest construction impacts to suitable roosting and foraging habitat for special-status bat species of all the Project alternatives. Alternative 4 would temporarily impact 63.7 more acres of suitable roosting and foraging habitat than Alternative 3 (92.9 acres for Alternative 4 versus 29.2 acres for Alternative 3) and permanently impact 29.6 more acres of suitable roosting and foraging habitat than Alternative 3 (93.3 acres for Alternative 4 versus 63.7 acres for Alternative 3). Impacts to riparian habitat (black willow thicket, box elder forest, Fremont cottonwood forest, mixed hardwood 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 4 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 4 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 the construction and maintenance of Alternative 4 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 on special-status bat species and suitable roosting habitat to **less than significant**.

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

Construction effects of Alternative 4 on suitable American badger foraging and denning habitat would include temporary impacts to 64.4 acres and permanent impacts to 65.7 acres of potentially suitable grassland habitat (Table 9-6.). Alternative 4 would have the highest construction-related temporary impacts to suitable foraging and denning habitat and the second-highest construction-related permanent impacts to suitable foraging and denning habitat for American badger of all the Project alternatives. Alternative 4 would temporarily impact 44.8 more acres than Alternative 3 (64.4 acres for Alternative 4 versus 19.6 acres for Alternative 3) and permanently impact 22.9 more acres than Alternative 3 (65.7 acres for Alternative 4 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 4 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 4 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 the construction of Alternative 4 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 on American badger and suitable foraging and denning habitat to **less than significant**.

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

Construction effects of Alternative 4 on sensitive natural communities would include temporary impacts to 22.2 acres and permanent impacts to 34.0 acres of California hardstem and bulrush marsh, black willow thickets, box elder forest, Fremont cottonwood forest, mixed hardwood forest, and valley oak woodland (Table 9-6). Alternative 4 would have the highest construction impacts to sensitive natural communities of all the Project alternatives. Alternative 4 would temporarily impact 11.8 more acres than Alternative 3 (22.2 acres for Alternative 4 versus 10.4 acres for Alternative 3) and permanently impact 4.7 more acres than Alternative 3 (34.0 acres for Alternative 4 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 4 on sensitive natural communities is the same as that for Alternative 3.

The operations and maintenance effects of Alternative 4 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 the construction of Alternative 4 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 on sensitive natural communities to **less than significant**.

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

Impacts to potential USACE and CDFW jurisdiction resulting from construction of Alternative 4 are shown in Figures 9-9a through 9-9h. Construction effects of Alternative 4 would include temporary impacts to 27.1 acres of potential USACE wetlands and 7.9 acres of potential non-wetland waters of the United States and permanent impacts to 28.2 acres of potential USACE wetland and 3.0 acres of potential non-wetland waters of the United States. In addition, construction of Alternative 4 would result in temporary impacts to 47.7 acres of potential CDFW riparian habitat, 7.9 acres of potential CDFW unvegetated streambed, permanent impacts to 52.9 acres of potential CDFW riparian habitat, and 3.0 acres of potential CDFW unvegetated streambed (Table 9-9 and Table 9-10). Alternative 4 would have the highest construction impacts to potential USACE wetlands and CDFW riparian habitat of all the Project alternatives. Compared to Alternative 3, Alternative 4 would temporarily impact 31 more acres of USACE jurisdiction (35.0 acres for Alternative 4 versus 4.0 acres for Alternative 3) and 42.8 more acres of CDFW jurisdiction (55.6 acres for Alternative 4 versus 12.8 acres for Alternative 3). In addition, Alternative 4 would permanently impact 16.3 more acres of USACE jurisdiction (31.2 acres for Alternative 4 versus 14.9 acres for Alternative 3) and 20.9 more acres of CDFW jurisdiction (55.9 acres for Alternative 4 versus 35.0 acres for Alternative 3).

The analysis of the potential significance of construction- and operations-related direct and indirect effects of Alternative 4 on potential USACE, CDFW, and RWQCB jurisdictional areas is the same as that for Alternative 3.

The operations and maintenance effects of Alternative 4 on potential USACE, CDFW, and RWQCB jurisdictional areas would be the same as those described for Alternative 3.

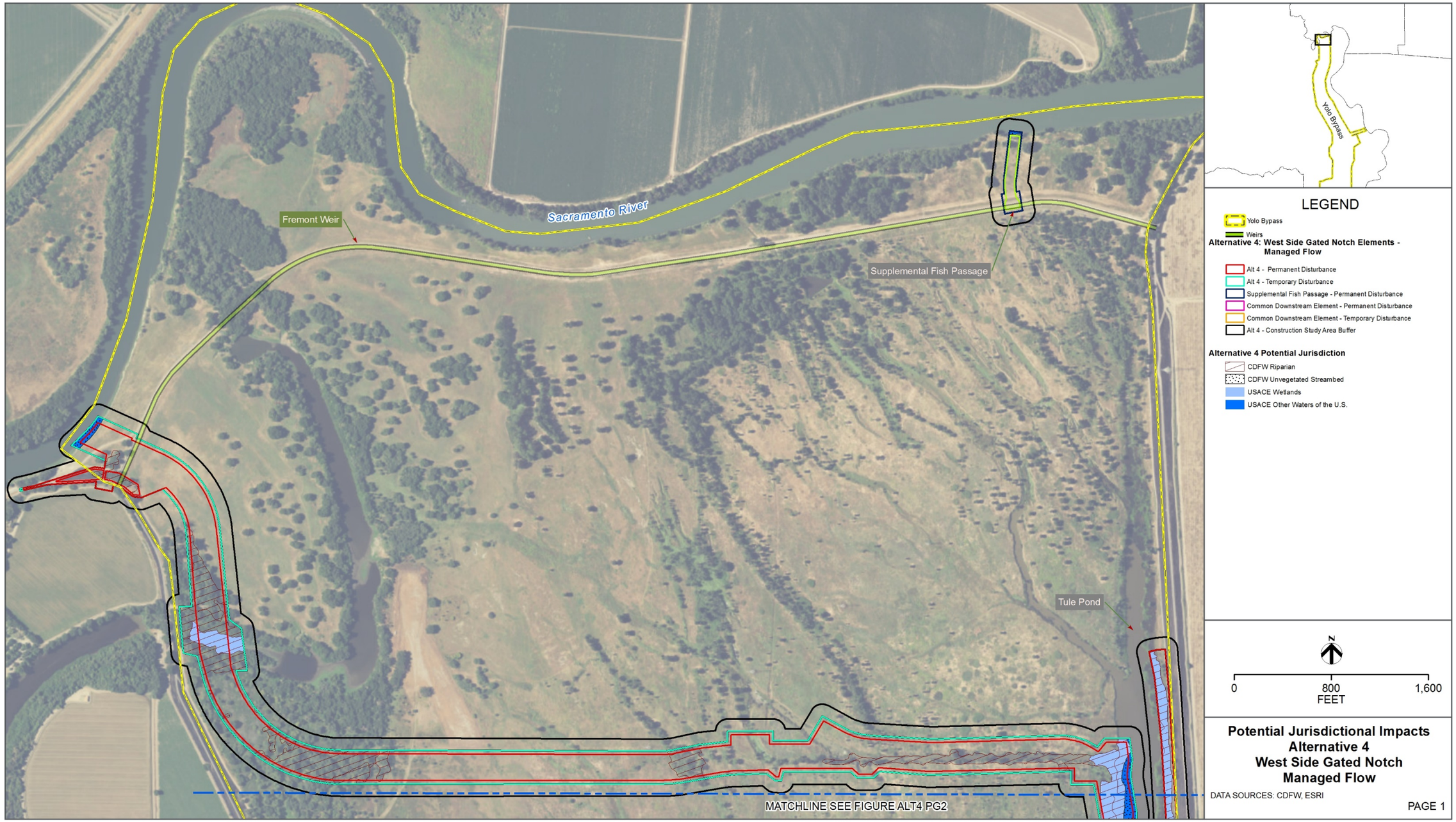

Figure 9-9a. Alternative 4 Construction Impacts to Potential USACE and CDFW Jurisdictional Areas

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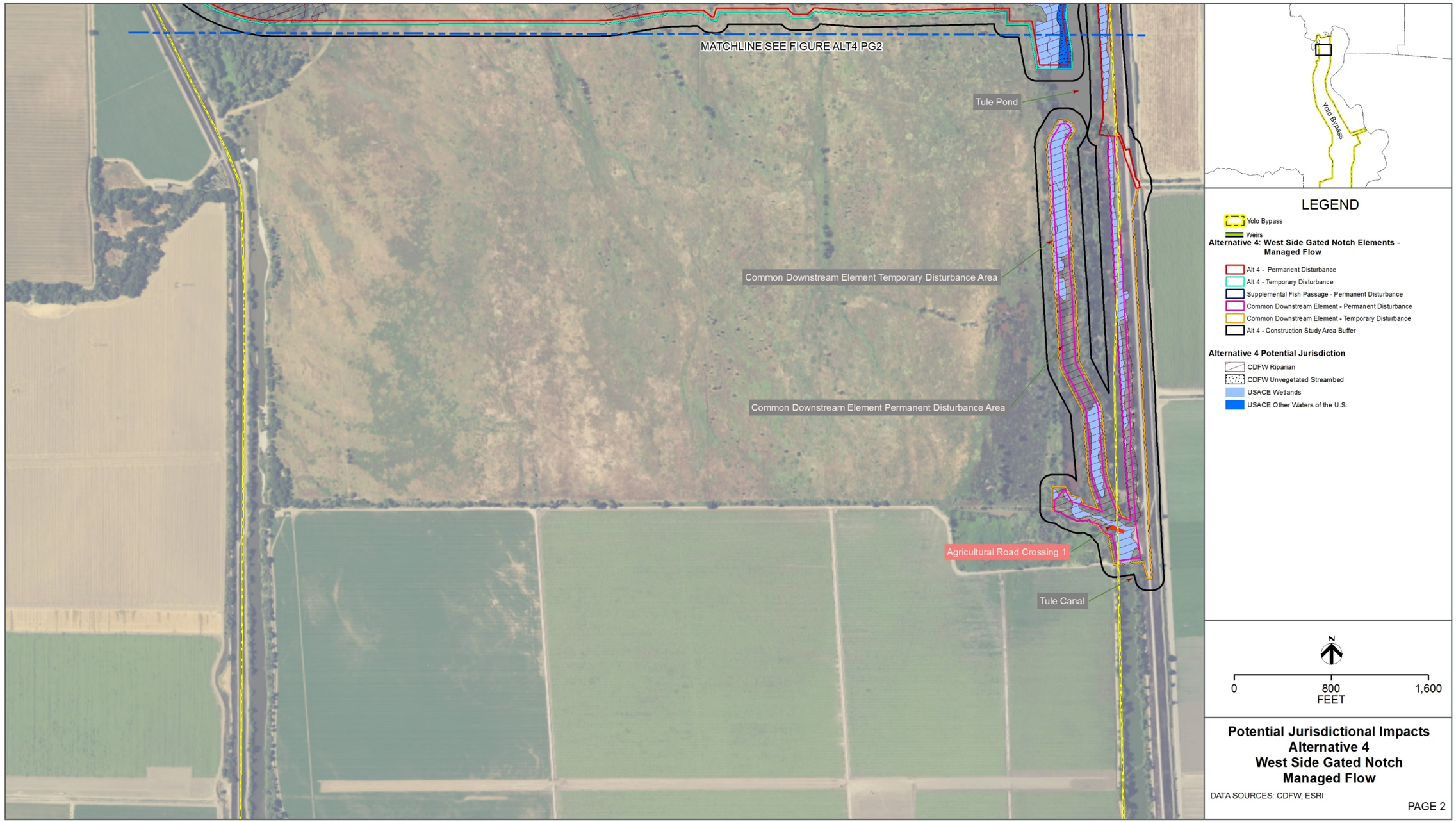

Figure 9-9b. Alternative 4 Construction Impacts to Potential USACE and CDFW Jurisdictional Areas

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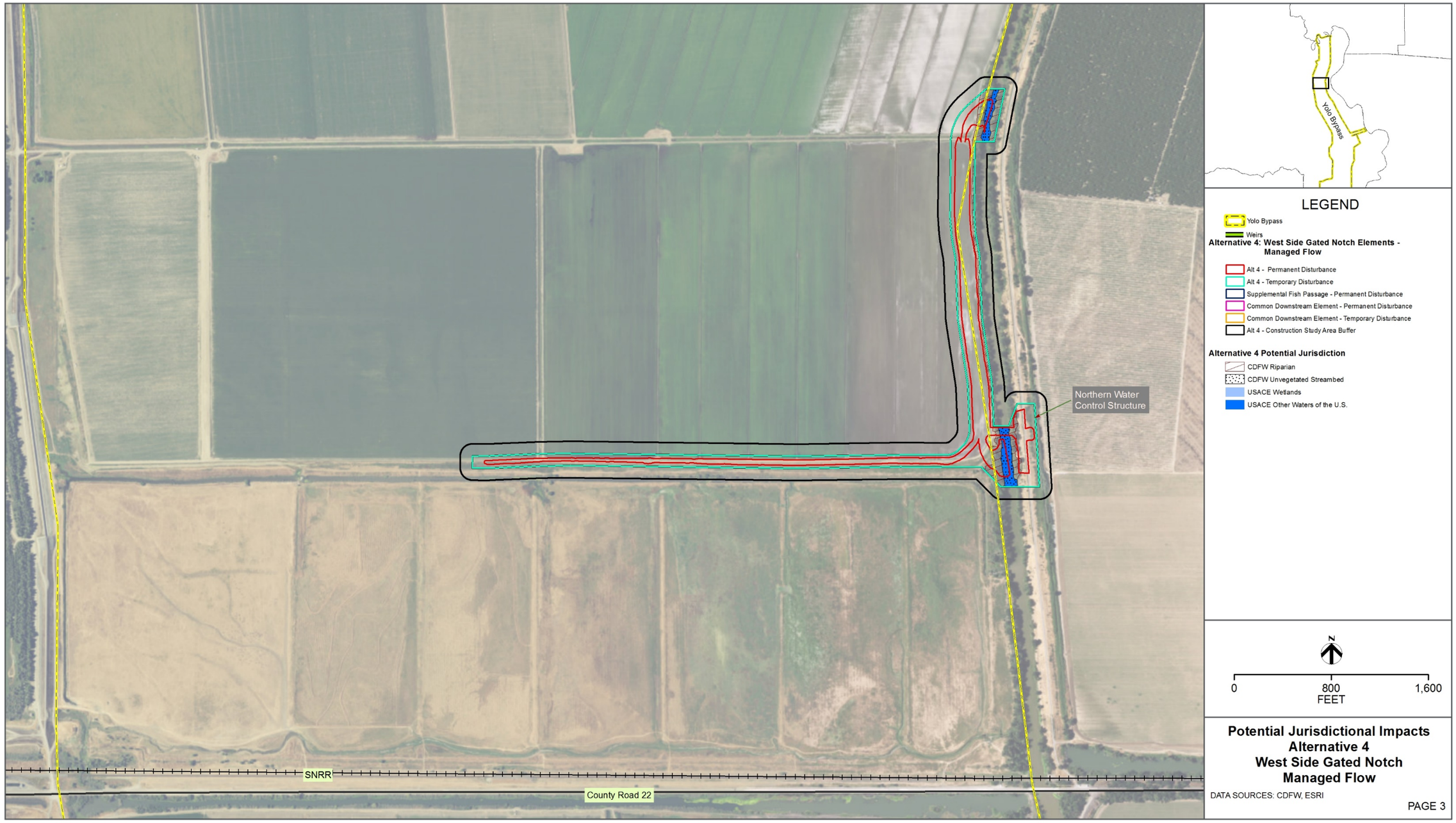

Figure 9-9c. Alternative 4 Construction Impacts to Potential USACE and CDFW Jurisdictional Areas

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Figure 9-9d. Alternative 4 Construction Impacts to Potential USACE and CDFW Jurisdictional Areas

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Figure 9-9e. Alternative 4 Construction Impacts to Potential USACE and CDFW Jurisdictional Areas

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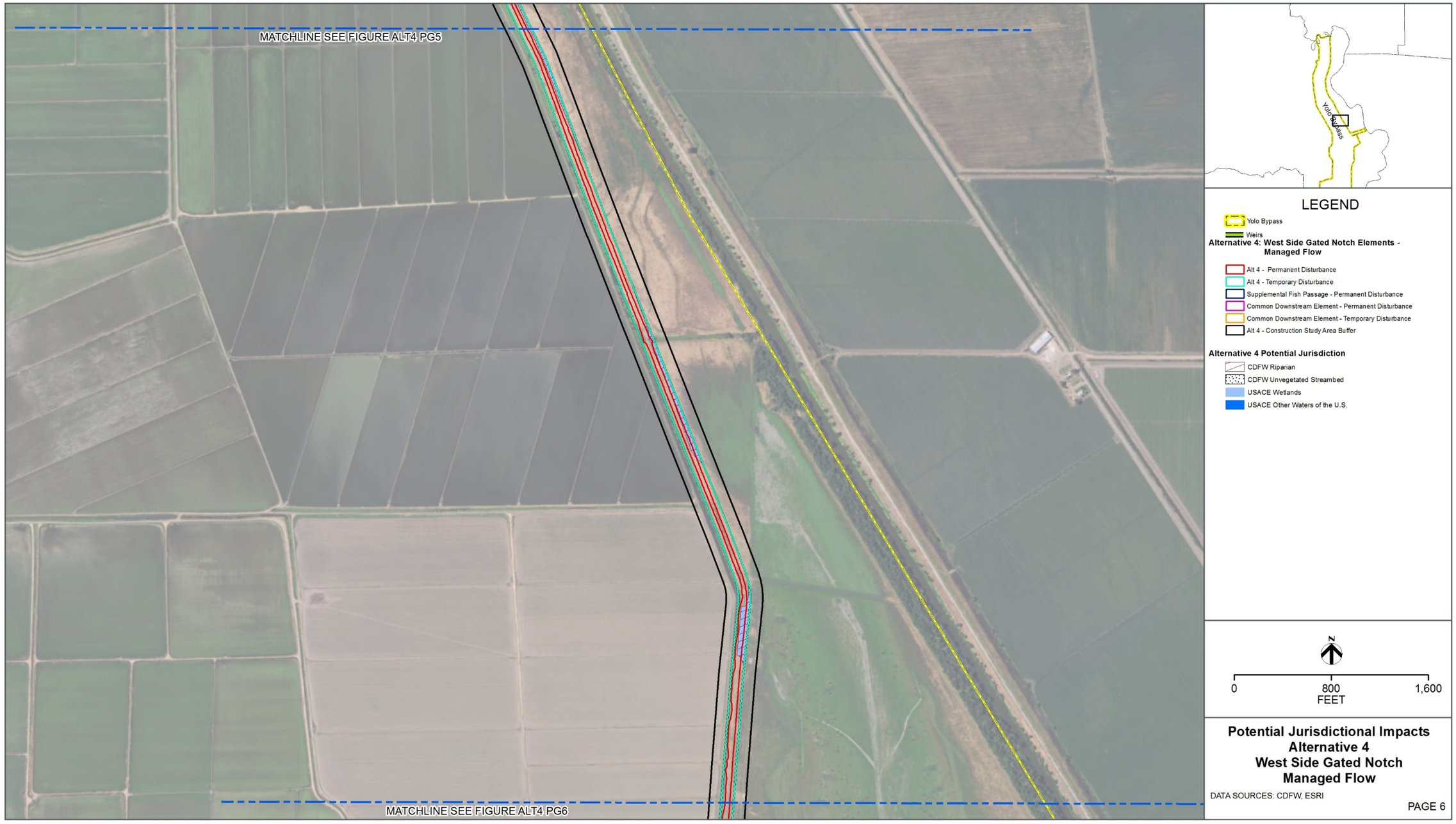

Figure 9-9f. Alternative 4 Construction Impacts to Potential USACE and CDFW Jurisdictional Areas

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Figure 9-9g. Alternative 4 Construction Impacts to Potential USACE and CDFW Jurisdictional Areas

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Figure 9-9h. Alternative 4 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), and CDFW riparian areas (freshwater marsh, freshwater emergent wetland, and riparian forest/woodland), and RWQCB jurisdictional areas resulting from the 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 on 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 the 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: Potential Conflict with Provisions of an Adopted HCP/NCCP or Other Approved Local, Regional, or State Habitat Conservation Plan

Construction and maintenance of Alternative 4 would impact a very small portion of Priority 1 (higher priority) Lands in the FWWA and a very small portion of Priority 2 (lower priority) Lands along the northern water control structure. Because these areas represent such a small proportion of the total designated Priority 1 and Priority 2 Lands and implementation of Alternative 4 would not prevent successful implementation of the identified Yolo HCP/NCCP conservation measures, conservation strategy, or conservation reserve system, Alternative 4 does not conflict with the Yolo HCP/NCCP.

CEQA Conclusion

Alternative 4 is consistent with the provisions of the 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, incorporates multiple gated notches in the central location on the existing Fremont Weir that would allow combined flows of up to 3,400 cfs. This alternative 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. 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 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.

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.

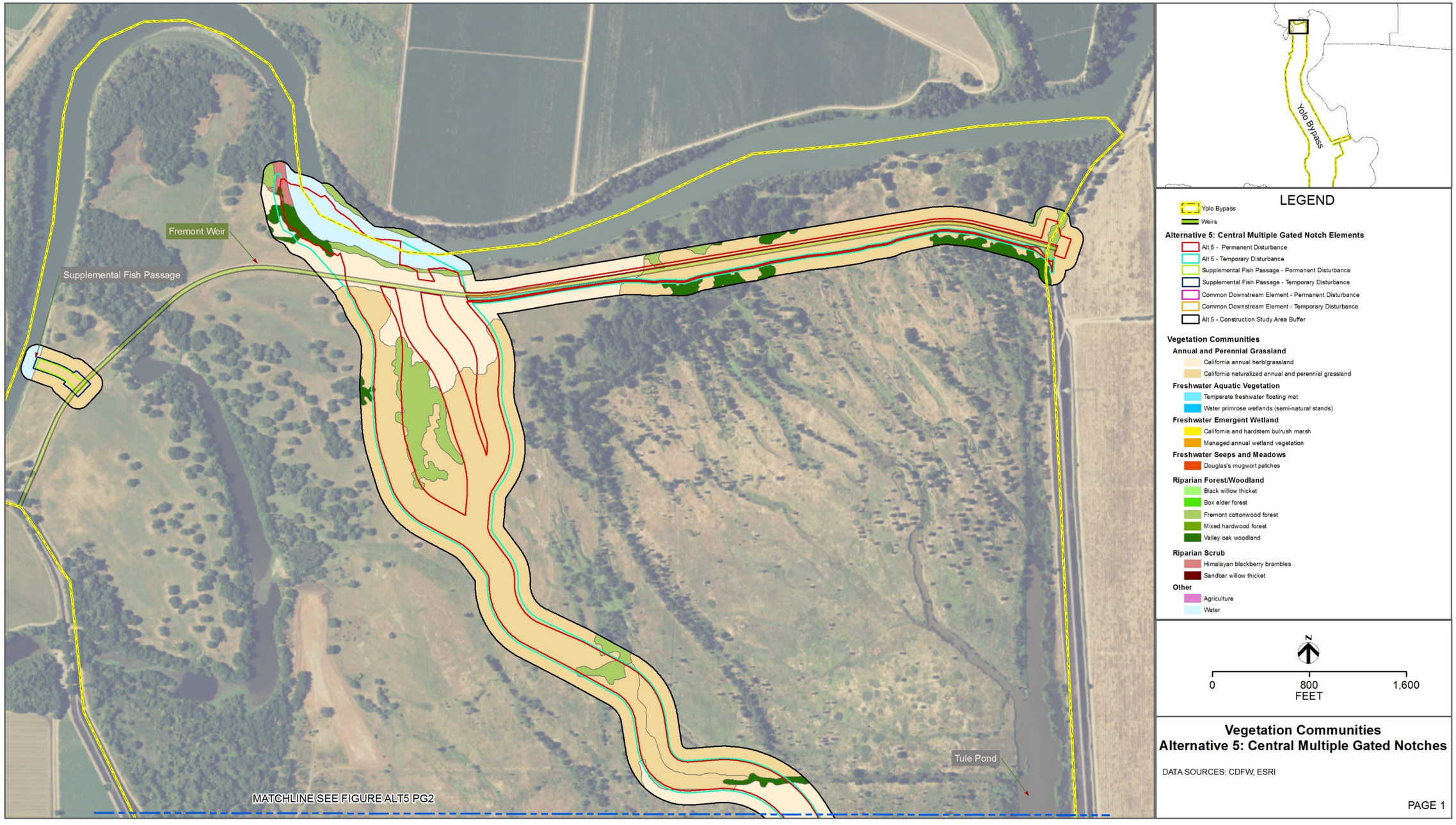

Figure 9-10a. Alternative 5 Construction Impacts to Vegetation Communities

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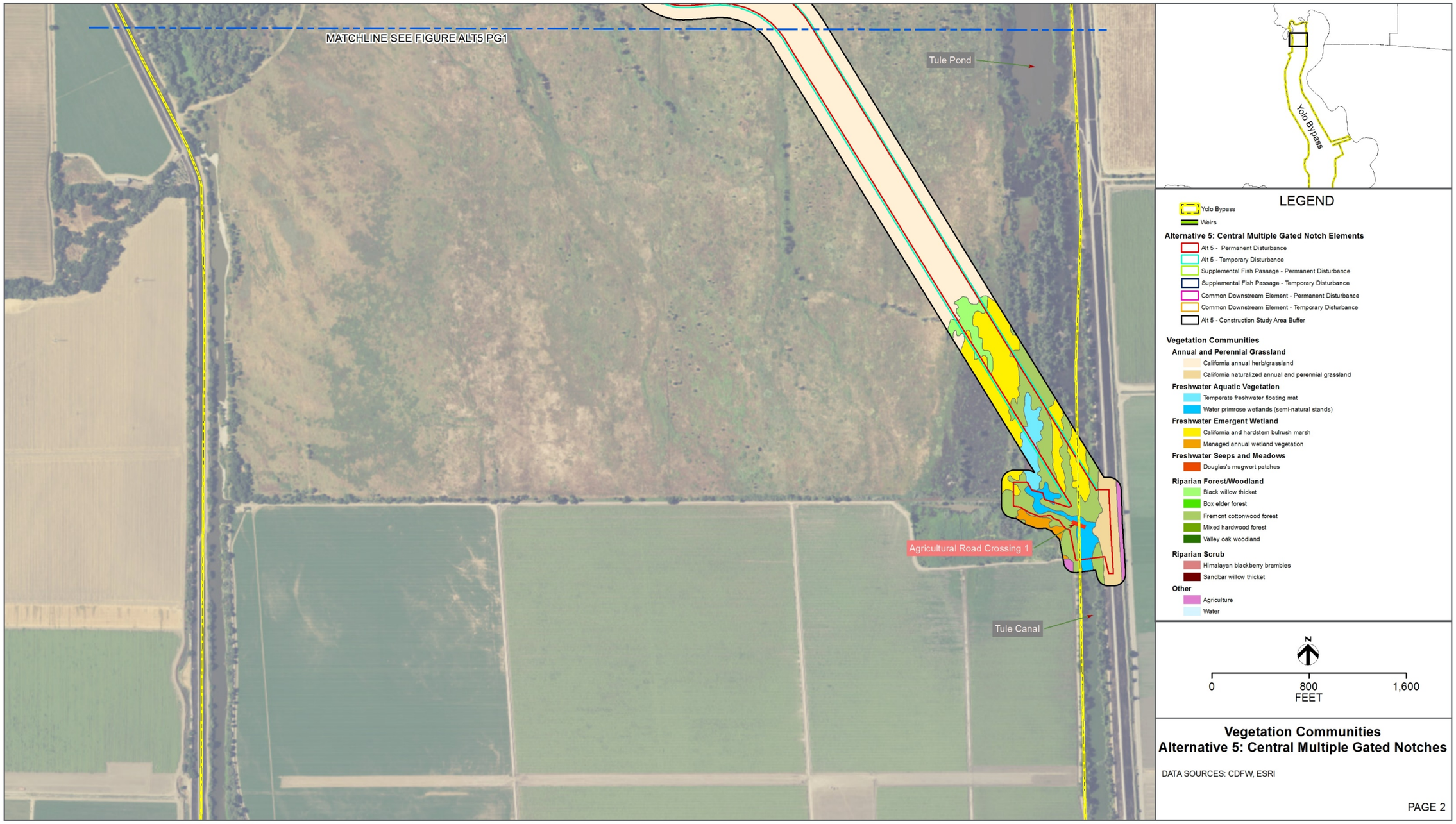

Figure 9-10b. Alternative 5 Construction Impacts to Vegetation Communities

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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 the construction and maintenance 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 on special-status plant species and suitable 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 resulting from the construction of Alternative 5 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 on valley elderberry longhorn beetle and suitable habitat 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 2.

CEQA Conclusion

Direct or indirect impacts to giant garter snake resulting from the 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 on giant garter snake and suitable 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 the 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 on western pond turtle and 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 and pursuant to Fish and Game Code Section 3503.5, 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 the 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 on nesting bird species and 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 the 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 on special-status bat species and 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 the 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 on American badger and 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 the 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 on 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 the 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 on 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 the 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: Potential 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 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 the 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 increased 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 the 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 on special-status plant species and suitable 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 the 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 on valley elderberry longhorn beetle and suitable habitat 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 the 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 on giant garter snake and suitable 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 the 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 on western pond turtle and 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 and pursuant to Fish and Game Code Section 3503.5, 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 the 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 on nesting bird species and 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 the 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 on special-status bat species and 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 the 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 on American badger and 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 the 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 on 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 41.5 acres of potential CDFW riparian habitat and 1.4 acres of potential CDFW unvegetated streambed (Table 9-9 and Table 9-10). 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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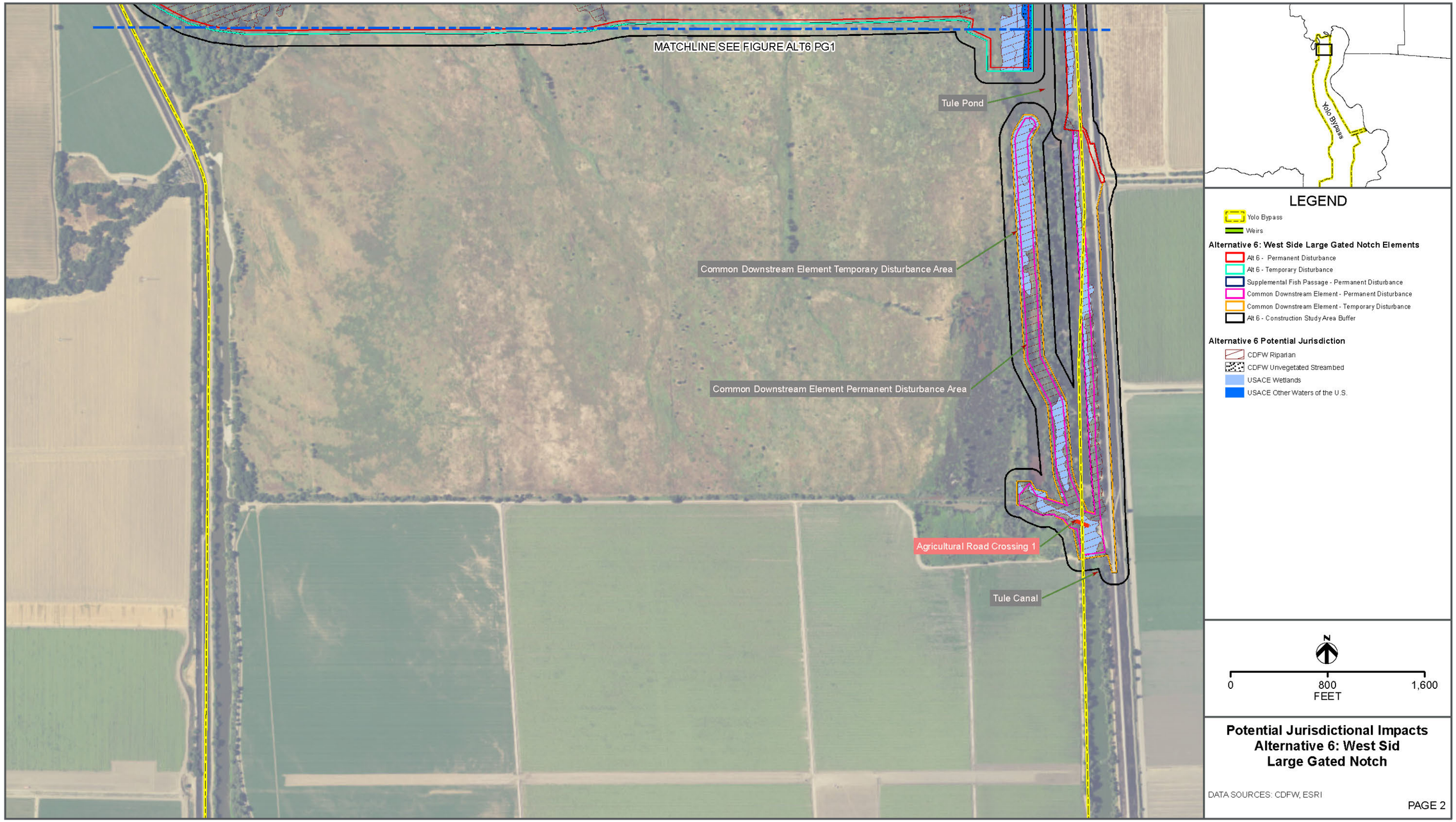

Figure 9-13b. Alternative 6 Construction Impacts to Potential USACE and CDFW Jurisdictional Areas

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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 the 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 on 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 the 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: Potential 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 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 (O)	MM-TERR-1	LTS
	2, 3, 4, 5, 6	S (C, M), LTS (O)	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: Potential 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, finalized in 2019, 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). All the alternatives under consideration for development and management, including all access, staging, and construction will collectively be referred to as the APE for the purposes of this document.

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 2018. 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 2018 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.

A supplemental cultural resources assessment was conducted in 2018 to identify potential cultural resources in the APE. This assessment included an updated record search that confirmed existing information, an additional study that modeled the extent of historic-era alluvium, a pedestrian surface archaeological survey that excluded the modeled area of historic alluvium, and a concurrent built environmental resources study. These studies confirmed the previous existing information. None of the new information changed the analysis or conclusions set forth in this chapter (Far Western 2018).

10.1.1.1 Literature and Records Search

10.1.1.1.1 California Historical Resources Information System (CHRIS)

Five record searches were conducted between September 2014 and October 2018 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 includes the 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 Previously Recorded Resources within the APE

The records searches identified previously recorded cultural resources within the Project APE (Table 10-1). The previously recorded 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), buried prehistoric site (P-51-000246 or DWR-FW-1), segment of multi-ditch canal system (P-57-000521), Fremont Weir (P-57-001117), SRFCP Levee Unit 123, levee segment (P-57-001118), north of Knights Landing Ridge Cut Cross Canal (P-57-001196), 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), the Levee Unit 27 is being treated as eligible for listing on both registers and the Tule Canal is potentially eligible for listing on both registers. In addition to the previously recorded sites, FW-FW-1, a prehistoric site was identified during the geoarchaeological testing program.

Table 10-1. Resources Previously Recorded within the APE

Primary No.	Resource type	In APE	CRHR Eligibility	NRHP Eligibility
51-000246	Buried prehistoric site	X	Unevaluated	Unevaluated
51-00196	North of Knights Landing Ridge Cross Cut Canal	X	Not Eligible	Not Eligible
51-001118	SRFCP Levee Unit 123, levee segment	X	Not Eligible	Not Eligible
P-57-000132	Trees/natural vegetation	X	Not Eligible	Not Eligible
P--000414	RD 1600 Tule Canal	X	Potentially Eligible	Potentially Eligible
51-000521	Multi-ditch canal system	X	Not Eligible	Not Eligible
P-57-000519	Levee Unit 127	X	Treated as Eligible	Treated as Eligible
51-001117	Fremont Weir	X	Not Eligible	Not Eligible

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

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 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.

10.1.1.2.2 Paleontological Resources

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), (Pierce 2017), and 2018 (Far Western 2018) 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. 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 (2014) were generally restricted to the Fremont Weir Wildlife Area and near the areas described above. Additional surveys were not conducted due to access restrictions including, but not limited to areas of the water control structures; 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 (2014, 2015, 2016 and 2018) is approximately 65 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 was conducted in 2018 completing approximately 80 percent of the subsurface investigation for the APE. Surveys were conducted at the headworks structures and supplemental fish passage for different alternative locations.

The overall potential for buried prehistoric archaeological sites in the study area was assessed through a Geographic Information Systems (GIS) -based model (Scher 2018a). The landform age

was not used as a factor in modeling the potential for buried sites because of the known historic-era sediment cap, as is typical. Instead, the potential for encountering buried prehistoric archaeological sites was estimated based solely on the proximity to historic-era water sources (springs, streams, lakes, etc.). Thus, the sensitivity model is essentially a "surface" potential model that can be used to assess the relative probability for prehistoric sites at the modern ground surface in areas without a historic-era sediment cap.

10.1.1.4 Field Survey Results

The 2014 and 2018 pedestrian surface surveys of approximately 65 percent of the APE 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 buried prehistoric sites, DWR-FW-1, DWR-FW-2, and DWR-FW-3, within the 2014 survey area. No archaeological resources were recorded in the 2018 pedestrian survey. During the geoarchaeological subsurface testing, FW-FW-1 was identified. Far Western identified two built environmental resources, EW-01 and EW-02, during the survey.

Using the geoarchaeological model, the highest prehistoric archaeological site potential occurs within 200 meters of a water source, with the potential diminishing with greater distance from active or formerly active sources of fresh water. Based on this modeling, the APE is estimated to have lowest to low potential for prehistoric sites in 287 acres (59.7%), moderate potential in 64 acres (13.3%), and high to highest potential in 130 acres. The majority of the high and highest potential is at the north end of the APE, adjacent to the Sacramento River. One small area of high to highest potential is located near the southern end of the APE, adjacent to historic-era Todhunters Lake.

10.1.1.4.1 Archaeological Sites

Two prehistoric archaeological sites have been identified in the project APE. Additional subsurface investigations may be required if changes to the APE are proposed that include areas not previously tested, and would be required to locate the full extent of site boundaries for buried sites P-51-000246/SUT-246 (DWR-FW-1) and FW-FW-1. Additional subsurface investigations may also be required if an alternative in a high-sensitivity areas that were inaccessible for testing, is selected. As P-51-000246/SUT-246 (DWR-FW-1) and FW-FW-1 have not previously been evaluated for eligibility for the National or California Registers, evaluation would be necessary if a project alternative is selected that could have an adverse effect on these resources.

Table 10-2. Archaeological Sites within the APE

Primary No.	Site Type	In APE	NRHP Status
P 51-000246	Prehistoric	X	Unevaluated
FW-FW-1	Prehistoric	X	Unevaluated

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

10.1.1.4.2 Historic Built Environment Resources

Based on the results of the previous research, the cultural context, and the results of the field survey, the following built environment resources were evaluated and recommended ineligible for the National or California Registers: P-57-000414/Tule Canal; P-57-001196/North of Knights Landing Ridge Cut Cross Canal; ESA-1/Pump Gauging Station East; ESA-2/Pump Gauging Station West; ESA-3/Canal System; EW-01/Canal; and EW-02, Abandoned Transmission Line/Flood Measurement Poles. Three resources (P-57-000519/Levees of the Knights Landing Ridge Cut/SRFCP Levee Unit 127; P-57-001118/SRFCP Levee Unit 123/Levee segment associated with Reclamation District 1600; and P-57-001117/Fremont Weir) are recommended as individually ineligible for the National or California Registers. However, if they are considered as potential contributors to a future Sacramento River Flood Control Project (SRFCP) historic district, these resources could then be considered as historical resources under CEQA and Section 106 of the NHPA.Table 10-3. Historic Built Environment Resources within the APE

Primary No.	Site Type	In APE	NRHP Status
P-57-000414	RD 1600 Tule Canal	X	Not eligible
P-57-000416	Tule Canal culvert control structure	X	Not eligible; destroyed
P-57-000519	Yolo Bypass Levee Unit 127	X	Not Individually, May Contribute to a SRFCP Historic District
P-57-001117	Historic Fremont Weir	X	Not Individually, May Contribute to a SRFCP Historic District
P-57-001118	East Yolo Bypass Levee/ Reclamation District 1600 Levee	X	Not Individually, May Contribute to a SRFCP Historic District
P-57-001196	North of Knights Landing Ridge Cut Cross Canal	X	Not eligible
ESA-1	Pump gauging station east	X	Not eligible
ESA-2	Pump gauging station west	X	Not eligible
ESA-3	Canal system	X	Not eligible
EW-01	Canal	X	Not eligible
EW-02	Abandoned transmission line/flood measurement poles	X	Not eligible

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

Previously Recorded and Evaluated Built Environment Resources

Fremont Weir (P-57-001117), recorded in 2014, is a 9,120-foot-long concrete flood control structure. The weir is approximately four feet high at its crest and the concrete stilling apron extends from the downstream side of the overflow structure to a width of approximately 20 feet. Fremont Weir was built in 1923-1924 as part of the SRFCP (which was constructed between 1917 and 1961). It was previously recommended ineligible for listing as an individual resource within the National or California Registers; however, based upon the supplemental assessment the National Register evaluation is appropriate but may contribute to a SRFCP Historic District pending SHPO consensus.

SRFCP Levee Unit 127 (P-57-000519), recorded in 2005 and updated in 2015, is an earthen berm measuring approximately 15 feet high, with a 16-foot-wide crown topped with a gravel access road. The levees making up this unit include sections built in the 1930s by private individuals with major improvements in 1943 as part of incorporation into the SRFCP (which was constructed between 1917 and 1961). It was previously recommended ineligible for listing

as an individual resource within the National or California Registers; however, based upon the supplemental assessment the National Register evaluation is appropriate but may contribute to a SRFCP Historic District pending SHPO consensus.

East Yolo Bypass Levee/ Reclamation District 1600 Levee Unit 123 (P-57-001118), recorded in 2014, is an earthen berm measuring approximately 15 feet high, with a 16-foot-wide crown topped with a gravel access road. It is part of the system built for the SRFCP between 1917 and 1961. The levee was previously recommended ineligible for listing as an individual resource within the National or California Registers; however, based upon the supplemental assessment the National Register evaluation is appropriate but may contribute to a SRFCP Historic District pending SHPO consensus.

Tule Canal (P-57-000414), recorded in 2002 and 2015, is approximately 40 feet wide, with vegetation along the banks and a levee (the East Yolo Bypass levee described above) and dirt toe road along the east side of the channel. The Tule Canal is depicted on maps dating to as early as 1871, but the original alignment or portions of the canal alignment appear to have evolved over time. It was recommended ineligible through survey evaluation in 2010; however, based upon the supplemental assessment the National Register evaluation is appropriate but may contribute to a SRFCP Historic District pending SHPO consensus.

North of Knights Landing Cross Cut Canal (P-57-001196), recorded in 2014, is an earthen canal measuring approximately 12 feet wide for most of its length, widening to about 40 feet wide as it approaches the Yolo Bypass east levee, and connecting via pipeline to the Reclamation District 1600 canal system east of the APE. The canal may be visible on historical aerial photographs as early as 1937. The canal was a part of a larger system of irrigation canals currently bounded by the SRFCP levee Unit 127 (P-57-000519) and the Yolo Bypass East Levee (P-57- 001118). It was not evaluated in prior studies and the current analysis indicates that the resource is not National Register eligible pending SHPO consensus.

Newly Recorded and Evaluated Built Environment Resources:

Ditch

EW-01 is a large ditch or canal cut at the southern end of an area crossed by several deep, northwest-southeast-trending overflow flood channels, probably to reclaim farm fields to the south. This ditch runs due east-west, and is up to eight meters deep and 10 meters across. Substantial undermining of the channel shows its age and lack of maintenance. Although the canal was in place on 1937 maps, the analysis indicates it is ineligible for listing for the National or California Registers pending SHPO consensus.

Wooden Poles

EW-02 is a series of at least seven wooden poles aligned along axis 95/280 degrees' azimuth. The poles are spaced about 75 meters apart, measure about 15 feet tall, and currently have no crosspieces, wires, or insulators associated. They all have metal number designations, and are graduated in 0.1-foot intervals on metal strips. While it appears as a transmission line on a 1954 map, the analysis indicates it is ineligible for listing for the National or California Registers pending SHPO consensus.

Pump Gauging Station

ESA-1 is a mid-twentieth-century pump gauging station along the bank of the Sacramento River. This resource consists of concrete pillars supporting elevated, sheet metal utility structures that house gauging equipment. Metal walkways provide access, measuring 30 feet long for ESA-1. It is noted on 1952 maps; however, the analysis indicates it is ineligible for listing for the National or California Registers pending SHPO consensus.

ESA evaluated the station, and recommended it ineligible for listing as an individual resource within the National or California Registers. Reclamation and DWR agree with this determination, pending SHPO consensus.

Similar to ESA-1, ESA-2 is a mid-twentieth-century pump gauging station along the bank of the Sacramento River. It is similar to ESA-1 but has a metal walkway 70 feet long. It is noted on 1952 maps; however, the analysis indicates it is ineligible for listing for the National or California Registers pending SHPO consensus.

Tule Canal Segment

ESA-3 was not accessible during the survey, but was identified through review of historical topographic maps and aerial photography. This resource consists of a segment of the Tule Canal, measuring approximately 5.7 miles long, with segments appearing on topographic maps dating as early as 1948, and in its nearly current alignment by 1967. The analysis indicates it is ineligible for listing for the National or California Registers pending SHPO consensus.

In summary, the 10 built environment resources within the APE all appear to be ineligible for listing in the National or California Registers. However, as an evaluation of the resources associated with the SRFCP is beyond the scope of this study, there are three resources (the levees of the Knights Landing Ridge Cut, the SRFCP Levee Unit 123, and the Fremont Weir) which could be considered as potential contributors to a future SRFCP historic district. As such, these resources would be considered potential historical resources under CEQA and historic properties for the purposes of Section 106 of the NHPA.

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 mentioned. 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 other 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 including Paleo-Indian, Archaic, and Emergent/Historic. 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 the later part of the period as new technologies were developed that reflected long-term residential occupation. These included:

- 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) and
- large quantities of habitation debris and features (such as fire-cracked rock heaps, shallow hearths, house floors, and flexed burials).

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 Krober (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.

10.1.4 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.

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 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.

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.

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).

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 4331(b)(4).

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 (36 CFR Section 800.1). 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.
- 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.
5. 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 800.5(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 …(36 CFR 800.11)

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 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 NHPA. 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.

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 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 avoid, minimize, and/or mitigate 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 or 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 and 2018 pedestrian surface surveys 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 site DWR-FW-1. Communication with DWR archaeologists indicates these resources may be sensitive for human remains. The Fremont Weir and East Yolo Bypass Levee are not eligible on an individual basis but could be considered as potential contributors to a future SRFCP historic district. 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. 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. Alternative 1 could also result in adverse effects to three built environment resources that have been determined not eligible on the NRHP or CRHR.

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.

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 are not eligible on an individual basis but could be considered as potential contributors to a future SRFCP historic district. The construction proposed under Alternative 1 would directly affect the Fremont Weir and may affect the integrity of the 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 to 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**.

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

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 resources in the remaining footprint. 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. The reclamation and agricultural development of the region provided part of the economic base for the development of surrounding urban centers; therefore, 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. 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; therefore, they are likely to qualify as historical resources or unique archaeological sites under CEQA and be eligible for the NRHP. Ground-disturbing construction could damage these resources causing a loss of 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 encompasses 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).

CEQA Conclusion

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**.

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

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. For example, 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 as defined in CEQA or adversely affect the resources as defined in Section 106 of NHPA because this disturbance would diminish 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, result in a **significant impact**. These resources would not be identified prior to construction; therefore, 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. Areas that are considered sensitive for unidentified archaeological resources may also include tribal monitor(s) from the applicable Native American tribe.
- 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**. These resources are not known and would not be known until accidently exposed; therefore, 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 as well as cultural awareness and tribal sensitivity training.

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. These isolated resources are not associated with larger deposits; therefore, 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 one identified archeological site and three 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 and/or affect the physical configuration of Fremont Weir that may affect the significant characteristics 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 archaeological and historic built environment resources would be minimized and impacts would be reduced to **less than significant**.

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 one previously unidentified archeological site 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. Four historic sites and one archaeological site would be affected.

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. The Fremont Weir and East Yolo Bypass Levee are not eligible on an individual basis but could be considered as potential contributors to a future SRFCP historic district. The construction proposed under Alternative 3 would directly affect the Fremont Weir and may affect the integrity of setting or other aspects of the integrity of the proposed historic district.

Potential impacts to identified one archeological site and four 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 one identified archaeological resource 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.

The Fremont Weir and East Yolo Bypass Levee are not eligible on an individual basis but could be considered as potential contributors to a future SRFCP historic district. The construction proposed under Alternative 3 would directly affect the Fremont Weir and may affect the integrity of setting or other aspects of the integrity of the proposed 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.

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 Flow[1]

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 one identified archaeological site and three historic-era built environment resources as described for Alternative 1, with the addition 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 one identified archaeological resource 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. The Fremont Weir and East Yolo Bypass Levee are not eligible on an individual basis but could be considered as potential contributors to a future SRFCP historic district. The construction proposed under Alternative 4 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, 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 Fremont Weir and East Yolo Bypass Levee are not eligible on an individual basis but could be considered as potential contributors to a future SRFCP historic district. The construction proposed under Alternative 4 would directly affect the Fremont Weir and may affect the integrity of setting or other aspects of the integrity of the proposed historic district. 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 alteration would be **less than significant**.

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

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**.

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**.

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. These isolated resources are not associated with larger deposits; therefore, 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 the identified archeological site and three 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 Fremont Weir and East Yolo Bypass Levee are not eligible on an individual basis but could be considered as potential contributors to a future SRFCP historic district. The construction proposed under Alternative 5 would directly affect the Fremont Weir and may affect the integrity of setting or other aspects of the integrity of the proposed historic district. 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 site 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 the identified archeological sites and four historic-era built resources under Alternative 6 would be similar to those described for Alternative 3.

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. 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**.

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.

Table10-4. 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
	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

Impact	Alternative	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
	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
- Agriculture Road Crossing 4 Fish Passage Project
- Lisbon Weir Fish Passage Project
- Lower Putah Creek Restoration Project

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.

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11 Land Use and Agricultural Resources

This chapter describes the existing land use conditions and the regulatory setting associated with land use and agricultural resources in the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project (Project) area and environmental consequences as they pertain to the implementation of the Project alternatives.

11.1 Environmental Setting/Affected Environment

The area of analysis for land use and agricultural resources includes areas where construction and operations would take place and could result in land use or agricultural resource effects. Construction activities would take place in the Fremont Weir Wildlife Area (FWWA), Tule Pond, Tule Canal, and fields within the Yolo Bypass, all located within Yolo and Sutter counties. The Yolo Bypass is predominantly located in Yolo County, with small areas of the bypass in Sutter and Solano counties.

The area of analysis for land use and agricultural resources is Yolo, Sutter, and Solano counties, with discussions specific to the Yolo Bypass. The Yolo Bypass is discussed first and followed by a regional-level discussion of the three counties. The regional-level discussion provides information on land use in the areas, including and surrounding the Yolo Bypass.

Lands within the Yolo Bypass are designated Agriculture, Public, and Open Space by Sutter County and Agriculture by Yolo County (County of Yolo 2009; Sutter County 2011). The area of analysis has no established communities.

Figure 11-1 shows the land use and agricultural resources study area. Figure 11-2 the land use designations, primarily by crop, within the area of analysis. Table 11-1 shows different agricultural land designations in comparison with other land and water areas within the Yolo Bypass. The majority of the Yolo Bypass is designated as Unique Farmland. Unique Farmland refers to lands, other than Prime Farmland, that are used for producing specific high-value food and fiber crops, such as citrus, tree nuts, olives, cranberries, and other fruits and vegetables, and is often located in special microclimates. Prime Farmland is land that has the best combination of physical and chemical properties desired to produce food, feed, forage, fiber, and oilseed crops. Farmlands of Statewide or Local Importance are generally lands, determined by the county board of supervisors and a local advisory committee, that nearly meet the requirements for Prime or Unique Farmlands that are used to produce food, feed, fiber, forage, and oilseed crop. Farmland of Local Potential refers to lands that have soils suitable for Prime or Farmland of Statewide Importance designations but are not irrigated or cultivated. Figure 11-3 presents the land use categories, including Prime Farmland, Unique Farmland, and Farmland of Statewide Importance, within the Yolo Bypass.

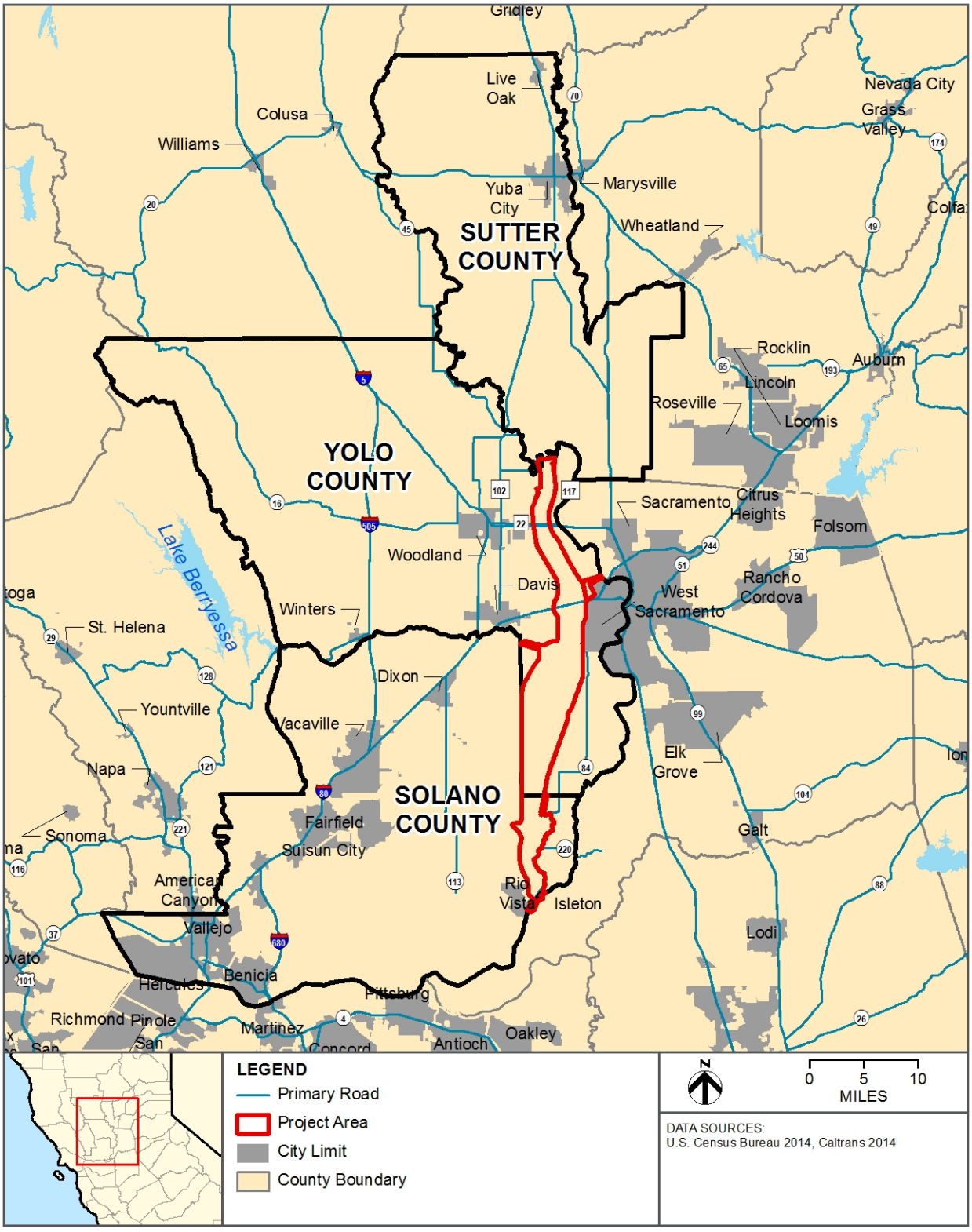

Figure 11-1. Area of Analysis for Land Use and Agricultural Resources

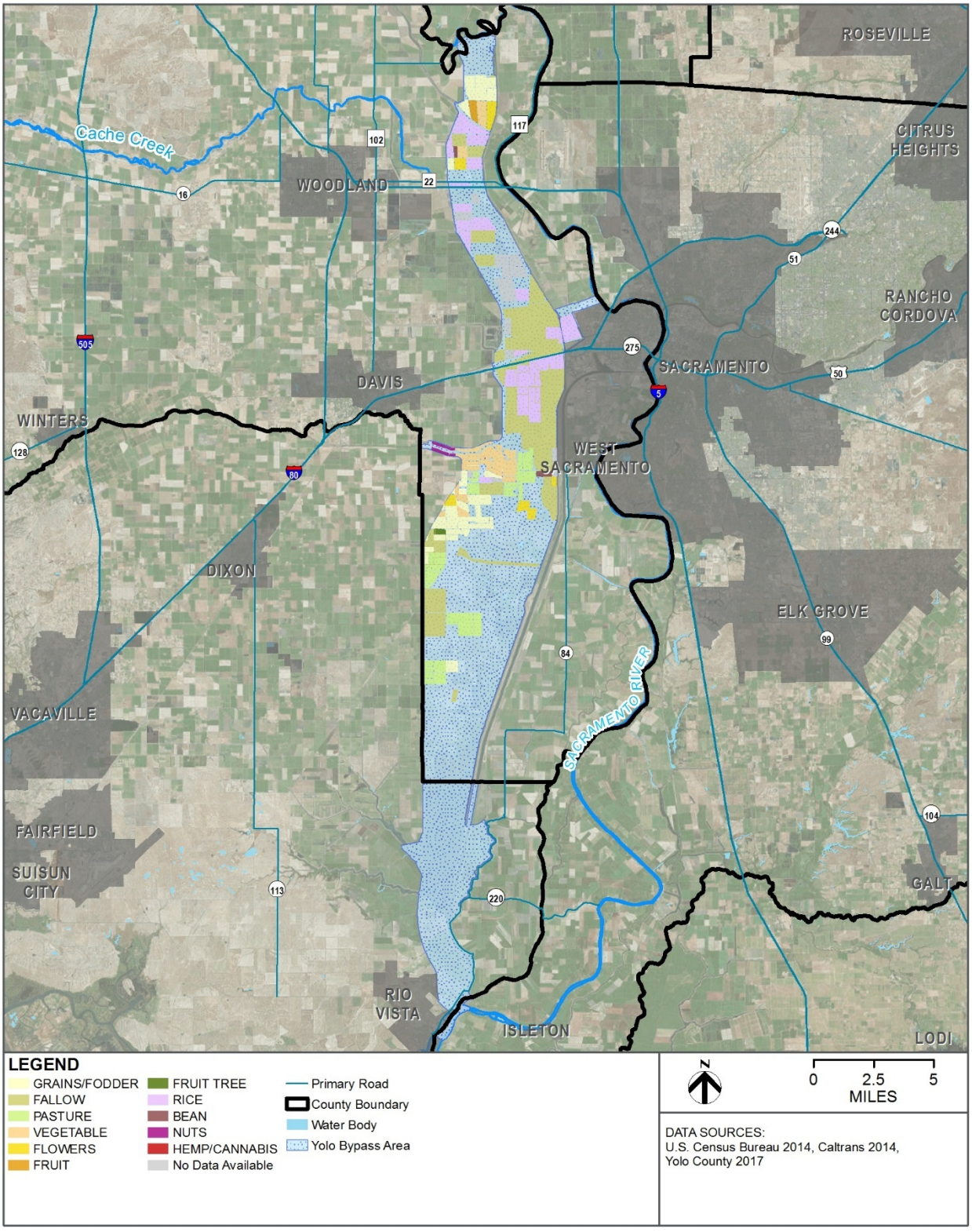

Figure 11-2. Yolo Bypass Land Use by Crop

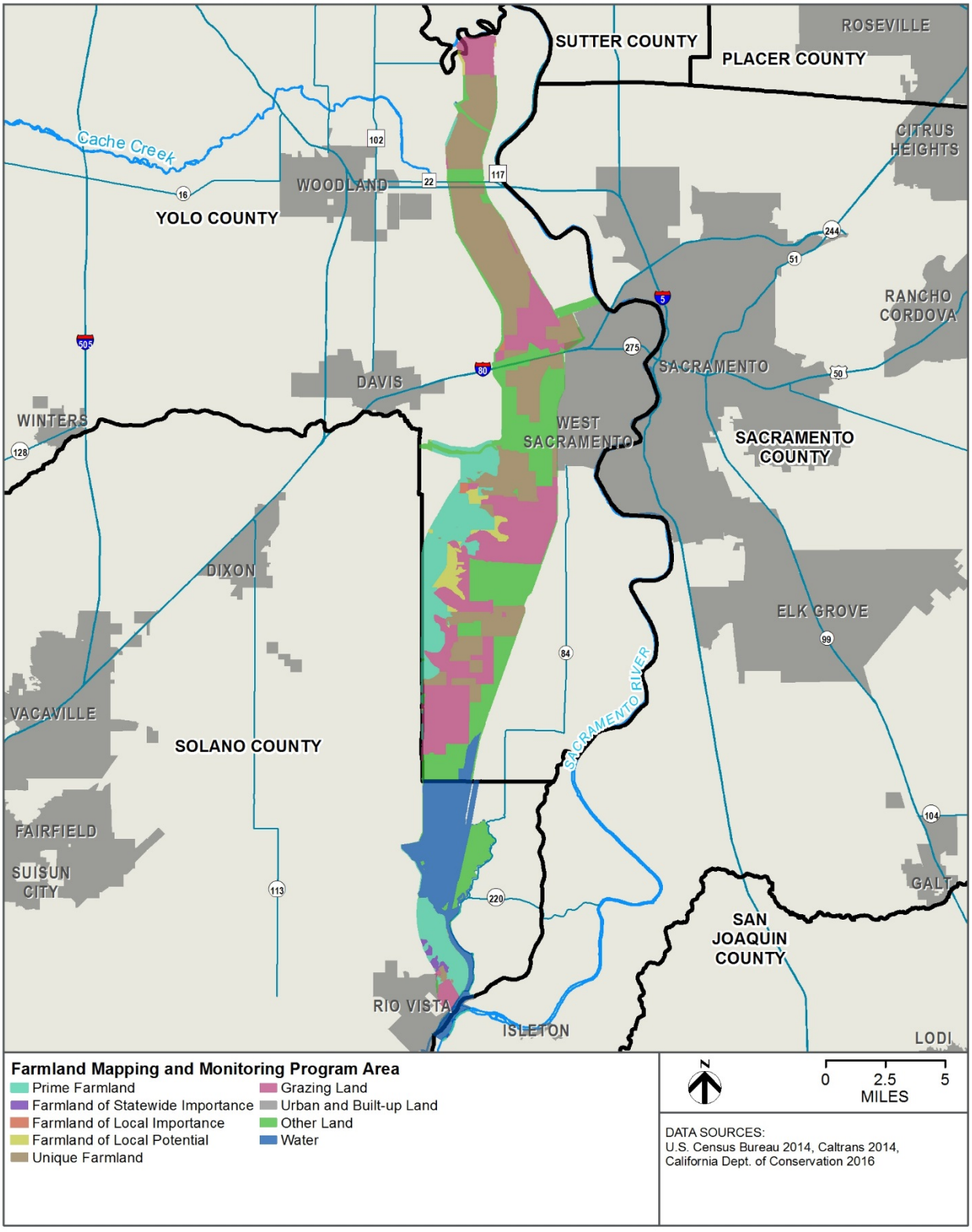

Figure 11-3. Farmland Designations in the Yolo Bypass

Table 11-1. Summary of Land Use Designations in the Yolo Bypass

Land Use Category	Acres
Prime Farmland	8,695
Farmland of Statewide Importance	192
Unique Farmland	18,753
Farmland of Local Importance	170
Important Farmland Subtotal	**27,810**
Grazing Land	17,873
Farmland of Local Potential	1,234
Agricultural Land Subtotal	**46,917**
Urban and Built-up Land	27
Other Land	15,397
Water Area	8,188
Total Acres in the Yolo Bypass	70,530

Source: Farmland Mapping and Monitoring Program (FMMP) 2016

Some lands within the project area are considered “agricultural preserves” and sometimes restricted to agricultural or open space designations for 10 to 20 years under the Williamson Act or Farmland Security Zone (FSZ) program. The Williamson Act and FSZ program are described in Section 11.2.2.1. Table 11-2 summarizes farm acreage enrolled in the Williamson Act and FSZ programs and the agricultural conservation easements in Yolo, Sutter, and Solano counties in 2012 and 2013.

Table 11-2. Williamson Act and Agricultural Conservation Easement Acreage in Yolo, Sutter, and Solano Counties (2012 to 2013)

County	2012 Williamson Act Prime (acres)	2012 Williamson Act Non-Prime (acres)	2012 Total (Williamson Act lands; acres)	2013 Williamson Act Prime (acres)	2013 Williamson Act Non-Prime (acres)	2013 Total (Williamson Act lands; acres)	Percent Change (Total Williamson Act lands; 2012-2013)	FSZ (2013 acres) Urban Prime	FSZ (2013 acres) Urban Non-Prime	FSZ (2013 acres) Non-Urban Prime	FSZ (2013 acres) Non-Urban Non-Prime	Agricultural Conservation Easement (through the CFCP; 2013 acres) Prime	Agricultural Conservation Easement (through the CFCP; 2013 acres) Non-Prime	2013 Total Conservation lands (acres)
Yolo	--	--	**--**	170,102	142,587	**312,689**	**+100**	158	--	--	--	117	20	**312,984**
Sutter	51,408	13,165	**64,573**	51,376	13,165	**64,541**	**-0.05**	--	--	--	--	--	--	**64,541**
Solano	119,799	145,335	**269,997**	119,361	145,221	**272,504**	**+0.93**	--	--	--	--	1,938	5,984	**272,504**

Source: California Department of Conservation (DOC) 2015c
Key: CFCP = California Farmland Conservancy Program; FSZ = Farmland Security Zone

11.1.1 Yolo County

The majority of the Yolo Bypass, roughly 82 percent (57,689 acres), is within Yolo County on lands designated as Agriculture. Between 124 and 406 acres of Yolo County would be affected by the construction and implementation of the Project. Yolo County encompasses 1,021 square miles (approximately 653,500 acres), which includes unincorporated areas and incorporated areas (the cities of Davis, West Sacramento, Winters, and Woodland). The Yolo Bypass is located within the unincorporated areas of Yolo County. The majority of the county is designated as Agriculture, most of which is in unincorporated areas (County of Yolo 2009). Open Space designations in Yolo County makes up 7.8 percent of the land, with the majority located in incorporated areas (County of Yolo 2009). Table 11-3 summarizes land use designations in Yolo County.

Table 11-3. Summary and Change by Land Use Category for Yolo County (2012 to 2014)

	Total Acreage Inventoried		2012 to 2014 Acreage Changes			
Land Use Category	**2012**	**2014**	**Acres Lost (-)**	**Acres Gained (+)**	**Total Acreage Changed**	**Net Acreage Changed**
Prime Farmland	250,693	250,345	1,051 (0.4%)	703 (0.3%)	1,754 (0.7%)	-348 (-0.1%)
Farmland of Statewide Importance	17,298	18,861	108 (0.6%)	1,671 (9.7%)	1,779 (10.3%)	1,563 (9.0%)
Unique Farmland	42,403	44,604	219 (0.5%)	2,420 (5.7%)	2,639 (6.2%)	2,201 (5.2%)
Farmland of Local Importance	58,137	51,725	7,537 (13.0%)	1,125 (1.9%)	8,662 (14.9%)	-6,412 (-11.0%)
Important Farmland Subtotal	368,531	365,535	8,915 (2.4%)	5,919 (1.6%)	14,834 (4.0%)	-2,996 (0.8%)
Grazing Land	163,640	166,367	1,753 (1.1%)	4,480 (2.7%)	6,233 (3.8%)	2,727 (1.7%)
Agricultural Land Subtotal	532,171	531,902	10,668 2.0%)	10,399 2.0%)	21,067 (4.0%)	-269 (-0.1%)
Urban and Built-up Land	30,835	31,049	7 (0.0%)	221 (0.7%)	228 (0.7%)	214 0.7%)
Other Land	82,639	82,694	188 (0.2%)	243 (0.3%)	431 (0.5%)	55 (0.1%)
Water Area	7,804	7,804	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Total Area Inventoried	653,449	653,449	10,863 (1.7%)	10,863 (1.7%)	21,726 (3.3%)	0 (0.0%)

Source: California Department of Conservation (DOC) 2015a

Notes:

[1] Based on 2012 to 2014 land use conversion data.

11.1.2 Sutter County

A small portion of the Yolo Bypass (approximately 98 acres, 0.14 percent) is within Sutter County. Between 4 and 45 acres, dependent on the alternative, of Open Space lands in Sutter County would be affected by the construction and implementation of the Project. Sutter County encompasses approximately 607 square miles (approximately 388,500 acres), with the majority located in unincorporated areas. Land in Sutter County is separated into specific land use designations that aid in guiding the type of development that takes place within the county. Most land within the county is designated as Agricultural (Sutter County 2011). Table 11-4 summarizes the land use acreages in the county.

Components of project alternatives would be located on lands designated as Open Space (Other Land).

Table 11-4. Summary and Change by Land Use Category for Sutter County (2012 to 2014)

	Total Acreage Inventoried		2012 to 2014 Acreage Changes			
Land Use Category	**2012**	**2014**	**Acres Lost (-)**	**Acres Gained (+)**	**Total Acreage Changed**	**Net Acreage Changed**
Prime Farmland	161,500	161,019	1,077 (0.7%)	596 (0.4%)	1,673 (1.0%)	-481 (-0.3%)
Farmland of Statewide Importance	104,576	104,003	1,160 (1.1%)	587 (0.6%)	1,747 (1.7%)	-573 (-0.5%)
Unique Farmland	16,036	16,087	296 (1.8%)	347 (2.2%)	643 (4.0%)	51 (0.3%)
Farmland of Local Importance	0	0	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Important Farmland Subtotal	282,112	281,109	2,533 (0.9%)	1,530 (0.5%)	4,063 (1.4%)	-1,003 (-0.4%)
Grazing Land	53,232	54,327	1,151 (2.2%)	2,246 4.2%)	3,397 (6.4%)	1,095 (2.1%)
Agricultural Land Subtotal	335,344	335,436	3,684 (1.1%)	3,776 (1.1%)	7,460 (2.2%)	92 (0.0%)
Urban and Built-up Land	13,611	13,607	240 (1.8%)	236 (1.7%)	476 (3.5%)	-4 (0.0%)
Other Land	38,474	38,386	796 (2.1%)	708 (1.8%)	1,504 (3.9%)	-88 (-0.2%)
Water Area	1,883	1,883	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Total Area Inventoried	389,312	389,312	4,720 (1.2%)	4,720 (1.2%)	9,440 (2.4%)	0 (0.0%)

Source: DOC 2016

Notes:

[1] Based on 2012 to 2014 land use conversion data.

11.1.3 Solano County

A small portion, approximately 12,293 acres (17 percent), of the Yolo Bypass is in Solano County on lands designated as Agriculture. There would be no lands affected in Solano County associated with Project construction or implementation. Solano County encompasses approximately 910 square miles (approximately 582,300 acres), with the majority located in unincorporated areas. Most of land within the county is designated as Agricultural (Solano County 2008a). Table 11-5 summarizes the land use acreages in the county.

Table 11-5. Summary and Change by Land Use Category for Solano County (2012 to 2014)

	Total Acreage Inventoried		2012 to 2014 Acreage Changes			
Land Use Category	**2012**	**2014**	**Acres Lost (-)**	**Acres Gained (+)**	**Total Acreage Changed**	**Net Acreage Changed**
Prime Farmland	130,548	130,292	758 (0.6%)	502 (0.4%)	1,260 (1.0%)	-256 (-0.2%)
Farmland of Statewide Importance	6,429	6,545	15 (0.2%)	131 (2.0%)	146 (2.3%)	116 (1.8%)
Unique Farmland	8,958	9,222	85 (0.9%)	349 (3.9%)	434 (4.8%)	264 (2.9%)
Farmland of Local Importance	0	0	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Important Farmland Subtotal	145,935	146,059	858 (0.6%)	982 (0.7%)	1,840 (1.3%)	124 (0.1%)
Grazing Land	210,633	210,153	1,147 (0.5%)	667 (0.3%)	1,814 (0.9%)	-480 (-0.2%)
Agricultural Land Subtotal	356,568	356,212	2,005 (0.6%)	1,649 (0.5%)	3,654 (1.0%)	-356 (-0.1%)
Urban and Built-up Land	60,027	60,488	22 (0.0%)	483 (0.8%)	505 (0.8%)	461 (0.8%)
Other Land	111,622	111,517	233 (0.2%)	128 (0.1%)	361 (0.3%)	-105 (-0.1%)
Water Area	54,153	54,153	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Total Area Inventoried	582,370	582,370	2,260 (0.4%)	2,260 (0.4%)	4,520 (0.8%)	0 (0.0%)

Source: DOC 2015b

Notes:

[1] Based on 2012 to 2014 land use conversion data.

11.2 Regulatory Setting

The following sections summarize relevant plans, policies, and regulations related to land use and agricultural resources in the area of analysis.

11.2.1 Federal Plans, Policies, and Regulations

The Farmland Protection Policy Act of 1981 is intended to minimize the impacts Federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. It assures that to the extent possible Federal programs are administered to be compatible with state, local units of government, and private programs and policies to protect farmland. It does not authorize the Federal government to regulate the use of private or nonfederal land or, in any way, affect the property rights of owners. For the purposes of the Farmland Protection Policy Act, farmland includes Prime Farmland, Unique Farmland, and Land of Statewide or Local Importance. Projects are subject to the Farmland Protection Policy Act requirements if they may irreversibly convert farmland (directly or indirectly) to nonagricultural use and are completed by a Federal agency or with assistance from a Federal agency.

The Farmland Protection Policy Act established the Farmland Protection Program and the Land Evaluation and Site Assessment (LESA) system. The Natural Resources Conservation Service (NRCS) uses the LESA system to establish a farmland conversion impact rating.

11.2.2 State Plans, Policies, and Regulations

The State of California (State) plans, policies, and regulations pertaining to land use and agricultural resources that may apply to the implementation of the project alternatives are described below.

11.2.2.1 Williamson Act

The Williamson Act, formally known as the California Land Conservation Act of 1965, enables local governments to enter into contracts with private landowners to promote the continued use of relevant land for agricultural or related open space use. The Williamson Act empowers local governments to establish “agricultural preserves” consisting of lands devoted to agricultural and other compatible uses. After such preserves are established, the locality may offer the owners of included agricultural land the opportunity to enter into annually renewable contracts that restrict the land to agricultural or open space use for a minimum of 10 years.

The Williamson Act was enhanced in 1998 with the FSZs (also known as Super Williamson Act lands) provisions. These provisions offer a minimum 20-year contract and must be in an “agricultural preserve” and designated as Prime Farmland, Farmland of Statewide Importance, Unique Farmland, or Farmland of Local Importance.

Table 11-2 summarizes farm acreage enrolled in the Williamson Act and FSZ program in 2012 and 2013.

11.2.2.2 Farmland Mapping and Monitoring Program

The FMMP was established in California in 1982 and provides maps and statistical data for analyzing potential impacts on agricultural resources within the State. The FMMP provides agricultural resource maps based on soil quality and land use and irrigation status. These maps are updated every two years with information gathered from aerial imagery, a computer mapping system, public review, and field reconnaissance. Lands are mapped into one of the following eight categories: Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, Grazing Land, Urban and Built-up land, other land and water.

11.2.2.3 California LESA Model

Similar to the Federal LESA system, the California LESA model was developed in 1997 to provide lead agencies with an optional methodology to ensure that significant effects associated with agricultural land conversions are fully considered in the environmental review process. The California LESA model is used to determine a project's potential significance by evaluating the project size, soil quality, water resource availability, and surrounding agricultural and protected resource lands.

11.2.2.4 California Farmland Conservancy Program

The CFCP is a voluntary program that seeks to encourage the long-term, private stewardship of agricultural lands through the use of agricultural conservation easements. The CFCP provides grant funding for projects that use and support agricultural conservation easements for protection of agricultural lands. An agricultural conservation easement is a voluntary, legally recorded deed restriction that is placed on a specific property used for agricultural production. The goal of an agricultural conservation easement is to maintain agricultural land in active production by removing the development pressures from the land. Such an easement prohibits practices that would damage or interfere with the agricultural use of the land. Because the easement is a restriction on the deed of the property, the easement remains in effect even when the land changes ownership.

11.2.2.5 Delta Plan

Signed by the governor of California in 2009, the Sacramento-San Joaquin Delta Reform Act (Water Code Section 85000 et seq.) created a new Delta Stewardship Council (DSC) and gave this body broad oversight of Delta planning and resource management. DSC was tasked with developing and implementing a long-term, comprehensive management plan (Delta Plan) that emphasizes the coequal goals of "providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem" (Water Code Section 85054) as the foundation for State decisions regarding Delta management.

Delta Plan Policy DP P2 (23 Cal. Code Regs. section 5011) states that water management facilities, ecosystem restoration, and flood management infrastructure must be sited to avoid or reduce conflicts with existing or planned uses when feasible, considering comments from local agencies and the Delta Protection Commission. The DSC has recommended the continued coordination with the Yolo Habitat Conservancy as the Yolo Habitat Conservation Plan/Natural Community Conservation Plan is completed and implemented, which is discussed further in Section 11.2.3.1.

11.2.3 Regional and Local Plans, Policies, and Regulations

This section presents the regional and local plans, policies, and regulations that may be relevant to implementation of one or more of the project alternatives. Generally, State and federal agencies, as well as some local or regional agencies involved with the location or construction of facilities for the production, generation, storage, treatment, or transmission of water, are not subject to local land use regulations; inconsistency with a specific local land use regulation is not by itself an adverse effect on the environment. However, this EIS/EIR, in assessing whether categories of environmental effects (e.g., biological or cultural resources) are adverse or

beneficial (NEPA) or significant (CEQA), considers relevant local land use regulations that are adopted to avoid or mitigate an environmental impact.

Regional and local plans, policies, and regulations pertaining to land use and agricultural resources that are relevant to the implementation of the alternatives are described in the following subsections.

11.2.3.1 Yolo County

Yolo County's *2030 Countywide General Plan* Land Use and Community Character Element describes the policies and standards for future land use and agricultural resource protection for rural and urban land use (County of Yolo 2009). The Conservation and Open Space Element addresses the conservation, development, and utilization of natural resources as well as open space lands used for a variety of purposes (County of Yolo 2009). Relevant policies included in the current general plan include:

- Policy AG-1.2: Maintain parcel sizes outside of the community growth boundaries large enough to sustain viable agriculture and discourage conversion to non-agricultural home sites.
- Policy AG-1.3: Prohibit the division of agricultural land for non-agricultural uses.
- Policy AG-1.4: Prohibit land use activities that are not compatible within agriculturally designated areas.
- Policy AG-1.5: Strongly discourage the conversion of agricultural land for other uses. No lands shall be considered for redesignation from Agricultural or Open Space to another land use designation unless all the following findings can be made:
  - There is a public need or net community benefit derived from the conversion of land that outweighs the need to protect the land for long-term agricultural use.
  - There are no feasible alternative locations for the proposed project that are either designated for non-agricultural land uses or are less productive agricultural lands.
  - The use would not have a significant adverse effect on existing or potential agricultural activities on surrounding land designated Agriculture.
- Policy AG-1.6: Continue to mitigate at a ratio of no less than 1:1 the conversion of farmland and/or the conversion of land designated or zoned for agriculture to other uses. This policy has been updated by the Agricultural Conservation and Mitigation Program (Section 8.2.402 of the County Zoning Code) to require mitigation at a ratio of 3:1 or 2:1, subject to potential adjustments.
- Policy AG-1.8: Regulate and encourage removal of incompatible land uses and facilities from agriculturally designated lands.
- Policy AG-2.8: Facilitate partnerships between agricultural operations and habitat conservation efforts to create mutually beneficial outcomes.
- Policy AG-2.9: Support the use of effective mechanisms to protect farmers potentially impacted by adjoining habitat enhancement programs, such as "safe harbor" programs and providing buffers within the habitat area.

- Policy AG-2.10: Encourage habitat protection and management that does not preclude or unreasonably restrict onsite agricultural production.
- Policy AG-6.1: Continue to promote agriculture as the primary land use in the portion of Yolo County that lies within the Primary Zone of the Sacramento-San Joaquin Delta.

Titles 1, 7, and 8 of the Yolo County Code address regulations related to the general rules of construction, building requirements, land development and zoning, agricultural mitigation, and habitat mitigation (Yolo County undated).

The Yolo Habitat Conservancy is currently preparing the *Yolo Habitat Conservation Plan/Natural Community Conservation Plan* (HCP/NCCP), a plan that would provide Endangered Species Act permits and associated mitigation for infrastructure and development activities in Yolo County within the next 50 years (Yolo Habitat Conservancy 2017). The HCP/NCCP could increase local control over endangered species laws and public and private activities by having permits administered through the Yolo Habitat Conservancy, with oversight from the California Department of Fish and Wildlife and the U.S. Fish and Wildlife Service. This would help streamline the permitting application by eliminating the current system of separately permitting and mitigating individual projects and creating a conservation and mitigation program that comprehensively coordinates the implementation of permit requirements through the development of a countywide conservation strategy. To complement the Yolo HCP/NCCP, the Yolo Regional Conservation Investment Strategy/Local Conservation Plan is being developed. The plan would identify conservation priorities and provide guidance for further non-regulatory conservation in Yolo County that address the conservation needs that are not addressed in the HCP/NCCP. The Yolo Regional Conservation Investment Strategy/Local Conservation Plan would establish guidelines for avoidance, minimization, and mitigation measures that conserve Yolo County's biological resources but would not provide the same level of protection as the HCP/NCCP.

11.2.3.2 Sutter County

The Land Use Element of Sutter County's *2030 General Plan* provides direction on land use, conservation areas, and growth areas and guidance for conservation and growth in unincorporated Sutter County (Sutter County 2011). The General Plan's Agricultural Element provides direction for the preservation of agricultural operations and uses, the reduction of conflicts between agricultural operations and uses, the preservation of natural resources for agriculture, the expansion and diversification of natural resources for agricultural industries, and the promotion of agriculturally related visitor services and attractions. Relevant policies include:

- AG 1.1: Preserve and maintain agriculturally designated lands for agricultural use and direct urban/suburban and other nonagricultural-related development to the cities, unincorporated rural communities, and other clearly defined and comprehensively planned development areas.
- AG 1.5: Discourage the conversion of the agricultural land to other uses unless the following findings can be made:
  - The net community benefit derived from conversion of the land outweighs the need to protect the land for long-term agricultural use.

- There are no feasible alternative locations for the proposed use that would appreciably reduce impacts upon agricultural lands.
- The use will not have significant adverse effects, or can mitigate such effects, upon existing and future adjacent agricultural lands and operations.

11.2.3.3 Solano County

Chapter 3 of the *Solano County General Plan* describes the county's agricultural goals and policies that support the growth and health of agriculture in Solano County (Solano County 2008b). Chapter 2.2 of Solano County's Code describes requirements for agricultural lands and operations within the unincorporated county (Solano County undated). Section 2.2-20 describes that it is the county's policy to conserve and protect both intensive and extensive agricultural land and to protect those lands for exclusive agricultural uses that do not interfere with agricultural operations (Solano County undated). Chapter 28 of the county's code establishes zoning regulations within the unincorporated county, including for agricultural districts.

Relevant policies include:

- Policy AG.P-1: Ensure agricultural parcels are maintained at a sufficient minimum parcel size so as to remain a farmable unit. Farmable units are defined as the size of parcels a farmer would consider viable for leasing or purchasing for different agricultural purposes. A farmable unit is not considered the sole economic function that will internally support a farm household.
- Policy AG.P-19: Require agricultural practices to be conducted in a manner that minimizes harmful effects on soils, air and water quality, and marsh and wildlife habitat.
- Policy AG.P-32: Lands within the Agriculture designation shown on the Land Use Diagram may be re-designated to a more intensive agricultural designation or to a rural residential designation (with a maximum density of one unit per 2.5 to 10 acres) if the Board of Supervisors makes each of the following findings:
  - That the approval will not constitute part of, or encourage, a piece-meal conversion of a larger agricultural area to residential or other non-agricultural uses and will not alter the stability of land use patterns in the area
  - That no land proposed for re-designation is prime agricultural land as defined pursuant to California Government Code Section 51201 (the California Land Conservation Act of 1965, also known as the Williamson Act)
  - That the subject land is unsuitable for agriculture due to terrain, adverse soil conditions, drainage, flooding, parcel size, or other physical factors such that it has no substantial market or rental value under the Agriculture designation
  - That the use and density proposed are compatible with agricultural uses and will not interfere with accepted farming practices
  - That the land is immediately adjacent to existing comparably developed areas and the applicant for the re-designation has provided substantial evidence that the fire district, school district, county sheriff, the area road system, and the proposed water supplier have adequate capacity to accommodate the development and provide it with adequate public services

– That annexation to a city or incorporation is not appropriate or possible based on the following factors: nearby cities' designated sphere of influence boundaries, cities' general plan growth limits and projections, and comprehensive annexation plans.

11.2.3.4 Delta Protection Commission Land Use and Resource Management Plan for the Primary Zone of the Delta

The Delta Protection Commission (DPC) was created by the State legislature in 1992 with the goal of developing regional policies for the Delta to protect and enhance the existing land uses (agriculture, wildlife habitat, and recreation) in the primary zone. The DPC adopted the *Land Use and Resource Management Plan for the Primary Zone of the Delta* initially in 1995 and amended it most recently in 2010. A large portion of the Yolo Bypass is within the Primary Zone of the Delta. The DPC's *Land Use and Resource Management Plan for the Primary Zone of the Delta* states the following three goals related to land use and agricultural resources (DPC 2010):

- Protect the unique character and qualities of the Primary Zone by preserving the cultural heritage, strong agricultural/economic base, unique recreational resources, and biological diversity of the Primary Zone.
- Direct new non-agriculturally oriented non-farmworker residential development within the existing unincorporated towns (Walnut Grove, Clarksburg, Courtland, Hood, Locke, and Ryde).
- Encourage a critical mass of farms, agriculturally-related businesses and supporting infrastructure to ensure the economic vitality of agriculture within the Delta.

In addition, the plan includes four policies applicable to land use and agricultural resources (DPC 2010):

- The rich cultural heritage, strong agricultural/economic base, unique recreational resources, and biological diversity of the Delta shall be preserved and recognized in public/private facilities, such as museums, recreational trails, community parks, farm stands, community centers, and water access facilities within the Delta.
- New non-agriculturally oriented residential, recreational, commercial, habitat, restoration, or industrial development shall ensure that appropriate buffer areas are provided by those proposing new development to prevent conflicts between any proposed use and existing adjacent agricultural parcels.
- Subsidence control shall be a key factor in evaluating land use proposals. Encourage agricultural, land management, recreational, and wildlife management practices that minimize subsidence of peat soils.
- The conversion of an agricultural parcel, parcels, and/or an agricultural island for water impoundment, including reservoirs, water conveyance or wetland development may not result in the seepage of water onto or under the adjacent parcel, parcels, and/or island. These conversions shall mitigate the risks and adverse effects associated with seepage, levee stability, subsidence, and levee erosion, and shall be consistent with the goals of this Plan.

11.3 Environmental Consequences

This section describes the environmental consequences associated with the Project alternatives and the No Action Alternative on land use and agricultural resources in the Yolo Bypass. This section presents the assessment methods performed to analyze the effects on land use and agricultural resources and the potential environmental consequences and mitigation measures as they relate to each Project alternative. Detailed descriptions of the alternatives evaluated in this chapter are provided in Chapter 2, *Description of Alternatives*.

11.3.1 Methods for Analysis

Construction and long-term operations of the Project alternatives could affect land use and agricultural resources in Yolo, Sutter, and Solano counties. Operation of Project alternatives could also affect agricultural resources through the conversion of agricultural lands to nonagricultural use because of increased inundation in the Yolo Bypass. This analysis assesses any permanent conversions of agricultural land to nonagricultural uses relative to the existing conditions (for CEQA) and the No Action Alternative (for NEPA). Changes in land use could result in incompatible uses and adverse effects. This analysis assumes that all Prime Farmland, Unique Farmland, and Farmland of Statewide Importance are protected under the Williamson Act or other land conservation programs.

Impacts to land use are determined relative to existing conditions (for CEQA) and the No Action Alternative (for NEPA). However, the No Action Alternative would be similar to existing conditions because land uses are not anticipated to experience substantive changes in the area of analysis through 2030, based on the planning projections in the county general plans. The county general plans provide planning guidelines and support for resource management and conservation through 2030, supporting the assumption that existing conditions in the area will not change substantially before the next general plan is developed. The No Action Alternative represents the future conditions that would exist without the implementation of the project, which would be similar to existing conditions. Modeling used in this section compares the proposed alternatives to existing conditions. Therefore, although NEPA requires comparison to the No Action Alternative, the analysis compares the impacts of the action alternatives to existing conditions because the No Action Alternative would be similar to existing conditions.

The basis for the analysis method is the *Draft Yolo Bypass Flood Date and Flow Volume Agricultural Impact Analysis* prepared by Yolo County (2012). This study evaluated agricultural impacts that could occur from the proposed increase in frequency and duration of flooding in the Yolo Bypass. The study assessed changes in agricultural practices (planting), crop yields, and revenue for six different flooding scenarios at both 3,000 cfs and 6,000 cfs using observed data, observed grower decisions in the Bypass, and a series of empirical models (described below). The total inundated acreage, reduction in crop yields, and increased land fallowing were identified as the fundamental driving factors in the study. The study did “not explicitly consider changes in late season rains and management or operation difficulties which may affect drainage and field preparation times” (Yolo County 2012). This EIS/EIR applied the analysis methods in this document to the action alternatives using the updated hydraulic modeling to identify the best available estimates of the potential effects.

11.3.1.1 Models Used

This analysis used information estimated by multiple models to determine land use impacts that would result from the implementation of the Project alternatives. Models that contributed to this analysis include:

- Two-Dimensional Unsteady Flow Modeling **(TUFLOW)** – Used to assess hydraulic impacts, including inundation periods and affected acreages and agricultural impacts, in the Yolo Bypass and surrounding areas, TUFLOW facilitates a comparison of depth, duration, and frequency of flooding between existing and proposed conditions. The TUFLOW model is described in Appendix D.
- **DAYCENT Model** – Used to estimate crop yields on a subset of fields throughout the Yolo Bypass, the DAYCENT model estimates the yield on any given field, taking into account all production conditions, including climate and date the crop was planted. The model was calibrated against data for corn, rice, safflower, sunflower, processing tomato, alfalfa, and mixed melons. The DAYCENT model is described in Appendix K1, *Bypass Production Model Technical Appendix*.
- **Bypass Production Model (BPM)** – Used to model agriculture in the Yolo Bypass, the BPM relates changes in crop yield and total affected acres to changes in agricultural production and revenues. The BPM incorporates data from TUFLOW as inputs for anticipated overtopping events and other impacts. Crop yield functions estimated by the DAYCENT model are used along with additional economic data to calibrate the BPM. The BPM is described in Appendix K1.
- **Impact Planning and Analysis (IMPLAN)** – Used to estimate the effects on employment, labor income, and total value output directly and indirectly associated with construction and reduced crop production, IMPLAN calculates the economic impacts of a change in value of production. IMPLAN is described in Section 16.3.1.1, *Construction and Annual Expenditure Effects*, in Chapter 16, *Socioeconomics*.

11.3.2 Thresholds of Significance – CEQA

Consistent with the CEQA Guidelines, impacts on land use and agricultural resources would be considered significant if implementation of the Project alternatives would:

- Physically divide a community or conflict with any relevant land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, the general plan, specific plan, local coastal program, or zoning ordinance) adopted to avoid or mitigate an environment effect
- Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, including lands enrolled in the Williamson Act and other conservation programs, to nonagricultural or incompatible uses

A significant impact “means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affect by the project.” For this evaluation, permanent conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance is considered significant.

These thresholds of significance for impacts encompass the factors under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts.

11.3.3 Effects and Mitigation Measures

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

11.3.3.1 No Action Alternative

Under the No Action Alternative, the Project would not be implemented, and none of the Project components would be developed.

11.3.3.1.1 Impact AGR-1: Physically divide a community or conflict with a relevant land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect

Under the No Action Alternative, Project components would not be developed in the Project area; therefore, there would not be any activities that would physically divide a community or conflict with land use plans, policies, or regulations adopted to avoid or mitigate an environmental effect. The No Action Alternative would not result in any changes to existing conditions.

CEQA Conclusion

There would be **no impact** resulting from the No Action Alternative regarding physically dividing a community or conflicting with a relevant land use plan, policy, or regulation because Project components would not be developed in the Project area.

11.3.3.1.2 Impact AGR-2: Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, which may also be protected under the Williamson Act or other conservation programs, to nonagricultural or incompatible uses

Under the No Action Alternative, Project components would not be developed in the Project area; therefore, no Prime Farmland, Unique Farmland, or Farmland of Statewide Importance enrolled in the Williamson Act or other conservation programs would be converted to an incompatible use. However, under existing conditions, water shortages and other factors (such as low commodity prices) have increased land idling in the region. Some lands could be taken out of production for the long term if shortages are expected to prolong and increase. Any lands temporarily taken out of production would not affect the Williamson Act or other land conservation programs, but some lands could be reclassified as Non-Prime. If reclassified, the land would remain in the program and still be compatible with agricultural uses.

CEQA Conclusion

There would be **no impact** to Prime Farmland, Unique Farmland, and Farmland of Statewide Importance or lands enrolled in the Williamson Act or other conservation programs under the No Action Alternative because Project components would not be developed in the Project area.

11.3.3.2 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 cubic feet per second (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.

11.3.3.2.1 Impact AGR-1: Physically divide a community or conflict with a relevant land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect

Implementation of Alternative 1 and the associated construction activities would not physically divide a community because there is not a community present to be divided. Section 11.2.3 summarizes agricultural land-related policies in Yolo, Sutter, and Solano counties. The counties have policies to protect and maintain agricultural land uses. Lands currently subject to agricultural activities, including those under conservation easements would continue to be farmed and remain subject to existing easements and restrictions. Land use designations would not be changed, and the alternative would not conflict with relevant existing land use plans, policies, or regulations adopted to avoid or mitigate an environmental effect.

CEQA Conclusion

Impacts to land use would be **less than significant** because Project actions associated with Alternative 1 would be consistent with relevant existing land use plans, policies, or regulations adopted to avoid or mitigate an environment effect and would not occur near a community.

11.3.3.2.2 Impact AGR-2: Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, which may also be protected under the Williamson Act or other conservation programs, to nonagricultural or incompatible uses

Construction of Alternative 1 would permanently affect approximately 31 acres of agricultural land (grazing land and Farmland of Local Potential) within the project footprint and temporarily affect an additional 14 acres. Permanently affected lands would represent a loss in grazing land and a reduction in crop yields where agricultural production would no longer be feasible due to the construction of project structures. The permanently affected land includes 25 acres of grazing land and 6 acres of Farmland of Local Potential. There would be no permanent or temporary conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance. Figure 11-4 shows the underlying land use designations in the areas where construction impacts from

Alternative 1 would occur. The affected lands that are designated as grazing lands are within the FWWA. While this land is mapped as grazing land, it is not typically used for grazing.

Implementation of Alternative 1 could affect farmland within the entire Yolo Bypass through increased periods of inundation, also referred to as effects related to operations. There are 24,708 acres within the Yolo Bypass that are designated Prime Farmland, Unique Farmland, and Farmland of Statewide Importance. If increased inundation periods affected all 24,708 acres of these three categories in the Yolo Bypass, it would account for approximately 6.8 percent of all Prime Farmland, Unique Farmland, and Farmland of Statewide Importance in Yolo County. The timing of increased inundation determines whether there would be an impact on agricultural practices because the longer fields remain wet, the later farmers can begin planting. If planting dates are substantially delayed, farmers may choose to remove the land from production or shift to alternate crops. In an average year (including average rice prices), a June 1 planting date is the end of the standard planting window for most Yolo Bypass crops (see Appendix K1). The "planting date" estimated for this analysis is the result of three assumptions: 1) the calculation of the "last day wet" (estimated by the TUFLOW model), which is defined as the date the ground is dry enough for tractors to disk the fields, 2) a drying time adjustment of six days to reflect additional drying time before field preparation begins, and 3) a preparation and planting period of 28 days.

Alternative 1 was developed to only allow flows to increase inundation until March 15 to avoid impacts to agricultural uses in the bypass (The gate could operate after March 15 for fish passage but would only allow flows into the Yolo Bypass that would stay in-channel in the Tule Canal). During the inundation period, water would be able to flow through the new gated notch during periods when the river elevations are not high enough to go over the crest of Fremont Weir. Figures 11-5 and 11-6 help characterize the inundation patterns by showing the number of occurrences when areas greater than 10,000 and 20,000 acres would be wet for extended periods of time.

The TUFLOW model estimated the last day lands in the Yolo Bypass would be wet, referred to as the last day wet, as a result of water releases through Fremont Weir gates under Alternative 1 and compared the last day wet to existing conditions. Based on the model results, if the last day inundation flows would be released through the proposed operable gate at Fremont Weir is March 15, the resulting additional days fields would remain wet would only rarely result in planting dates after June 1 and there would be no change to FMMP land use designations. There would still be potential yield losses, however, since a March 15 end date could delay planting relative to existing conditions, as shown in Figure 11-7. These effects are discussed in Chapter 16, *Socioeconomics*. Figure 11-7 presents the difference in the last wet day between Alternative 1 and existing conditions. Figure 11-7 shows conditions in 2002 because that year had the greatest change in last day wet of all years modeled (1997 through 2012). While increased inundation could temporarily affect up to seven percent of Yolo County's Prime Farmland, Unique Farmland, and Farmland of Statewide Importance, the lands would not be taken out of production although it is possible that farms might shift to alternative crops or experience changes in agricultural yield (see Chapter 16, *Socioeconomics*). There would not be any conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, which may also be protected under the Williamson Act or other conservation programs, to nonagricultural use or incompatible use because of increased periods of inundation.

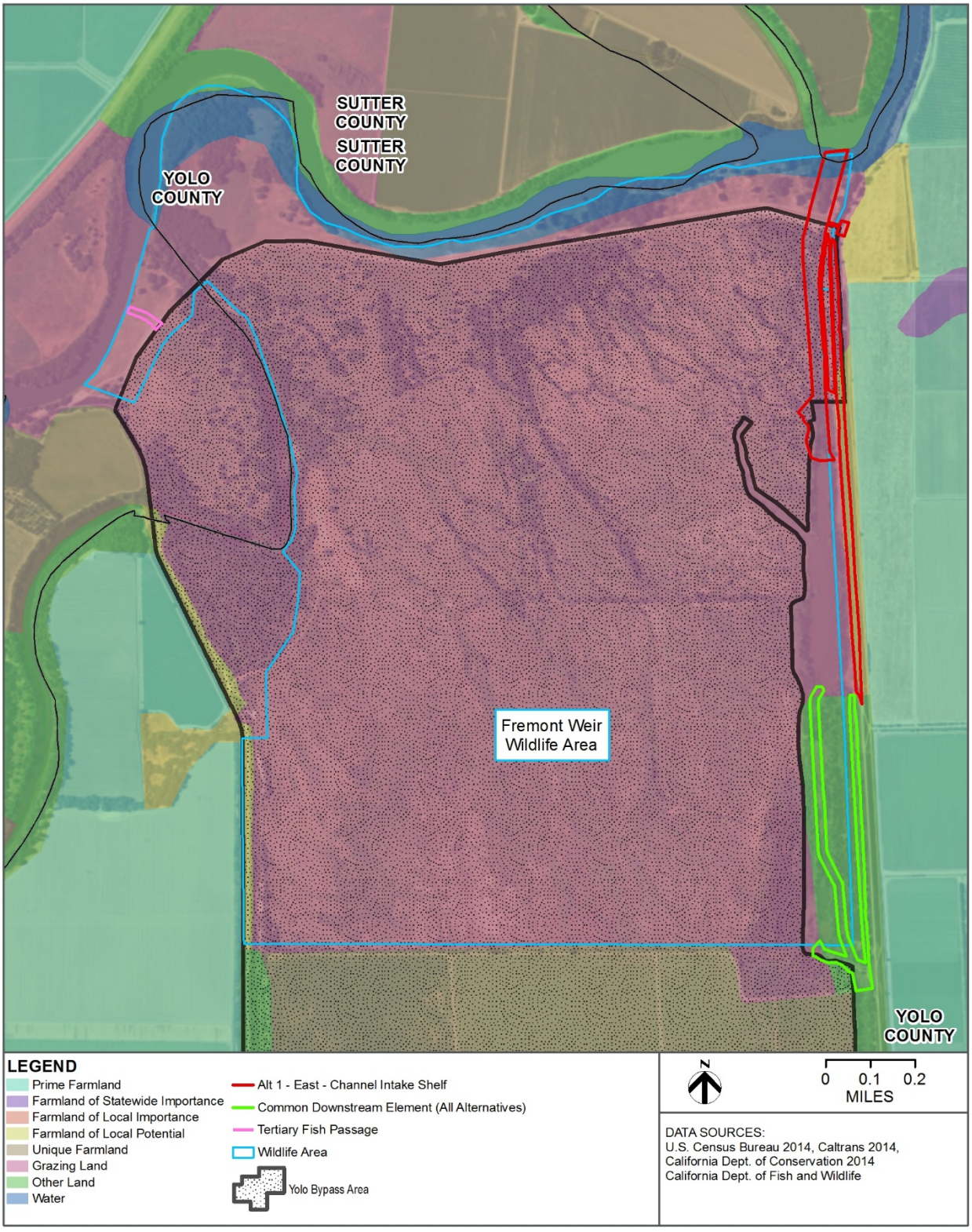

Figure 11-4. Areas of Land Use Impacts under Alternative 1

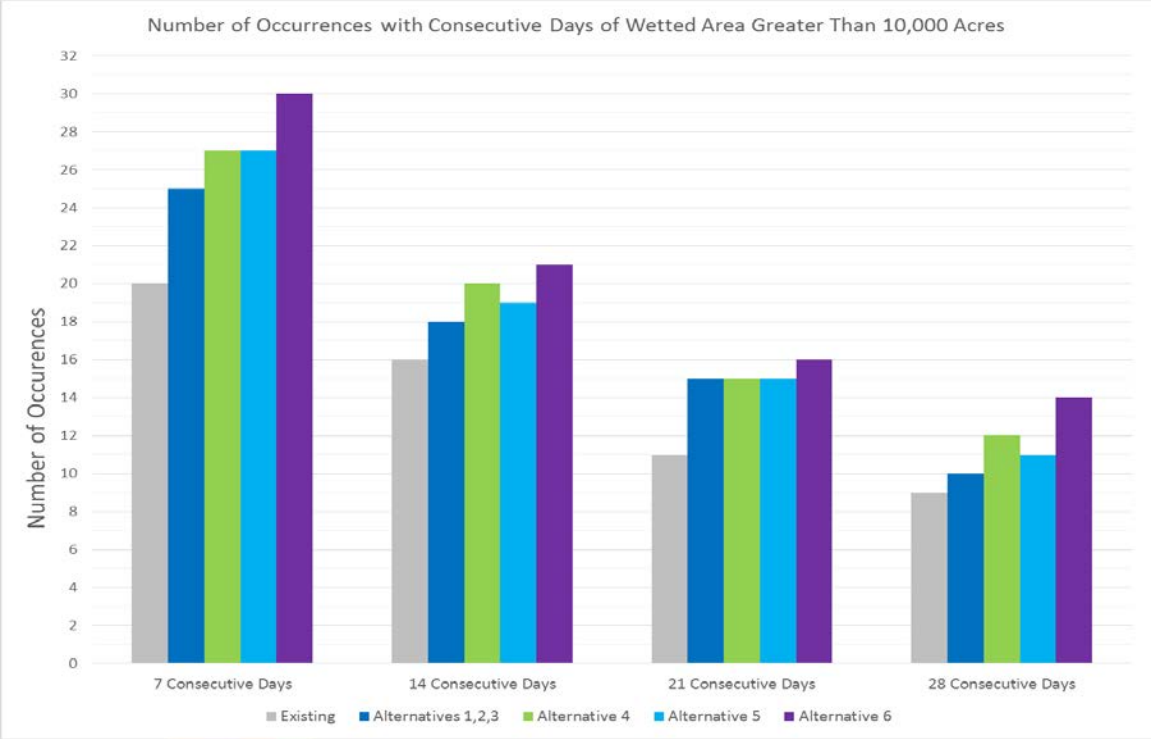

Figure 11-5. Number of Occurrences with Consecutive Days of Wetted Areas Greater than 10,000 Acres

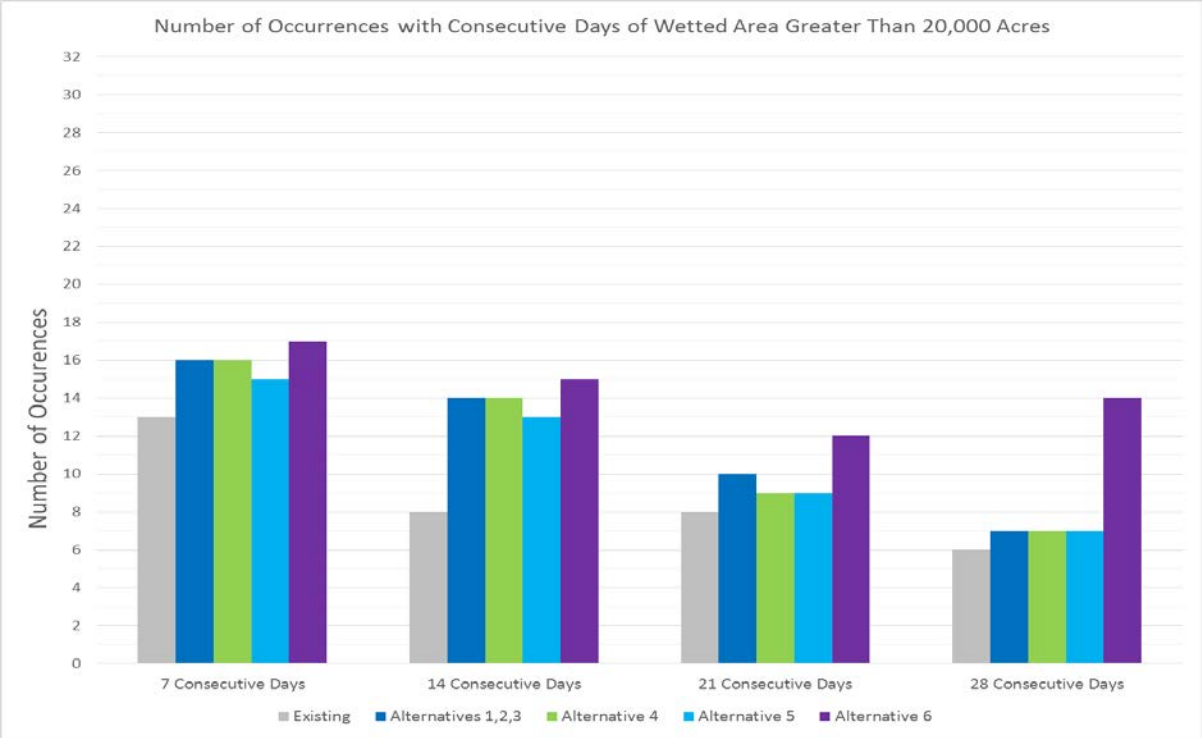

Figure 11-6. Number of Occurrences with Consecutive Days of Wetted Areas Greater than 20,000 Acres

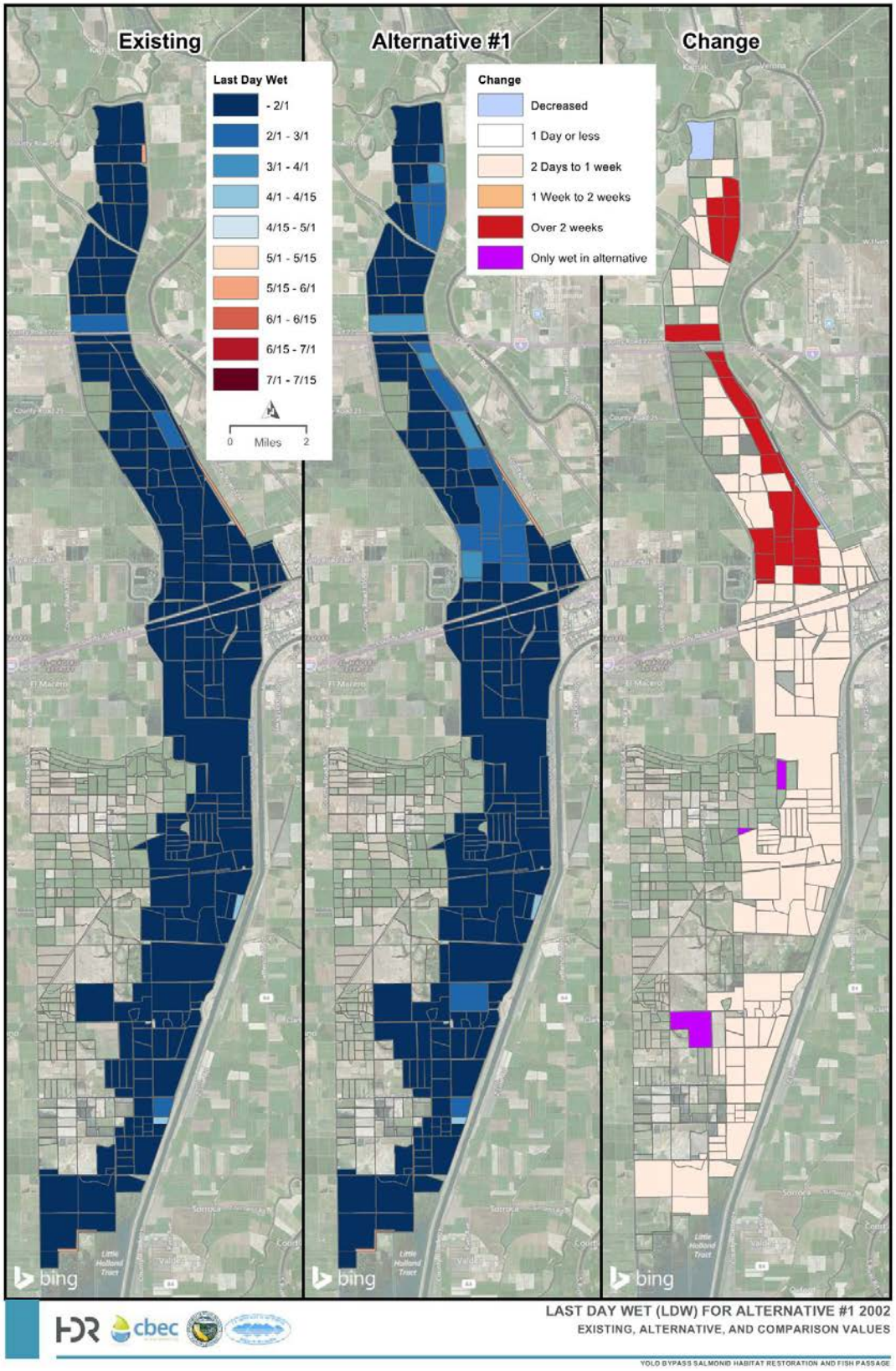

Figure 11-7. Greatest Change in Last Day Wet of all Years Modeled for Fields in the Yolo Bypass under Alternative 1 Compared to Existing Conditions (2002)

CEQA Conclusion

Impacts to agricultural land use resulting from implementation of Alternative 1 would be **less than significant** because Prime Farmland, Unique Farmland, or Farmland of Statewide Importance would not be converted to nonagricultural uses by alternative construction or increased periods of inundation.

11.3.3.3 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 similar in size to Alternative 1 but would have an invert elevation that is higher (14.8 feet) because the river is higher at this upstream location. The gate also would allow up to 6,000 cfs through to provide open channel flow for adult fish passage. See Section 2.5 for more details on the alternative features.

11.3.3.3.1 Impact AGR-1: Physically divide a community or conflict with a relevant land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect

Impacts to land use from the implementation of Alternative 2 would be similar to those discussed for Alternative 1. Alternative 2 would not divide a community because there are no communities present within the Project area and would not conflict with land use plans, policies, or regulations adopted to avoid or mitigate an environmental effect. Agricultural lands would remain designated for agricultural use, but some fields could be fallowed or shifted to alternative crops, which could occur under existing conditions.

CEQA Conclusion

Impacts to land use resulting from implementation of Alternative 2 would be **less than significant** because Project actions associated with Alternative 2 would be consistent with relevant existing land use plans, policies, or regulations adopted to avoid or mitigate an environmental effect and would not occur near a community.

11.3.3.3.2 Impact AGR-2: Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, which may also be protected under the Williamson Act or other conservation programs, to nonagricultural or incompatible uses

Construction of Alternative 2 would permanently affect approximately 61 acres of agricultural land (grazing land and Farmland of Local Importance) within the project footprint and temporarily affect an additional 11 acres. Permanently affected lands would represent a loss in grazing land where it would no longer be feasible due to the construction of project structures. The permanently affected land includes 61 acres of grazing land that are within the FWWA and typically not used for grazing purposes. There would be no permanent conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance. Figure 11-8 shows the underlying land use designations in the areas where construction impacts for Alternative 2 would occur.

Implementation of Alternative 2 could affect farmland within the entire Yolo Bypass through increased periods of inundation, also known as effects from operations. As discussed for Alternative 1, the last day that parcels are wet affects the planting schedules for agricultural production in the Yolo Bypass. The longer fields remain wet, the later planting can begin. If planting is delayed beyond June 1 (the last date to begin planting, on average, as described in Section 3.2 of Appendix K1), the lands may not be planted that year. Figures 11-5 and 11-6 help characterize the inundation patterns by showing the number of occurrences when areas greater than 10,000 and 20,000 acres would be wet for extended periods of time.

For Alternative 2, the gated notch at Fremont Weir would not allow inundation flows to enter the Yolo Bypass after March 15. Flows and facility operations under Alternative 2 would be the same as those under Alternative 1; therefore, model results for Alternative 1 represent the potential impacts under Alternative 2. Based on the model results, if the last day inundation flows would be released through the proposed operable gate at Fremont Weir is March 15, the resulting additional days fields would remain wet would only rarely result in planting dates after June 1 and there would be no change to FMMP land use designations. There would still be potential yield losses, however, because a March 15 end date could delay planting relative to existing conditions, as shown in Figure 11-7. These effects are discussed in Chapter 16, *Socioeconomics*. Figure 11-7 presents the comparison of the last wet day between Alternative 1 (which is representative of Alternative 2) and existing conditions. While increased inundation could temporarily affect up to seven percent of Yolo County's Prime Farmland, Unique Farmland, and Farmland of Statewide Importance, the lands would not be permanently taken out of production although it is possible that farms might shift to alternative crops or experience changes in agricultural yield (see Chapter 16, *Socioeconomics*). There would not be any conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, which may also be protected under the Williamson Act or other conservation programs, to nonagricultural use or incompatible use because of increased periods of inundation.

CEQA Conclusion

Impacts to agricultural land use resulting from implementation of Alternative 2 would be **less than significant** because Prime Farmland, Unique Farmland, or Farmland of Statewide Importance would not be converted to nonagricultural uses by alternative construction or increased periods of inundation.

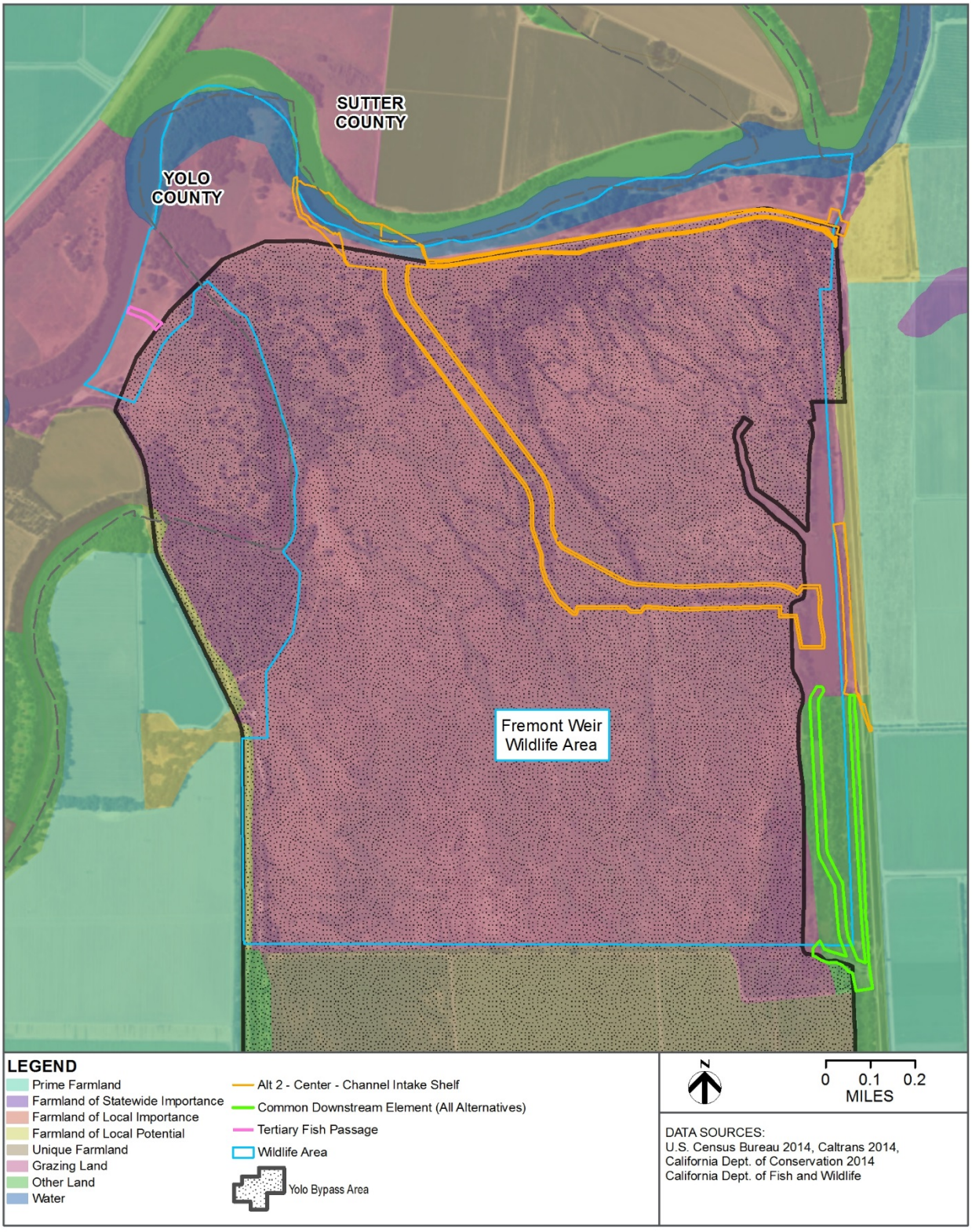

Figure 11-8. Areas of Land Use Impacts under Alternative 2

11.3.3.4 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.

11.3.3.4.1 Impact AGR-1: Physically divide a community or conflict with a relevant land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect

Impacts to land use from the implementation of Alternative 3 would be similar to those discussed for Alternative 1. Actions associated with Alternative 3 would not divide a community as there are no communities present to be divided and should not conflict with land use plans, policies, or regulations adopted to avoid or mitigate an environmental effect. Agricultural lands would remain designated for agricultural use, but some fields could be fallowed or shifted to alternative crops, which could occur under existing conditions.

CEQA Conclusion

Impacts to land use resulting from implementation of Alternative 3 would be **less than significant** because Project actions associated with Alternative 3 would be consistent with relevant existing land use plans, policies, or regulations adopted to avoid or mitigate an environmental effect and would not occur near a community.

11.3.3.4.2 Impact AGR-2: Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, which may also be protected under the Williamson Act or other conservation programs, to nonagricultural or incompatible uses

Construction of Alternative 3 would permanently affect approximately 52 acres of agricultural land (grazing land and Farmland of Local Potential) within the project footprint and temporarily affect an additional 14 acres. Permanently affected lands would represent a loss in grazing land where it would no longer be feasible due to the construction of project structures. The permanently affected land includes 52 acres of grazing land in the FWWA that are typically not used for grazing purposes. There would be no permanent conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance. Figure 11-9 shows the underlying land use designations in the areas where construction impacts from Alternative 3 would occur.

Implementation of Alternative 3 could affect farmland within the entire Yolo Bypass through increased periods of inundation, also known as effects from operations. As discussed for Alternative 1, the last day that parcels are wet affects the planting schedules for agricultural production in the Yolo Bypass. The longer fields remain wet, the later planting can begin. If planting is delayed beyond June 1 (the last date to begin planting, on average, as described in Section 3.2 of Appendix K1), the lands may not be planted that year. Figures 11-5 and 11-6 help characterize the

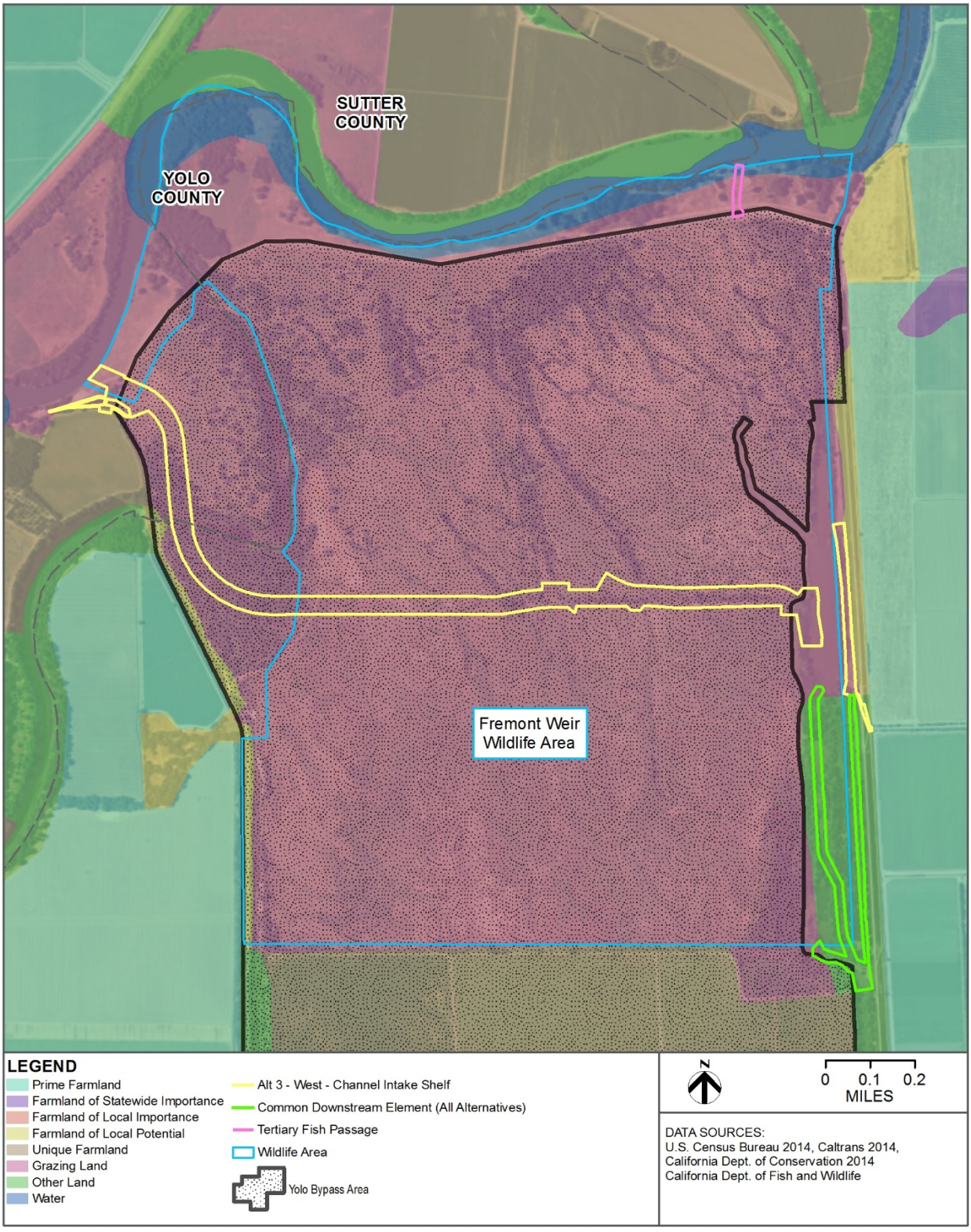

Figure 11-9. Areas of Land Use Impacts under Alternative 3

inundation patterns by showing the number of occurrences when areas greater than 10,000 and 20,000 acres would be wet for extended periods of time.

For Alternative 3, the gated notch at Fremont Weir would not allow inundation flows to enter the Yolo Bypass after March 15. Flows and facility operations under Alternative 3 would be the same as those under Alternative 1; therefore, model results for Alternative 1 represent the potential impacts under Alternative 3. Based on the model results, if the last day inundation flows would be released through the proposed operable gate at Fremont Weir is March 15, the resulting additional days fields would remain wet would only rarely result in planting dates after June 1 and there would be no change to FMMP land use designations. There would still be potential yield losses, however, because a March 15 end date could delay planting relative to existing conditions, as shown in Figure 11-7. These effects are discussed in Chapter 16, *Socioeconomics*.

Figure 11-7 presents the comparison of the last wet day between Alternative 1 (which is representative of Alternative 3) and existing conditions. While increased inundation could temporarily affect up to seven percent of Yolo County's Prime Farmland, Unique Farmland, and Farmland of Statewide Importance, the lands would not be permanently taken out of production although it is possible that farms might shift to alternative crops or experience changes in agricultural yield (see Chapter 16, *Socioeconomics*). There would not be any conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, which may also be protected under the Williamson Act or other conservation programs, to nonagricultural use or incompatible use because of increased periods of inundation.

CEQA Conclusion

Impacts to agricultural land use resulting from implementation of Alternative 3 would be **less than significant** because Prime Farmland, Unique Farmland, or Farmland of Statewide Importance would not be converted to nonagricultural uses by alternative construction or increased periods of inundation.

11.3.3.5 Alternative 4: West Side Gated Notch – Managed Flow

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.

11.3.3.5.1 Impact AGR-1: Physically divide a community or conflict with a relevant land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect

Impacts to land use from the implementation of Alternative 4 would be similar to those discussed for Alternative 1. Alternative 4 actions would not divide a community as there are no communities present to be divided and should not conflict with land use plans, policies, or

regulations adopted to avoid or mitigate an environmental effect. Agricultural lands would remain designated for agricultural use, but some fields could be fallowed or shifted to alternative crops, which could occur under existing conditions.

CEQA Conclusion

Impacts to land use resulting from implementation of Alternative 4 would be **less than significant** because Project actions would be consistent with relevant existing land use plans, policies, or regulations adopted to avoid or mitigate an environmental effect and would not occur near a community.

11.3.3.5.2 Impact AGR-2: Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, which may also be protected under the Williamson Act or other conservation programs, to nonagricultural or incompatible uses

Construction of Alternative 4 would permanently affect approximately 101 acres of agricultural land, including one acre of Prime Farmland and 30 acres of Unique Farmland, within the project footprint and temporarily affect an additional 84 acres, including two acres of Prime Farmland and 50 acres of Unique Farmland. Permanently affected lands would represent a loss in grazing land and a reduction in crop yields where agricultural production would no longer be feasible due to the construction of project structures. These lands are mainly grazing land (70.3 acres) and Unique Farmland (30 acres). The amount of Prime Farmland and Unique Farmland that would be permanently affected by the Alternative 4 project footprint would account for less than one percent of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance (30.6 of over 313,810 acres) in Yolo County. This change to less than one percent of the Prime Farmland, Unique Farmland, and Farmland of Statewide Importance in Yolo County is within the typical range of lost acreage fluctuations experienced in the area. Figure 11-10 shows the underlying land use designations in the areas where construction impacts from Alternative 4 would occur. Most of the grazing lands that would be affected are in the FWWA and not typically used for grazing.

Similar to Alternative 1, implementation of Alternative 4 could affect additional farmland within the Yolo Bypass through increased periods of inundation. The majority of the Yolo Bypass is designated as Unique Farmland and makes up nearly seven percent of Yolo County's Prime Farmland, Unique Farmland, and Farmland of Statewide Importance. The longer fields remain wet, the later planting can begin. If planting is delayed beyond June 1 (the last date to begin planting, on average, as described in Section 3.2 of Appendix K1), the lands may not be planted that year. Figures 11-5 and 11-6 help characterize the inundation patterns by showing the number of occurrences when areas greater than 10,000 and 20,000 acres would be wet for extended periods of time.

The TUFLOW model estimated changes to the last day lands would remain wet as a result of water released from Fremont Weir under Alternative 4 compared to existing conditions. The model was run once with a March 15 date for the end of inundation flows and again with a date of March 7. These comparisons are presented in Figures 11-11 and 11-12. These figures present the difference in last day wet between Alternative 4 and existing conditions. The figures show conditions in 2002 because that year had the greatest change in last day wet of all years modeled (1997 through 2012). Under both scenarios, the additional wet period experienced by lands in the

bypass under Alternative 4 was not found to be outside of the typical planting window (between March 15 and June 1, as described in Section 3.2 of Appendix K1). However, there would still be potential yield losses, because the suggested dates for the end of inundation flow releases (March 15 and March 7) could delay planting relative to existing conditions. These effects are discussed in Chapter 16, *Socioeconomics*. Both the March 15 end date and the March 7 end date result in no permanent land use conversion, so they do not have different impacts regarding converting Prime Farmland, Unique Farmland, and Farmland of Statewide Importance. While project implementation could temporarily affect up to seven percent of Yolo County's Prime Farmland, Unique Farmland, and Farmland of Statewide Importance because of increased periods of inundation, the lands would not be permanently taken out of production although it is possible that farms might shift to alternative crops or experience changes in agricultural yield (see Chapter 16, *Socioeconomics*). There would not be any conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, which may also be protected under the Williamson Act or other conservation programs, to nonagricultural use or incompatible use because of increased periods of inundation.

CEQA Conclusion

Impacts to agricultural land use resulting from implementation of Alternative 4 would be **significant** because there would be a change to Prime Farmland and Unique Farmland.

Mitigation Measure MM-AGR-1: Purchase Agricultural Conservation Easements.

The following activities will be implemented where feasible to minimize adverse effects on existing Prime Farmland, Unique Farmland, and Farmland of Statewide Importance in production and limit the extent of the lands in these three categories that would be converted to non-agricultural uses.

- When selecting locations for staging areas and spoils sites, minimize the fragmentation of lands that are to remain in agricultural use and retain contiguous parcels of agricultural land of sufficient size to support their efficient use for continued agricultural production.
- Purchase property interests in agricultural lands (e.g., conservation easements), requiring the preservation and/or enhancement of other land of similar agricultural quality and acreage, either directly or indirectly, to mitigate for permanently converted Prime Farmland, Unique Farmland, and Farmland of Statewide Importance. Where feasible, the agricultural conservation easements should be acquired in the county in which the conversions would take place, Yolo County. If there is not a sufficient supply of similar Prime Farmland, Unique Farmland, or Farmland of Statewide Importance in the county where the conversions would occur, the agricultural conservation easements may be obtained in a different county.

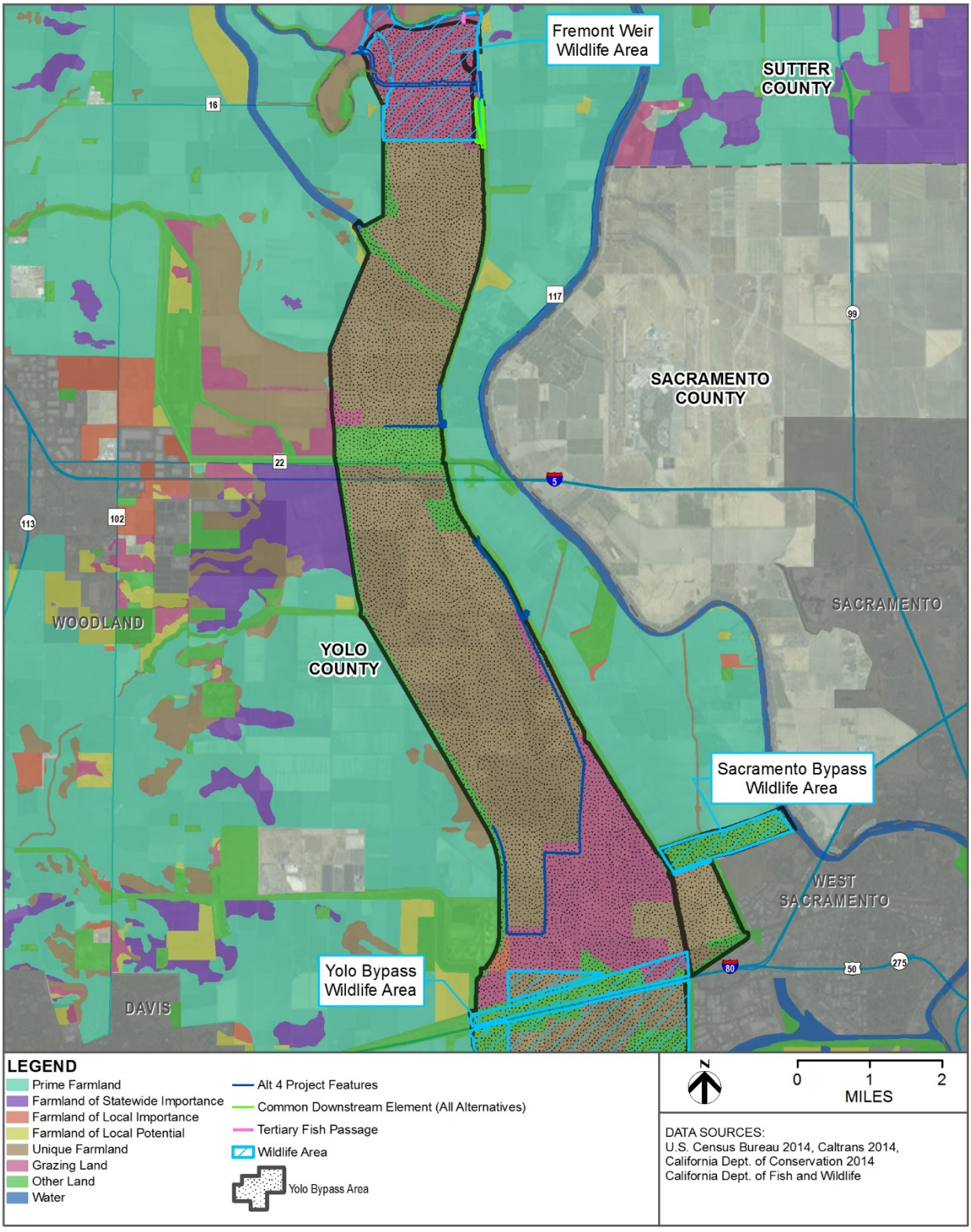

Figure 11-10. Areas of Land Use Impacts under Alternative 4

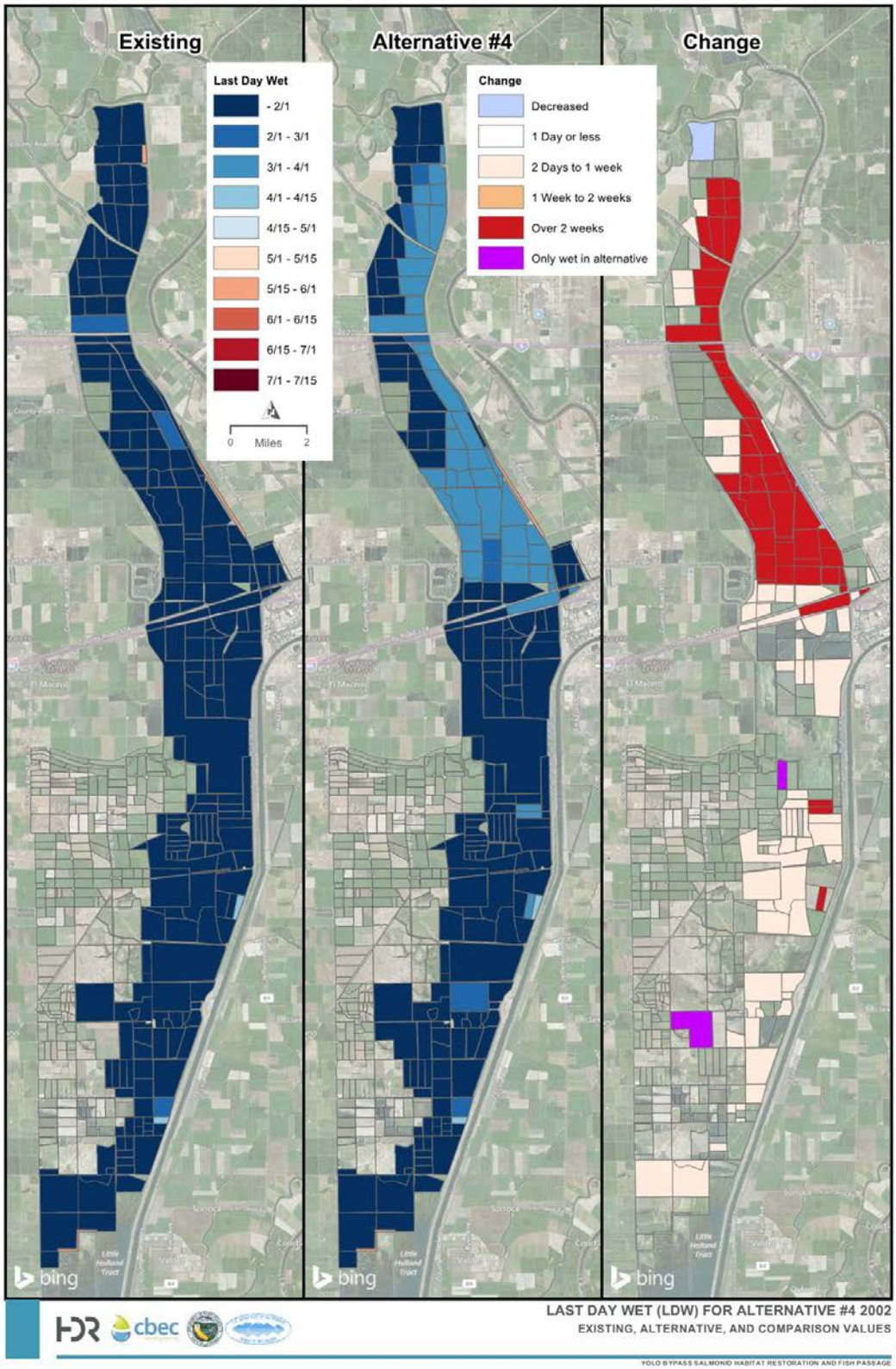

Figure 11-11. Greatest Change in Last Day Wet of all Years Modeled for Fields in the Yolo Bypass under Alternative 4 Compared to Existing Conditions (2002) with End Date of March 15

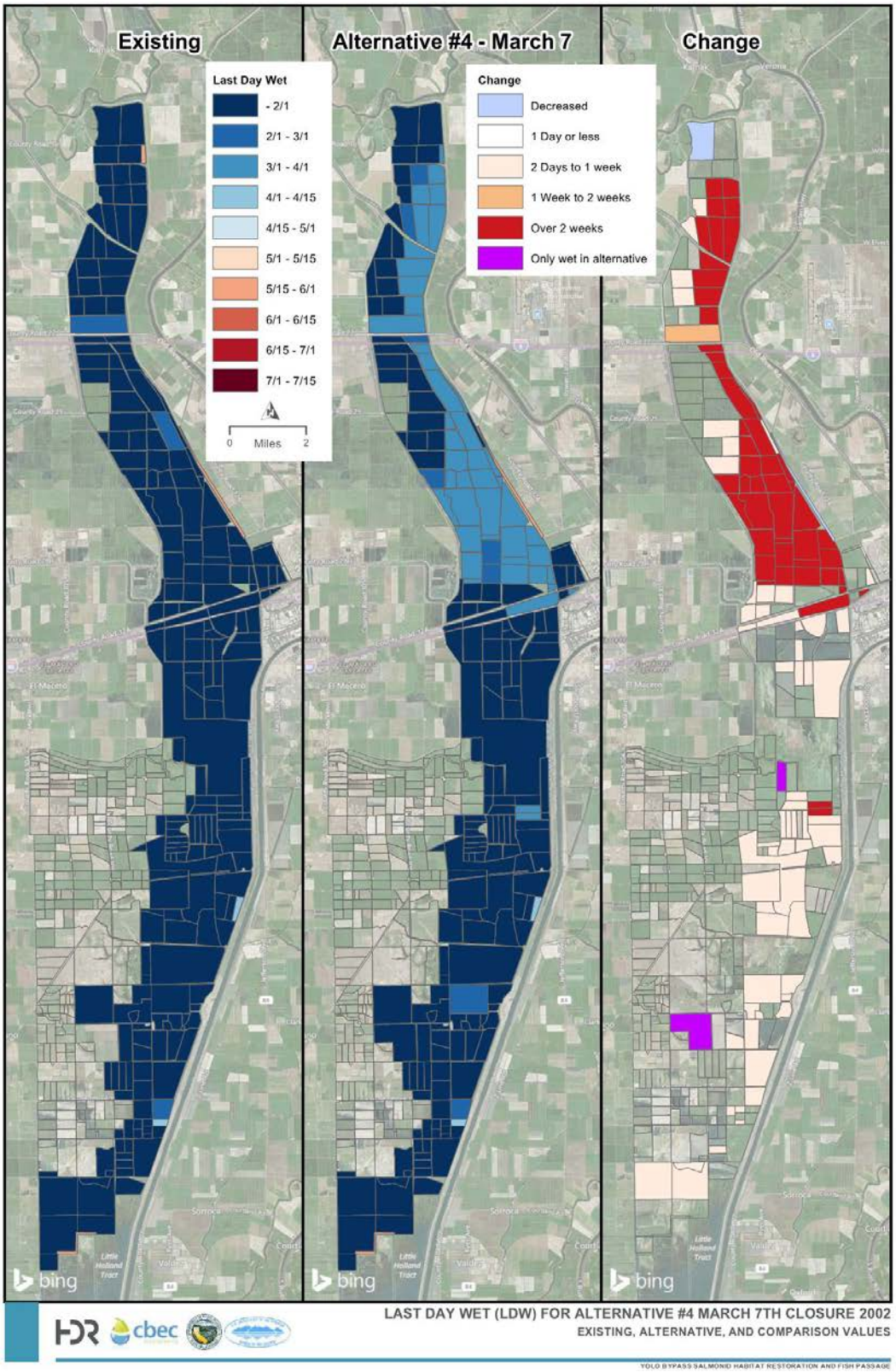

Figure 11-12. Greatest Change in Last Day Wet of all Years Modeled for Fields in the Yolo Bypass under Alternative 4 Compared to Existing Conditions (2002) with End Date of March 7

The acquisition of agricultural conservation easements included in Mitigation Measure MM-AGR-1 would reduce these impacts; however, conservation by means of acquiring agricultural conservation easements would not avoid a net loss of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, and the impact would be remain **significant and unavoidable**.

11.3.3.6 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.

11.3.3.6.1 Impact AGR-1: Physically divide a community or conflict with a relevant land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect

Impacts to land use from the implementation of Alternative 5 would be similar to those discussed for Alternative 1. Alternative 5 actions would not divide a community because there is no community present to be divided and should not conflict with land use plans, policies, or regulations adopted to avoid or mitigate an environmental effect. Agricultural lands would remain designated for agricultural use, but some fields could be fallowed or shifted to alternative crops, which could occur under existing conditions.

CEQA Conclusion

Impacts to land use resulting from implementation of Alternative 5 would be **less than significant** because Alternative 5 actions would be consistent with relevant existing land use plans, policies, or regulations adopted to avoid or mitigate an environmental effect and would not occur near a community.

11.3.3.6.2 Impact AGR-2: Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, which may also be protected under the Williamson Act or other conservation programs, to nonagricultural or incompatible uses

Construction of Alternative 5 would permanently affect approximately 77 acres of agricultural land (grazing lands) within the project footprint and would temporarily affect an additional 27 acres. Permanently affected lands would represent a loss in grazing land and a reduction in crop yields where agricultural production would no longer be feasible due to the construction of project structures. There would be no permanent conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance. Figure 11-13 shows the underlying land use designations in the areas where construction impacts from Alternative 5 would occur. Most of the grazing lands that would be affected are in the FWWA and not typically used for grazing.

Similar to Alternative 1, implementation of Alternative 5 could affect farmland within the entire Yolo Bypass through increased periods of inundation, also known as effects from operations. The longer fields remain wet, the later planting can begin. If planting is delayed beyond June 1 (the last date to begin planting, on average, as described in Section 3.2 of Appendix K1), the lands may not be planted that year. Figures 11-5 and 11-6 help characterize the inundation patterns by showing the number of occurrences when areas greater than 10,000 and 20,000 acres would be wet for extended periods of time. Farmland in the Yolo Bypass represents nearly seven percent of Yolo County's Prime Farmland, Unique Farmland, and Farmland of Statewide Importance.

For Alternative 5, the gated notch at Fremont Weir would not allow inundation flows to enter the Yolo Bypass after March 15. The TUFLOW model was used to estimate the changes to the last day lands would be wet, referred to as the last day wet, under Alternative 5 compared to existing conditions. Figure 11-14 presents the difference in the last wet day between Alternative 5 and existing conditions. The figure shows conditions in 2002 because that year had the greatest change in last day wet of all years modeled (1997 through 2012).

In an average year, the last date to plant is June 1 (see Section 3.2 of Appendix K1). After June 1, farmers would not plant crops. The additional wet period that would be experienced by most of the lands in the bypass is not anticipated to cause a delay that would result in planting dates beyond June 1 or a change in FMMP land use classifications. There would still be potential yield losses, however, because a March 15 end date could delay planting relative to existing conditions, as shown in Figure 11-14. These effects are discussed in Chapter 16, *Socioeconomics*. While project implementation could temporarily affect up to seven percent of Yolo County's Prime Farmland, Unique Farmland, and Farmland of Statewide Importance because of increased periods of inundation, the lands would not be permanently taken out of production although it is possible that farms might shift to alternative crops or experience changes in agricultural yield (see Chapter 16, *Socioeconomics*). There would not be any conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, which may also be protected under the Williamson Act or other conservation programs, to nonagricultural use or incompatible use because of increased periods of inundation.

CEQA Conclusion

Impacts to agricultural land use resulting from implementation of Alternative 5 would be **less than significant** because Prime Farmland, Unique Farmland, or Farmland of Statewide Importance would not be converted to nonagricultural uses by alternative construction or increased periods of inundation.

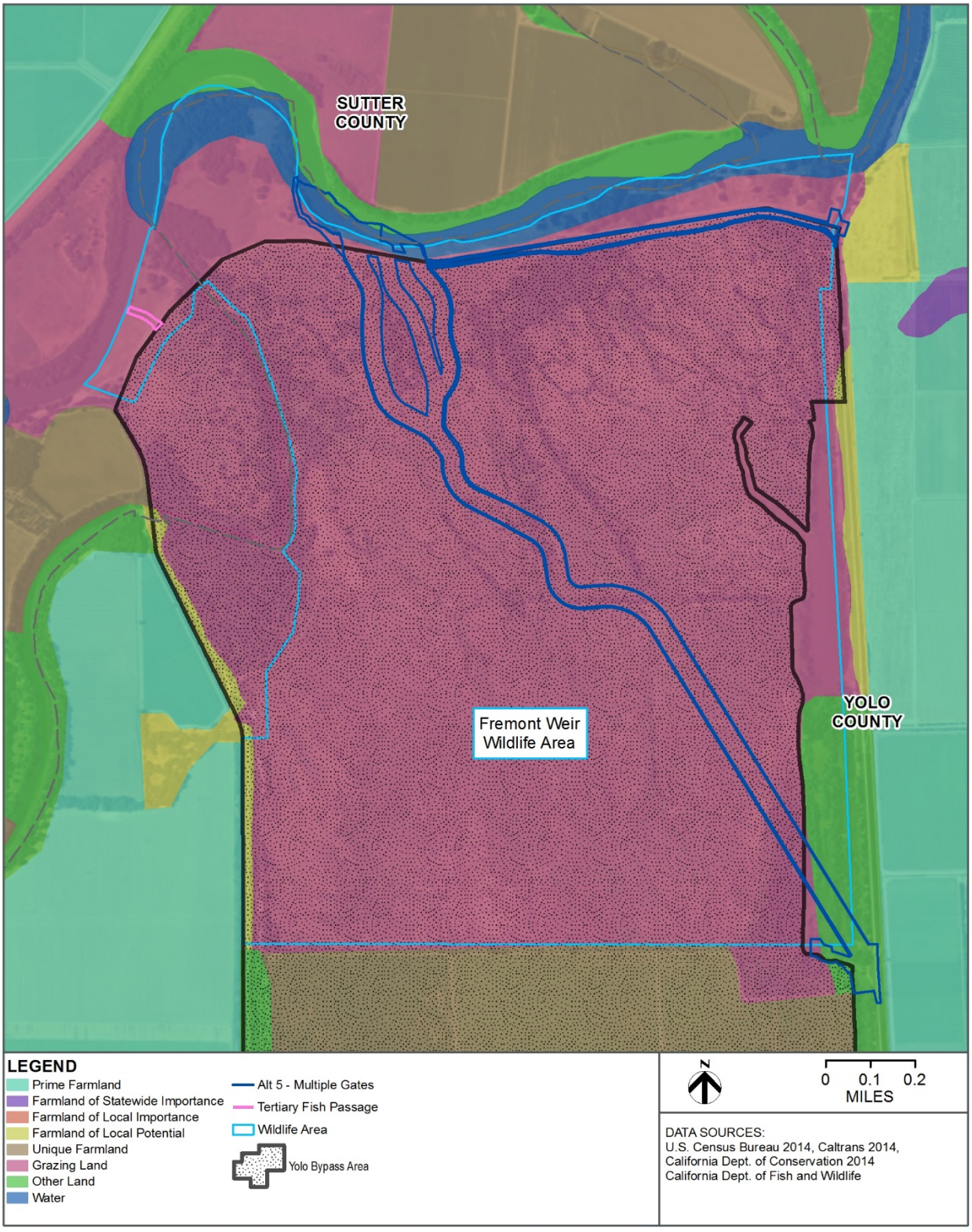

Figure 11-13. Areas of Land Use Impacts under Alternative 5

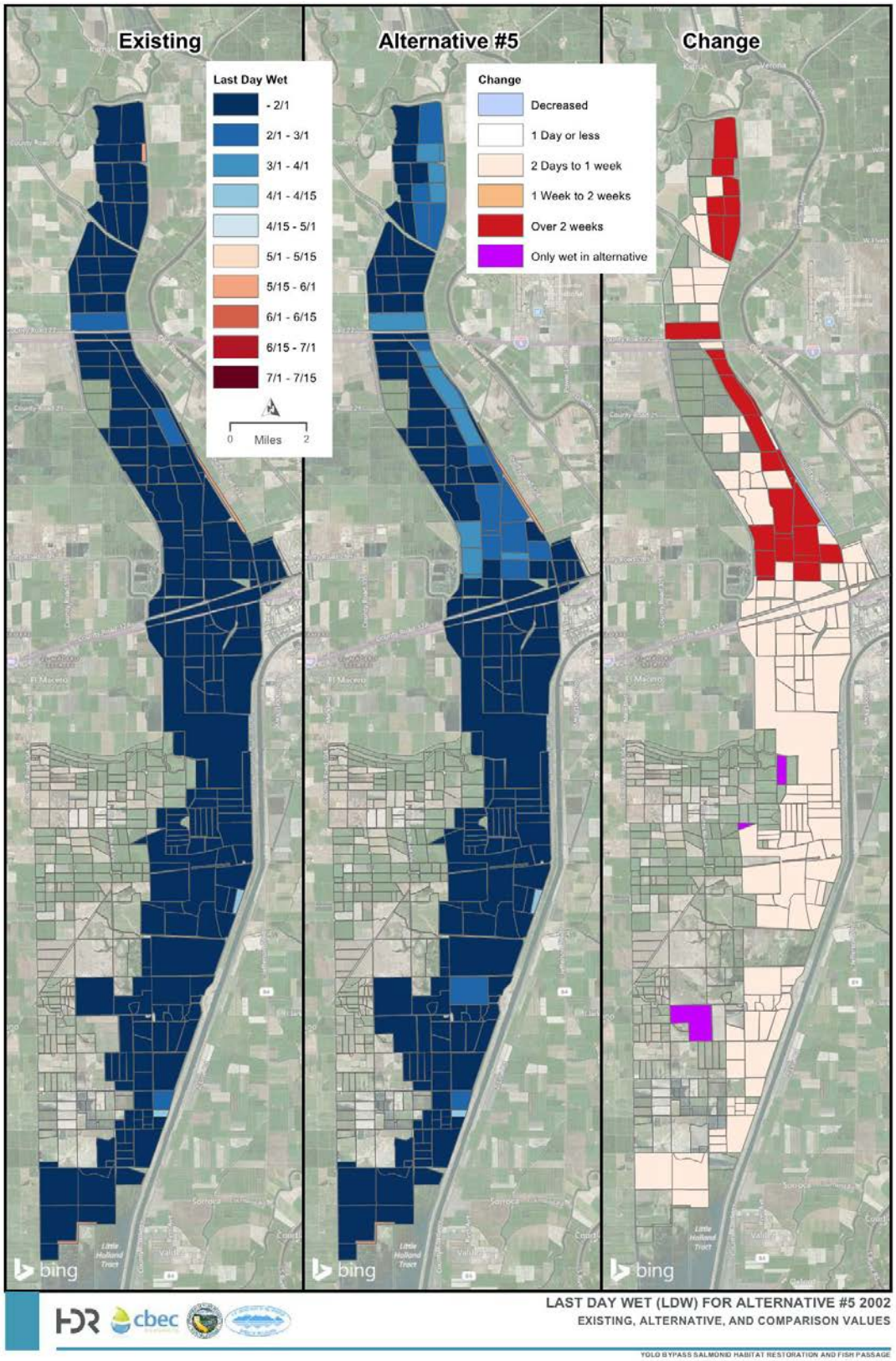

Figure 11-14. Greatest Change in Last Day Wet of all Years Modeled for Fields in the Yolo Bypass under Alternative 5 Compared to Existing Conditions (2002)

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

Impact AGR-1: Physically divide a community or conflict with a relevant land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect

Program level improvements to the Tule Canal Floodplain (a series of secondary channels that connect to Tule Canal, north of Interstate 80) would not divide a community because there is no community present to be divided and should not conflict with land use plans, policies, or regulations adopted to avoid or mitigate an environmental effect. These improvements may have a potential effect on a very small portion of agricultural land, which would remain designated for agricultural use, but some fields could be fallowed or shifted to alternative crops, which could occur under existing conditions.

CEQA Conclusion

Impacts to land use resulting from the program level improvements to the Tule Canal Floodplain associated with Alternative 5 would be **less than significant** because actions would be consistent with relevant existing land use plans, policies, or regulations adopted to avoid or mitigate an environmental effect and would not occur near a community.

Impact AGR-2: Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, which may also be protected under the Williamson Act or other conservation programs, to nonagricultural or incompatible uses

Program level improvements to the Tule Canal Floodplain associated with Alternative 5 would be located on lands largely functioning as wetlands or designated as fallowed fields. However, a small portion of the area is designated Unique Farmland, which could be affected by increased inundation. Increased inundation from the secondary channels is not expected to result in changes to land use classifications or conversion of agricultural lands to nonagricultural uses.

CEQA Conclusion

Impacts to land use resulting from the program level improvements to the Tule Canal Floodplain associated with Alternative 5 would be **less than significant** because Unique Farmland would not be converted to nonagricultural uses.

11.3.3.7 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.

11.3.3.7.1 Impact AGR-1: Physically divide a community or conflict with a relevant land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect

Impacts to land use from the implementation of Alternative 6 would be similar to those discussed for Alternative 1. Alternative 6 actions would not divide a community as there are no communities present to be divided and should not conflict with land use plans, policies, or regulations adopted to avoid or mitigate an environmental effect. Agricultural lands would remain designated for agricultural use, but some fields could be fallowed or shifted to alternative crops, which could occur under existing conditions.

CEQA Conclusion

Impacts to land use resulting from implementation of Alternative 6 would be **less than significant** because Alternative 6 actions would be consistent with relevant existing land use plans, policies, or regulations adopted to avoid or mitigate an environmental effect and would not occur near a community.

11.3.3.7.2 Impact AGR-2: Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, which may also be protected under the Williamson Act or other conservation programs, to nonagricultural or incompatible uses

Construction of Alternative 6 would permanently affect approximately 70 acres of agricultural land (grazing lands and Farmlands of Local Potential) within the project footprint and temporarily affect an additional 14 acres. Permanently affected lands would represent a loss in grazing land where it would no longer be feasible due to the construction of project structures. These lands are mainly grazing land (69 acres). There would be no permanent or temporary conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance. Figure 11-15 shows the underlying land use designations in the areas where construction impacts from Alternative 6 would occur. Most of the grazing lands that would be affected are in the FWWA and not typically used for grazing.

Similar to Alternative 1, potential increases in inundation associated with the implementation of Alternative 6 could affect additional farmland within the Yolo Bypass. Agricultural lands in the Yolo Bypass represent nearly seven percent of Yolo County's Prime Farmland, Unique Farmland, and Farmland of Statewide Importance. The longer fields remain wet, the later planting can begin. If planting is delayed beyond June 1 (the last date to begin planting, on average, as described in Section 3.2 of Appendix K1), the lands may not be planted that year. Figures 11-5 and 11-6 help characterize the inundation patterns by showing the number of occurrences when areas greater than 10,000 and 20,000 acres would be wet for extended periods of time.

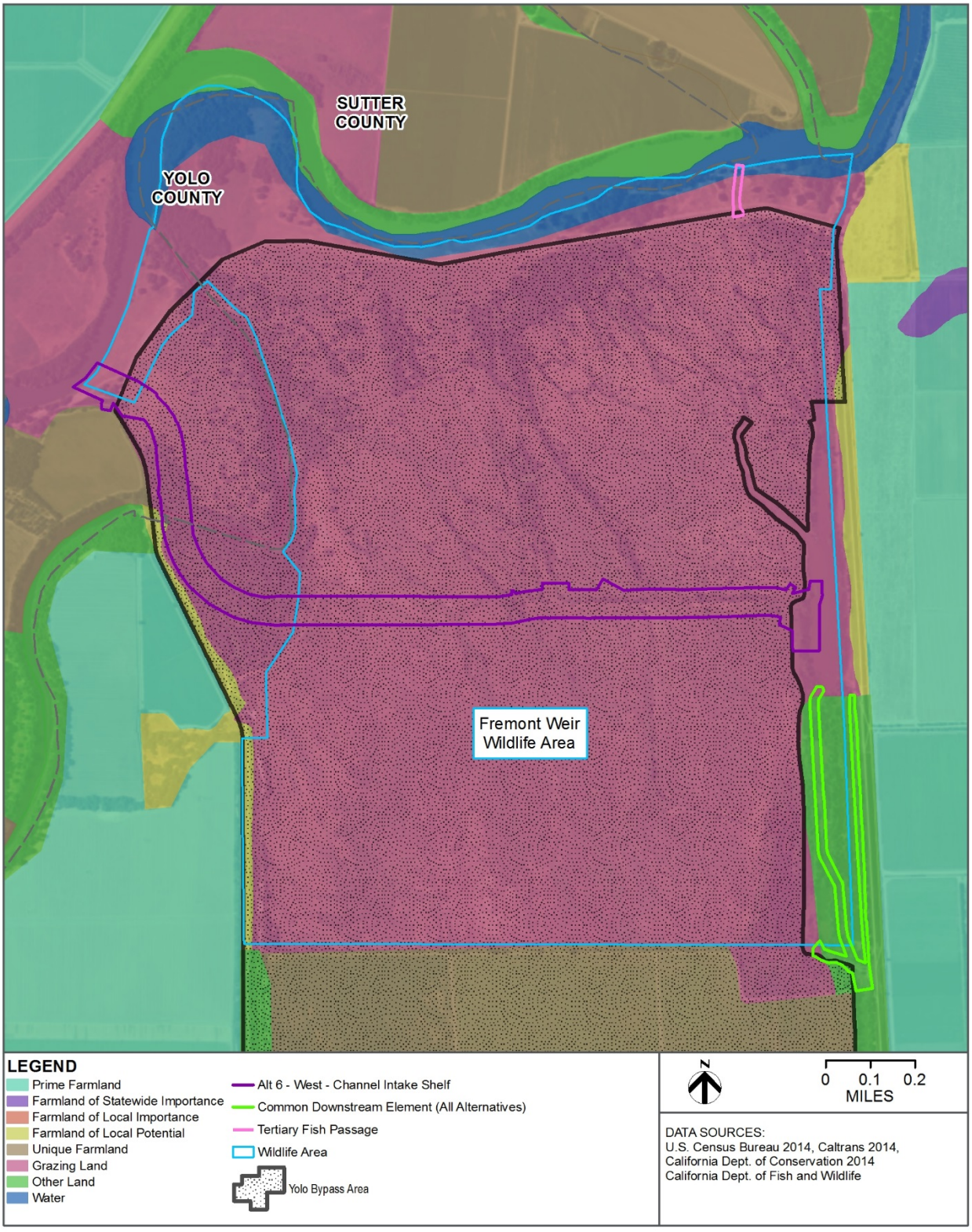

Figure 11-15. Areas of Land Use Impacts under Alternative 6

The TUFLOW model was used to estimate the changes to the last day lands would remain wet, referred to as the last day wet, under Alternative 6 compared to existing conditions. Figure 11-16 presents the difference in the last wet day between Alternative 6 and existing conditions. The figure shows conditions in 2002 because that year had the greatest change in last day wet of all years modeled (1997 through 2012).

In an average year, the last date to plant is June 1 (see Section 3.2 of Appendix K1). After June 1, farmers would choose not to plant crops. The additional wet period experienced by most of the lands in the bypass is not anticipated to cause a delay that would result in planting dates beyond June 1 or change FMMP land use classifications. There are still potential yield losses, however, because the proposed date (March 15) for the end of inundation flow releases at Fremont Weir could delay planting relative to existing conditions, as shown in Figure 11-16. These effects are discussed in Chapter 16, *Socioeconomics*. While implementation of Alternative 6 could temporarily affect up to seven percent of Yolo County's Prime Farmland, Unique Farmland, and Farmland of Statewide Importance because of increased periods of inundation, the lands would not be permanently taken out of production although it is possible that farms might shift to alternative crops or experience changes in agricultural yield (see Chapter 16, *Socioeconomics*). There would not be any conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, which may also be protected under the Williamson Act or other conservation programs, to nonagricultural use or incompatible use because of increased periods of inundation.

CEQA Conclusion

Impacts to agricultural land use resulting from implementation of Alternative 6 would be **less than significant** because Prime Farmland, Unique Farmland, or Farmland of Statewide Importance would not convert to nonagricultural uses by alternative construction or increased periods of inundation.

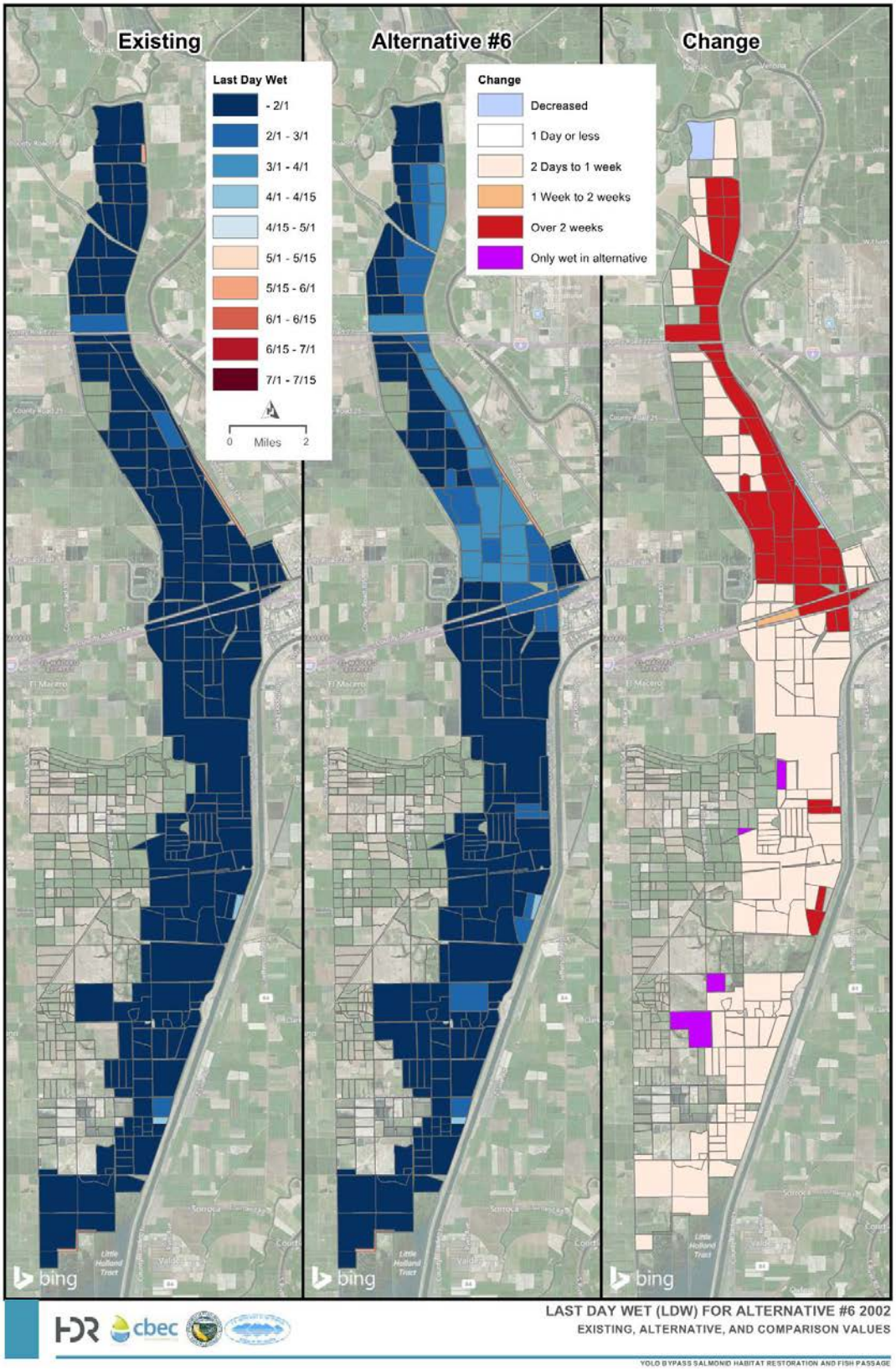

Figure 11-16. Greatest Change in Last Day Wet of all Years Modeled for Fields in the Yolo Bypass under Alternative 6 Compared to Existing Conditions (2002)

11.3.4 Summary of Impacts

Table 11-6 provides a summary of the identified impacts to land use and agricultural resources within the Project area.

Table 11-6. Summary of Impacts and Mitigation Measures – Land Use and Agricultural Resources

Impact	Alternative	Estimated Affected Land (acres)	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Impact AGR-1: Physically divide a community or conflict with a relevant land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect	No Action	---	NI	---	NI
	All Action Alternatives	---	LTS	---	LTS
Impact AGR-2: Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, which may also be protected under the Williamson Act or other conservation programs, to nonagricultural or incompatible uses	No Action	0	NI	---	NI
	1, 2, 3, 5 (Project), 5 (Program), 6	0	LTS	---	LTS
	4	P: 1 Prime; 30 Unique T: 2 Prime; 50 Unique	S	MM-AGR-1	SU

Key: LTS = less than significant; NI = no impact; P = Permanent; S = significant; SU = significant and unavoidable; T = temporary

11.4 Cumulative Impacts Analysis

This section describes the cumulative impacts analysis for land use. 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 effects analysis.

11.4.1 Methodology

This evaluation of cumulative impacts for land use considers the effects of the Project and how they may combine with the effects of other past, present, and future projects or actions to create significant impacts on specific resources. The area of analysis for these cumulative impacts includes the area surrounding, and including, 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.

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

Projects that would require or result in construction activities, or other actions such as increased flooding, within the Project area have the potential to impact land use and agricultural resources in combination with the Project alternatives. These projects are listed below:

- California EcoRestore projects
  - Agricultural Road Crossing #4 Fish Passage Improvement Project
  - Cache Slough Area Restoration – Prospect Island
  - Fremont Weir Adult Fish Passage Modification Project
  - Lisbon Weir Modification Project
  - Lower Putah Creek Realignment Project
  - Prospect Island Tidal Habitat Restoration Project
  - Tule Red Tidal Marsh Restoration Project
  - Wallace Weir Fish Rescue Facility Project
- California WaterFix
- Central Valley Flood Protection Plan
- Liberty Island Conservation Bank
- Lower Elkhorn Basin Levee Setback Project
- Lower Yolo Restoration Project
- Sacramento River Bank Protection Project
- Sacramento River General Reevaluation Report

11.4.2 Cumulative Impacts

Several related and reasonably foreseeable projects and actions may result in impacts to land use and agricultural resources in the Project area.

Specifically, the Central Valley Flood Protection Plan, which includes the Sacramento River Basin-Wide Feasibility Study, Lower Elkhorn Basin Levee Setback Project, Sacramento River Bank Protection Project, and Sacramento River General Reevaluation Report, may result in construction in or adjacent to the Yolo Bypass. Construction activities could be associated with levee setbacks, removal, and improvements, expansion of Fremont Weir and the Yolo Bypass, construction of new bypass channels, and the construction of levees. Construction activities associated with the cumulative projects could affect the amount of agricultural lands taken out of production around the same period as the Project alternatives. However, impacts to agricultural lands from the actions included in the Sacramento River General Reevaluation Report are unknown but expected to be compatible with the project.

The Lower Elkhorn Basin Levee Setback Project Draft EIS/EIR (United States Army Corps of Engineers, Sacramento District 2018) stated that implementation of all of its proposed action alternatives would not change the existing land uses at the project site or convert adjacent agricultural land or Williamson Act-contracted land to other uses. However, construction of the proposed levee setbacks would convert 294 to 494.3 acres of Prime Farmland and Unique Farmland to nonagricultural uses, some of which would likely be inconsistent with the uses allowed under Williamson Act contracts. To reduce this impact, mitigation measures were proposed, but the impacts would be significant and unavoidable.

The Liberty Island Conservation Bank proposes to breach the northernmost east/west levee, which could permanently flood an additional 1,000 acres. The Lower Yolo Restoration Project is intended to restore tidal flux to 1,100 acres of existing pasture land. The Lower Restoration Project would remove 240 acres of Important Farmland due to construction activities and convert 170 acres of Unique Farmland to wetlands and 60 acres of Unique Farmlands (active grazing fields) to the proposed levee toe berm, removing around 650 acres of irrigated agriculture surrounding the restored wetlands (State and Federal Contractors Water Agency [SFCWA] 2013, SFCWA 2011). This would represent a conversion of 0.04 percent of the total agricultural land in Yolo County and a 0.4 percent reduction in the County's Unique Farmland (SFCWA 2013). Additionally, EcoRestore Projects in or near the Yolo Bypass, including Agricultural Road Crossing #4, Lisbon Weir Modification Project, and Lower Putah Creek Realignment Project, could affect small areas of agricultural land. These actions have the potential to change land use in these parts of the bypass but would not likely change land use designations as sometimes the operational land use on a parcel may change temporarily but the use remains consistent with the land use designation. For example, a parcel with an agricultural designation could typically be used to produce commercial crops, but the landowner could switch operations to agricultural processing and the agricultural land use designation would remain the same.

Neither the Project nor cumulative projects are expected to affect land use by physically dividing a community or conflicting with a relevant land use plan, policy, or regulation. Regarding construction-related impacts or the location of new or relocated structures, the cumulative projects would be expected to implement proper mitigation measures, when necessary, to prevent significant cumulative impacts such as the conversion of agricultural lands to nonagricultural use or the reduction of crop yields. It is also assumed that construction-related impacts to agricultural lands would be temporary and would not result in the conversion of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance to nonagricultural uses or substantial reductions to crop yields. Therefore, the Project alternatives' incremental contributions to the cumulative effects associated with Prime Farmland, Unique Farmland, and Farmland of Statewide Importance **would not result in significant cumulative effects.**

11.5 References

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12 Geology and Soils

This chapter describes the environmental and regulatory settings of geology and soils, including mineral resources, in the area of the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project (Project) and the environmental consequences and mitigation measures as they pertain to the implementation of Project alternatives. This discussion focuses on the Great Valley geomorphic province of California where components of the Project alternatives are located (California Geological Survey [CGS] 2002).

12.1 Environmental Setting/Affected Environment

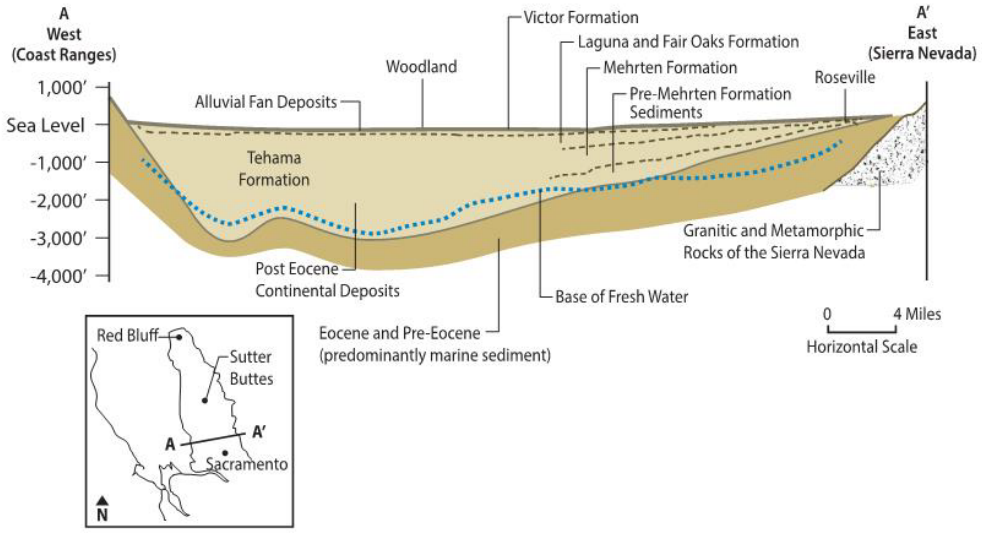
This section describes the environmental setting and affected environment related to geology, soils, mineral resources, and geologic hazards, including earthquakes and landslides.

12.1.1 Regional Geology and Topography

The area of analysis for geology and soils consists of the Project area, where project actions would occur, located within the Yolo Bypass. The majority of the Yolo Bypass is in Yolo County, with the remainder of the bypass in Sutter and Solano counties. Project actions would occur in Yolo and Sutter counties. The southern point of Yolo Bypass is in Solano County; however, no project actions or soil-related impacts, such as increased sediment deposition, would occur there. Therefore, there would be no impacts to geology and soils in Solano County, so it is not discussed further in this section. Yolo and Sutter counties are in the southern part of the Sacramento Valley Groundwater Basin. The Sacramento Valley Groundwater Basin is bordered by the Coast Range to the west, the Sierra Nevada to the east, and the San Joaquin Valley Groundwater Basin to the south. The Yolo Bypass is bounded to the north and east by the natural levees of the Sacramento River, to the west by the coalesced alluvial fans of Putah Creek and Cache Creek, and to the south by the tidal marshes of the Sacramento-San Joaquin Delta (Delta).

Many geologically different areas, called geomorphic provinces, have been created by geologic processes active in California for millions of years. The Project area is in Great Valley Province. The Great Valley Province is an alluvial plain in which sediments have been deposited almost continuously since approximately 160 million years ago (CGS 2002). The alluvial basin deposits are further described as Holocene basin deposits and Holocene alluvium (CGS 2011).

The Great Valley Province primarily consists of gently sloping to level alluvial plains. Geologic units in the Great Valley Province generally consist of Quaternary alluvium and the Quaternary Modesto and Riverbank formations, both of which consist of somewhat older alluvium and make up the alluvial fan deposits. As presented in Figure 12-1, the Tehama Formation (non-marine sandstone, siltstone, and volcaniclastic rocks) underlies the Quaternary alluvial fan deposits (Yolo County 2012).



Source: California Department of Water Resources (DWR) 1978

Figure 12-1. Geologic Cross-Section of the Lower Sacramento Valley Groundwater Basin

12.1.2 Geomorphology

The portion of the Sacramento River that is within the Project area is completely constrained by levees that are typically located within 100 feet or less of the river channel (HDR, Inc. 2017a). At Fremont Weir, the Sacramento River is relatively stable and exhibits typical river bend behavior even though natural bank migration is occurring, upwards of three feet per year over the last few decades, mainly to the north (HDR, Inc. 2017a). The prominent meander on the western end of the Fremont Weir (the western meander) has exhibited similar behavior since 1908, with the outside concave bank migrating to the north and the convex inside bank building a point bar, with trending movements to the east. Downstream of the western meander, along the Fremont Weir, the river has been relatively straight since the 1950s. Immediately downstream of the weir, the river, clinging closely to the right bank levee, has experienced an increase in width over time. Near the eastern end of Fremont Weir, the river straightens and has bank migration trends that imply the occurrence of both bank erosion and bank building (HDR, Inc. 2017a). Near the Project area, small scale lateral migrations have occurred, including river channel widening, between the upstream and downstream ends of Fremont Weir. These trends imply that the river might move toward or away from a fixed inlet structure added by Project alternatives (HDR, Inc. 2017a).

Historically, prior to the construction of weirs and levees, the Yolo Bypass area was part of the Yolo Basin, a natural depression on the Sacramento Valley floor that formed after the last Ice Age. Until the construction of the levees began (1917) and the weirs were completed (Sacramento Weir in 1917 and Fremont Weir in 1924), the basin trough formed vast wetlands (seasonal wetlands to the north, freshwater tidal marshes and slough channels to the south) and did not function as a true floodplain that directly interacted with the Sacramento River as it rose and fell with the winter and spring (California Department of Fish and Game 2008). During the winter months in the 1800s, the Yolo Basin would fill with surrounding river water and become a marsh ecosystem that could last more than 100 days, limiting travel between cities. In 1911,

Congress approved the Sacramento River Flood Control Project to divert the water and avoid travel limitations. Under the Sacramento River Flood Control Project, the natural basin was converted to a weir-regulated system called the Yolo Bypass. The bypass is surrounded completely on the east and partially on the west by United States Army Corps of Engineers levees.

12.1.3 Soils

The shrinking and swelling of soils has the potential to cause damage to crops and infrastructure such as buildings, roads, and bridges. When soils swell or expand, they exert a force and put pressure on the surrounding area, which could cause structural damage such as lifting or cracking. Typically, swelling does not negatively affect crops. When soils shrink, the particles shift, which can cause an uneven settling of the sediment under the foundation. Shrinking can pull the roots of crop plants apart, allow contaminants to penetrate deeper into the soil, and potentially result in structural failure of infrastructure. The shrink-swell potential of soils is dependent on the change in the length of an unconfined clump of soil as its moisture content is either decreased or increased. This measure is a soil's linear extensibility and is often expressed as a percent. Linear extensibility and shrink-swell potential are closely correlated with the type and amount of clay present in the soil. The highest shrink-swell potential occurs in soils with a high ratio (two to one) of lattice clays; illitic and kaolinitic clays have intermediate and low potentials, respectively. If the linear extensibility of a soil is three to 30 percent, the shrink-swell potential is rated moderate to very high and can cause damage to infrastructure (Natural Resources Conservation Service [NRCS] Undated).

As shown in Figure 12-2, the eastern part of Yolo County where the Project is located is mainly composed of silt loam, loam, and silty clay loam. These soils are characterized as having low erodibility, low to high shrink-swell potentials, and low to high linear extensibility percentages (NRCS 2007a, 2007b, and 2007c), as shown in Figure 12-3.

As shown in Figure 12-2, the small portion of the Project area that is within Sutter County is along the Sacramento River near the county line. Soils in this area are a mixture of silt loam, loamy sand, and fine sandy loam (NRCS 2009b). These soils are typically characterized as having low linear extensibility and shrink-swell potential and mid-range to high erodibility (NRCS 2009a, 2009c).

Soils near Fremont Weir have a low shrink-swell potential and consequently a low risk of causing damage to infrastructure. Soils near Agricultural Road Crossing 1 have a moderate to high shrink-swell potential, which could potentially damage crops or infrastructure.

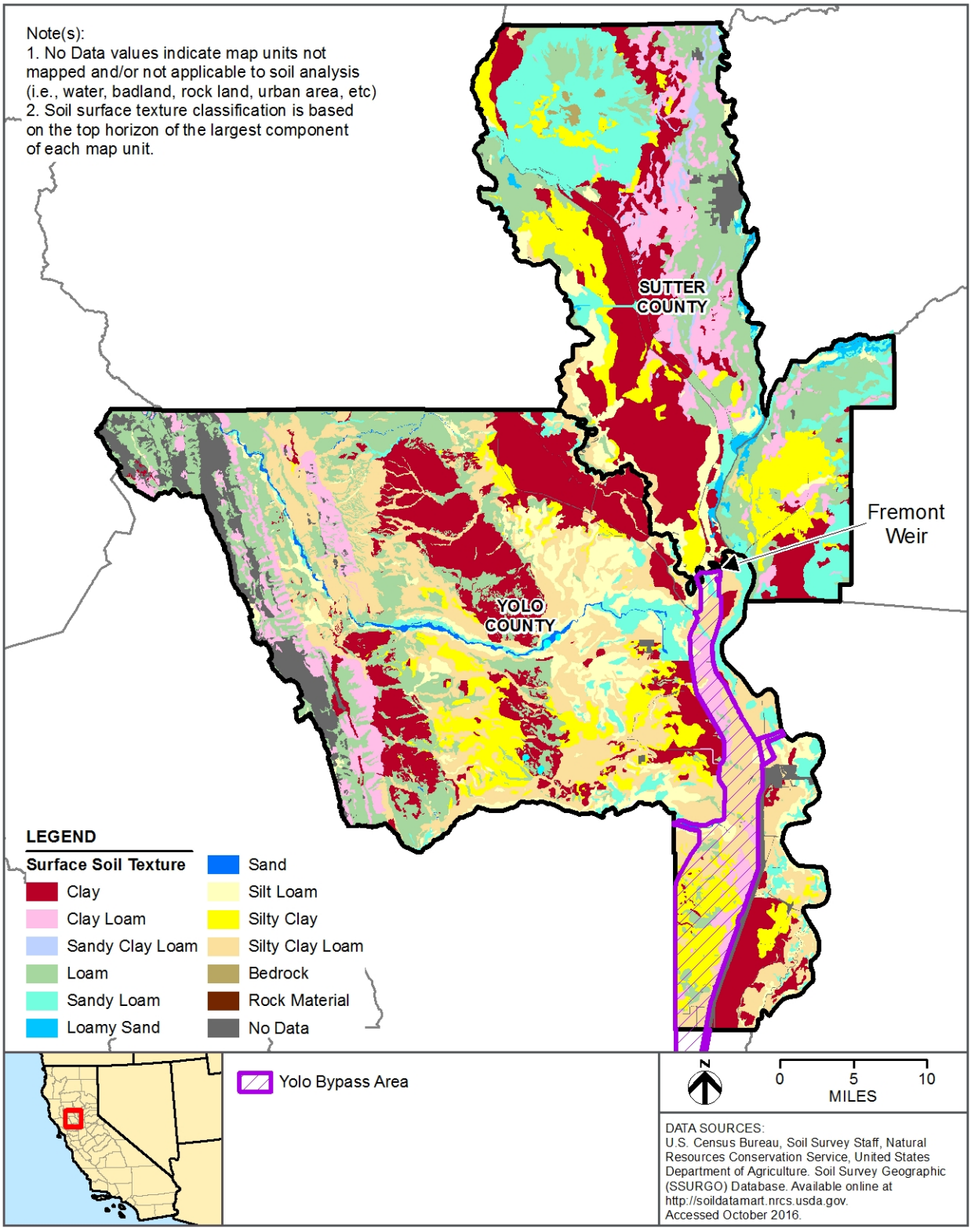


Figure 12-2. Surface Soil Texture Map for Yolo and Sutter Counties

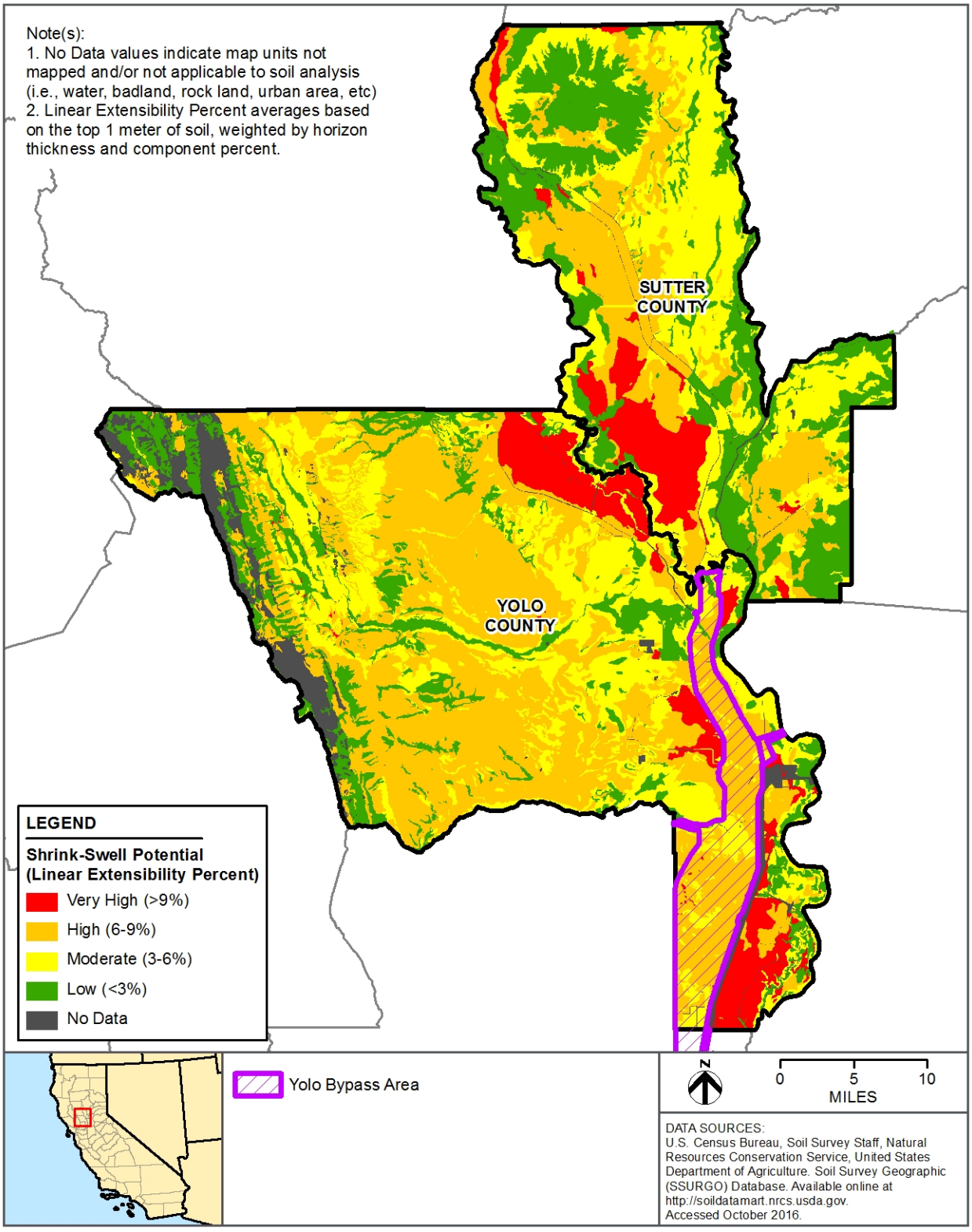


Figure 12-3. Shrink-Swell Potential of Soils in Yolo and Sutter Counties

12.1.4 Geologic Hazards

The geologic hazards discussed in this section include regional seismic activity and potential for surface fault rupture, seismic shaking, liquefaction, landslides, and land subsidence. The Project area is not located in an Alquist-Priolo Earthquake Fault Zone, no active faults have been identified in the area, and the area experiences less frequent low levels of seismic activity compared to many areas in California; therefore, the risk for surface fault rupture in the Project area is low (CGS 2015, 2010, and 2008a). As shown in Figure 12-4, the active fault in an Alquist-Priolo Earthquake Fault Zone closest to the Project area is the Hunting Creek fault just outside of the northwest portion of Yolo County, and the closest inactive fault is the Dunnigan Hills fault, centrally located in Yolo County (CGS 2010).

Strong, sustained seismic shaking (ground shaking) is the main cause of earthquake damage. Ground shaking can cause soils and unconsolidated sediments to compact and settle. When compacted, water stored in the pores of these soils can also be forced to the surface, causing soil deformation called liquefaction. Liquefaction can cause minor to major damage to infrastructure (e.g., foundation failure). The *Ground Motion Interpolator* provided by the CGS (2008b) shows a low ground shaking hazard in the Project area. There are no site-specific data or surveys to determine the liquefaction hazard in the Project area. However, because the water table near Fremont Weir is high and the soils are relatively deep, the risk of liquefaction during an earthquake near the Project area is assumed to be moderate (DWR 2017). The potential for seismic shaking in the Project area is low to minimal because there are no nearby active fault lines (as shown in Figure 12-4). The potential for liquefaction is greater when there is a seismic event. Therefore, it is assumed that because the potential for seismic events is low, there is little to no risk of liquefaction.

Landslides are characterized by the down-slope movement of soil and rock under the direct influence of gravity. Landslides can damage structures and buildings, including levees. Typically, landslides occur on steep slopes, when the slope conditions change from stable to unstable. However, landslides could also occur on low-angle slopes. The lands within the Project area have relatively low slopes associated with the topography of a valley. However, low-angle landslides could affect the nearby levees, depending on the levees' construction. Segment 171 of the Yolo Bypass East Levee was founded upon some of the weaker foundation soils in the surrounding area and has the potential to experience geologic hazards associated with erosion and stability (HDR, Inc. 2017c). The relative risk for landslides in the Project Area is very low given the low sloping topography of the area. Project actions should not disturb soils that serve as the foundation of the levee. Therefore, there is little to no risk of landslides in the Project area.

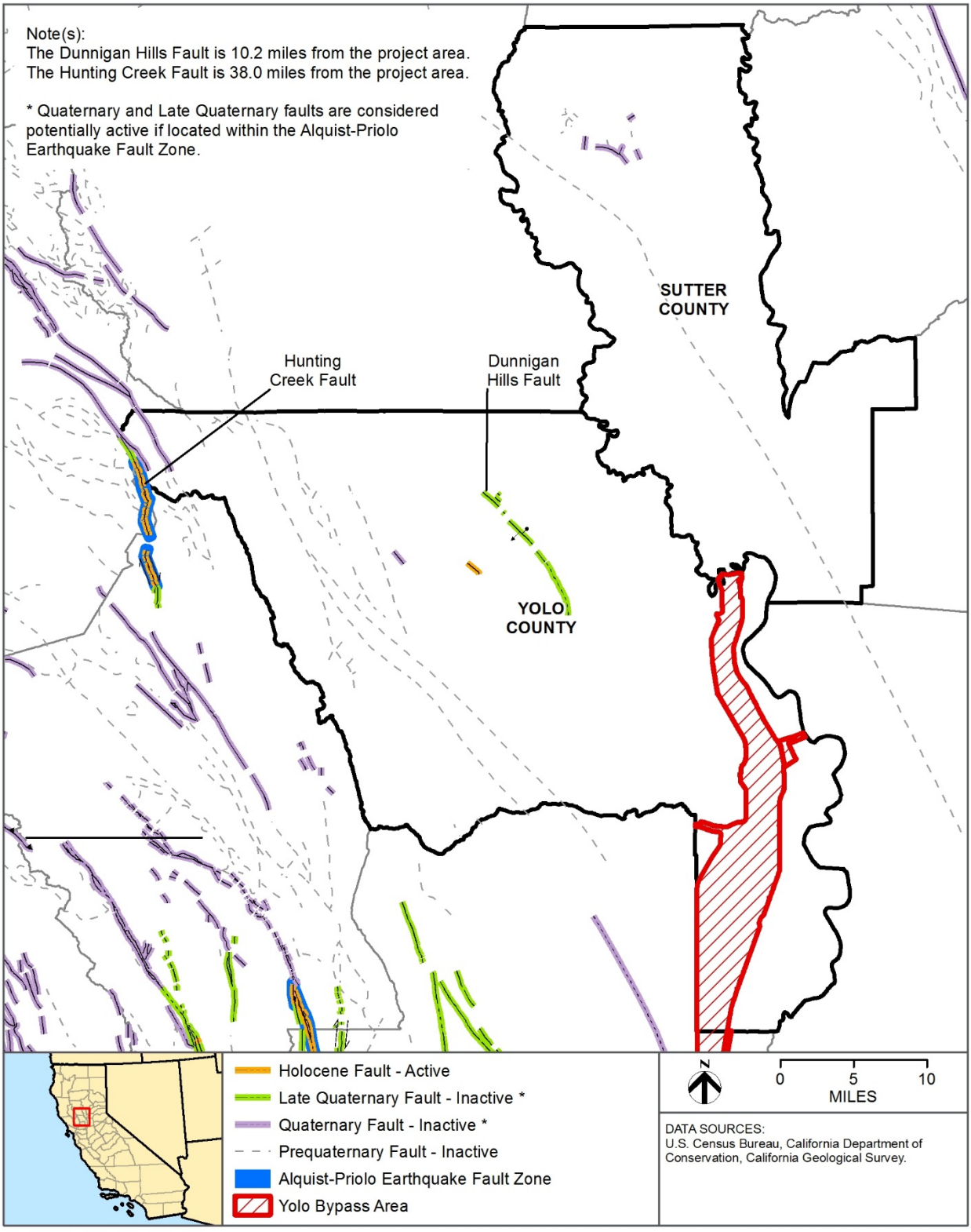


Figure 12-4. Fault Locations in Yolo, Sutter, and Surrounding Counties

Land subsidence is the sudden or gradual sinking of the earth's surface resulting from subsurface movements. Land subsidence can be caused by several events or conditions, including aquifer-system compaction due to the lowering of groundwater levels by sustained groundwater overdraft, hydrocompaction of moisture-deficient deposits above the water table, fluid withdrawal from oil and gas fields, and crustal tectonic activity during recent geologic time. In Yolo and Sutter counties, land subsidence is often attributed to the significant withdrawal of groundwater. Land subsidence and groundwater monitoring stations in Yolo and Sutter counties (Station Number 11N01E24Q008M, 09N03E08C004M, and 11N04E04N005M) have recorded land subsidence from 0.032 to 1.1 feet since the late 1900s (DWR 2016a and 2016b). For a more detailed discussion on land subsidence in the Project area, see Section 7.1.1.3 *Groundwater-Related Land Subsidence* of Chapter 7, *Groundwater*.

12.1.5 Mineral Resources

The primary mineral resources in Yolo County are mined aggregate and natural gas (County of Yolo 2009). The Surface Mining and Reclamation Act (SMARA) regulations, Article 2, describe areas designated as having regional significance due to the presence of mineral resources. There are no areas within the Project area that are currently mined for aggregate mineral resources or that have been determined to contain minerals of regional, statewide, or multi-community significance (California State Mining and Geology Board 2012). According to the California Department of Conservation's Division of Oil, Gas and Geothermal Resources Well Finder (2018), there are natural gas fields and 427 dry gas and oil and gas wells present within the Yolo Bypass. Of the 427 wells, 6 wells are active, 14 wells are idle, and 407 are plugged and abandoned.

12.2 Regulatory Setting

Several Federal, State of California (State), and local regulations are applicable to geology, seismicity, and soils. These include California's Alquist-Priolo Earthquake Fault Zoning Act and Seismic Hazards Mapping Act as well as county regulations that address geologic hazards related to construction standards, structural integrity, and grading and erosion during construction. The following sections summarize applicable plans, policies, and regulations related to geology, seismicity, and soils in the Project area.

12.2.1 Federal Plans, Policies, and Regulations

Federal laws and regulations pertaining to geology, seismicity, and soils are discussed below.

12.2.1.1 Earthquake Hazard Reduction Act of 1977

The Earthquake Hazard Reduction Act of 1977 established a national goal of reducing the risks of life and property from future earthquakes in the United States through the establishment and maintenance of an earthquake program, including prediction and hazard assessment research, seismic monitoring, and information dissemination. The act established the Earthquake Hazard Reduction Program to promote the adoption of earthquake hazard reduction measures by Federal, State, and local governments. Section 8 of the act calls for the adoption of standards for

assessing and enhancing the seismic safety of buildings constructed for or leased by the Federal government (42 United States Code 7701 et. seq.).

12.2.2 State Plans, Policies, and Regulations

State laws and regulations pertaining to geology, seismicity, and soils are discussed below.

12.2.2.1 Seismic Hazards Mapping Act

The 1990 Seismic Hazards Mapping Act (California Public Resources Code [PRC] Section 2690-2699.6) was enacted to minimize loss of life and property from strong ground shaking, liquefaction, landslides, or other ground failures as a result of earthquakes. The Seismic Hazards Mapping Act requires the CGS to identify and map areas with the potential for liquefaction, landslides, or ground shaking. These maps are used by cities and counties in their land use permitting process to adequately prepare the safety element of their general plans (CGS 1991). Permits for development projects are not issued until geologic investigations have been completed and mitigation has been developed to address any seismic hazard issues.

12.2.2.2 Surface Mining and Reclamation Act of 1975

SMARA of 1975 (PRC, Division 2, Chapter 9, Section 2710 et. seq.) addresses surface mining and requires mitigation to reduce adverse impacts to public health, property, and the environment. The SMARA applies to anyone (including a government agency) that disturbs more than one acre or removes more than 1,000 cubic yards of material through surface mining activities even if activities occur on Federally managed lands (California State Mining and Geology Board 2012). Local city and county lead agencies are required to develop ordinances for permitting that provide the regulatory framework for mining and reclamation activities. The California State Mining and Geology Board reviews lead agency ordinances to ensure they comply with SMARA (California State Mining and Geology Board 2012).

12.2.2.3 California Building Code

Minimum standards for structural design and construction are outlined in the California Building Standards Code (Title 24, California Code of Regulations). The California code is based on the Uniform Building Code, which is widely used throughout the United States and has been modified for California conditions with numerous, more detailed, and/or more stringent regulations.

The California Building Standards Code requires that “classification of the soil at each building site…be determined when required by the building official” and that “the classification be based on observation and any necessary test of the materials disclosed by borings or excavations.” In addition, the code states that “the soil classification and design-bearing capacity shall be shown on the (building) plans, unless the foundation conforms to specified requirements.” The California code provides standards for various aspects of construction, including but not limited to excavation, grading, and earthwork construction; fill placement and embankment construction; construction on expansive soils; foundation investigations; and liquefaction potential and soil strength loss.

12.2.2.4 Alquist-Priolo Earthquake Fault Zoning Act

In 1972, the Alquist-Priolo Earthquake Fault Zoning Act, originally named the Special Studies Zones Act, was enacted to mitigate the risk to life and property from surface faulting hazards during earthquakes. The act requires local agencies to regulate development and construction in earthquake fault zones.

12.2.3 Regional and Local Plans, Policies, and Regulations

Local jurisdictions typically regulate construction activities through a multi-stage permitting process that may require preparation of a site-specific geotechnical investigation. The purpose of a site-specific geotechnical investigation is to provide a geologic basis for the development of appropriate project design. Geotechnical investigations typically assess bedrock and Quaternary (recent) geology, geologic structure, soils, and previous history of excavation and fill placement. They may also address the requirements of the Alquist-Priolo Earthquake Fault Act, the Seismic Hazards Mapping Act, and/or local regulations.

12.2.3.1 Yolo County General Plan

Policies related to geologic and seismic hazards that are applicable to this project are provided in the Yolo County General Plan. The General Plan includes Goal HS-1: Geologic Hazards, the aim of which is to protect the public and reduce damage to property from earthquakes and other geologic hazards (County of Yolo 2009). The following policies support this goal:

- Policy HS-1.1: Regulate land development to avoid unreasonable exposure to geologic hazards.
- Policy HS-1.2: All development and construction proposals shall be reviewed by the county to ensure conformance to applicable building standards.
- HS-1.3: Require environmental documents prepared in connection with the California Environmental Quality Act (CEQA) to address seismic safety issues and provide adequate mitigation for existing and potential hazards identified.

12.2.3.2 Sutter County General Plan

Policies related to geologic and seismic hazards that are applicable to this project are provided in the *Sutter County General Plan*. The General Plan establishes Goal PHS-2 to minimize the risk of personal injury and property damage due to geologic and seismic hazards and adverse soil conditions (Sutter County 2011). Some of the policies that will help support this goal include:

- PHS-2.1: Review and enforce seismic and geologic safety standards and require the use of best management practices in the site design and building construction methods.
- PHS-2.2: Minimize development in areas where geologic hazards exist from landslides and erosion.
- PHS-2.3: Require the preparation of a county-approved site-specific geotechnical analysis prior to approval of development in areas where there is potential for geologic or seismic hazards and incorporate recommended features to mitigate the identified hazards.

- PHS-2.4: Promote the upgrade, retrofitting, and/or relocation of existing essential facilities that do not meet current building code standards and are within areas susceptible to seismic or geologic hazards.

12.3 Environmental Consequences

This section describes the environmental consequences associated with the Project alternatives and the No Action Alternative on geology and soils, including mineral resources. This section presents the assessment methods used to analyze the effects on geology, soils, and mineral resources, the thresholds of significance that determine the significance of effects, and the potential environmental consequences and mitigation measures as they relate to each Project alternative.

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

12.3.1 Methods for Analysis

This section describes the approach for the analysis of geology and soils, and mineral resources, in the Project area. The evaluation of impacts on geology, soils, and mineral resources considers the potential for increased sedimentation in the Yolo Bypass; induced levee instability; erosion at the Yolo Bypass east levee; and increased risk of personal injury, loss of life, and damage to property, including Project facilities, because of geologic conditions in the area. The environmental consequences of the Project alternatives were analyzed qualitatively, based on a review of the soil and geologic data presented in Section 12.2.

Impacts to geology, soils, and mineral resources are determined relative to existing conditions (for CEQA) and the No Action Alternative (for the National Environmental Policy Act [NEPA]). However, the No Action Alternative would be similar to existing conditions because geology and soils, including mineral resources, are not anticipated to experience substantive changes in the area of analysis. Therefore, the analysis compares the impacts of the action alternatives only to the impacts of the existing conditions.

12.3.2 Thresholds of Significance – CEQA

The thresholds of significance for impacts were developed consistent with the CEQA Guidelines to determine the significance of potential impacts in relation to geology, soils, and mineral resources that could result from implementation of the Project. These thresholds of significance for impacts were designed to also encompass the factors under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. Impacts related to geology and soils would be considered significant if the project would:

- Result in a substantial increase in sediment deposition
- Destabilize existing infrastructure such as levees, bridges, or other structures
- Result in substantial soil erosion

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, based on substantial evidence of a known fault
  - Strong seismic ground shaking
  - Seismic-related ground failure, including liquefaction
  - Landslides
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on or offsite landslides, lateral spreading, subsidence, liquefaction, or collapse.
- Be located on expansive soil, creating substantial risk to life or property.
- Result in the loss of availability of a known mineral resource that would be of value to the region and residents of the State.

As discussed in Sections 12.1.3 and 12.1.4, the Project area is not within range of active faults or recent seismic activity and lacks features that would contribute to liquefaction or landslides. Land subsidence, primarily due to the overdraft of groundwater, has been recorded in Yolo and Sutter counties, as discussed in Section 12.1.4; therefore, impacts regarding land subsidence in the Project area are discussed in Chapter 7, *Groundwater Resources*. As discussed in Section 12.1.5, no known mineral resources of State, regional, or local importance are present in the Project area. Sediment removal during maintenance activities would restore the Project area to design capacity and would not impact the underlying geology or soils in the Yolo Bypass. Therefore, these topics are not discussed further.

12.3.3 Effects and Mitigation Measures

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

12.3.3.1 No Action Alternative

Under the No Action Alternative, the Project would not be implemented, and none of the Project components would be developed. There would be no Project-related construction activities.

CEQA Conclusion

There would be **no impact** on geology and soils in the area of analysis if the Project is not implemented because there would be no construction or development.

12.3.3.2 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 cubic feet per second (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.

12.3.3.2.1 Impact GEO-1: Substantial increase in sediment deposition in Yolo Bypass

Alternative 1 is estimated to increase the total amount of sediment entering the Yolo Bypass to approximately 743,000 cubic yards on an average annual basis, an increase of 84,000 cubic yards (13 percent) compared to existing conditions. Of the 84,000 cubic yards entering the bypass, approximately 25,200 cubic yards (30 percent) are expected to be clays and fine silts that would remain in suspension and wash through the bypass (HDR, Inc. 2017a). Approximately 21,000 cubic yards (25 percent) are expected to settle downstream of Agricultural Road Crossing 1 on agricultural fields and, once dry, would be tilled into the ground during typical agricultural activities. Spread across agricultural fields between Agricultural Road Crossing 1 and Interstate (I) 5, this amount of sediment would not result in a substantial change in ground elevation.

Approximately 37,800 cubic yards of soil (45 percent) would settle directly downstream of Fremont Weir and upstream of Agricultural Road Crossing 1 (HDR, Inc. 2017a). This sediment would need to be removed in addition to existing maintenance activities, increasing the annual amount of sediment removal to 334,350 cubic yards from 296,550 cubic yards. From 1986 to 2006, five sediment removal operations were performed on an as-needed basis (1986, 1987, twice in 1991, and 2006). Within that 20-year span, between approximately 530,000 and 1,450,000 cubic yards of soil were removed, per operation, for a total of 4,390,000 cubic yards of soils removed (HDR, Inc. 2017b). The increased sediment deposition from operation of Alternative 1 would require a change from the existing frequency of sediment removal actions (as needed) to at least every five years and as needed. Although Alternative 1 would increase the amount and frequency of sediment removal within the bypass, it would remove all deposited sediment upstream of Agricultural Road Crossing 1 and would not result in a substantial increase in sediment deposition.

CEQA Conclusion

Impacts to sediment deposition in the Yolo Bypass from the operation of Alternative 1 would be **less than significant** because the increased amount of sediment deposited in the Yolo Bypass would be removed during maintenance activities.

12.3.3.2.2 Impact GEO-2: Induce levee instability at the Yolo Bypass east levee

Alternative 1 would require the excavation of a new transport channel that would connect the headworks structure to the existing Tule Pond and convey flow up to 6,000 cfs through the Yolo Bypass. Alternative 1 would include improvements to the existing channel that extends from the Tule Pond outlet to the beginning of Tule Canal. This new transport channel would run parallel to the existing Yolo Bypass east levee. Excavation near the waterside toe of the Yolo Bypass east levee has the potential to induce levee instability. This alternative includes a minimum setback distance of 112 feet from the waterside toe of the existing levee to the new channel to avoid potential impacts to the stability of the existing levee embankment. All construction would take place outside the waterside toe of the existing levee.

CEQA Conclusion

Impacts to the stability of the existing Yolo Bypass east levee as a result of construction under Alternative 1 would be **less than significant** because construction would take place at least 112 feet from the outside of the waterside toe of the existing levee.

12.3.3.2.3 Impact GEO-3: Substantially increase soil erosion at the Yolo Bypass east levee

The new excavated transport channel under Alternative 1 would be adjacent to and run parallel to the existing Yolo Bypass east levee. The water flow through the channel would be parallel to the existing levee and would not cause scouring at the existing levee. Construction and operation of Alternative 1 would not introduce potential soil erosion at the Yolo Bypass east levee.

Impacts of soil erosion are also addressed in detail in Chapter 6, *Water Quality*, and Chapter 18, *Air Quality*. Impacts of construction-related sedimentation are addressed in Chapter 6, *Water Quality*.

CEQA Conclusion

There would be **no impacts** related to soil erosion at the Yolo Bypass east levee associated with Alternative 1 because the channel would run parallel to the eastern bypass and would not result in scouring at the Yolo Bypass east levee.

12.3.3.2.4 Impact GEO-4: Loss of availability of a known mineral resource that would be of value to the region and the residents of the state

Alternative 1 would increase flows through the Yolo Bypass by up to 6,000 cfs. There are known oil and gas wells in the Project area, the majority of which (98.6 percent) are idled or plugged and abandoned. Active wells and idled wells that have the potential to be reactivated account for 4.7 percent of oil and gas wells in the bypass. Wells and buried pipelines associated with nearby natural gas fields are designed and built to withstand flood conditions. Increased flows under Alternative 1 would be lower than the design flood flows and would not result in the loss of availability of mineral resources and would not affect the natural gas fields.

CEQA Conclusion

Impacts to mineral resources in the Yolo Bypass associated with Alternative 1 would be **less than significant** because the increased flows through the bypass would be lower than the flood flows mining infrastructure is built to withstand.

12.3.3.2.5 Impact GEO-5: Loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan

The 2030 Countywide General Plan (2009) identifies gas fields located within the Yolo Bypass. These resources are currently subject to seasonal inundation during flood events. Changes in flows through the bypass associated with Alternative 1 would not affect the natural gas fields and would not result in the loss of availability of this resource.

CEQA Conclusion

Impacts to locally important mineral resource sites within the Yolo Bypass associated with Alternative 1 would be **less than significant** because infrastructure associated with the gas fields are built to withstand floods with higher flows than the alternative would allow.

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

12.3.3.3.1 Impact GEO-1: Substantial increase in sediment deposition in Yolo Bypass

Impacts to sediment deposition from the operation of Alternative 2 would be identical to those discussed for Alternative 1.

CEQA Conclusion

Impacts to sediment deposition in the Yolo Bypass, resulting from operation of Alternative 2, would be **less than significant** because the increased amount of sediment deposited in Yolo Bypass would be removed during maintenance activities.

12.3.3.3.2 Impact GEO-2: Induce levee instability at the Yolo Bypass east levee

Under Alternative 2, improvements would be made to the channel that extends from the Tule Pond outlet to the beginning of Tule Canal. These improvements would require excavation in the downstream channel, west of the Yolo Bypass east levee. Excavation near the waterside toe of the Yolo Bypass east levee has the potential to induce levee instability. Excavation would occur more than 112 feet from the waterside toe of the levee, providing sufficient distance between the existing levee and the improved channel.

CEQA Conclusion

Impacts to the stability of the existing Yolo Bypass east levee as a result of construction under Alternative 2 would be **less than significant** because construction would take place more than 112 feet from the outside of the waterside toe of the existing levee.

12.3.3.3.3 Impact GEO-3: Substantially increase soil erosion at the Yolo Bypass east levee

Under Alternative 2, the angle at which the transport channel would enter Tule Canal has the potential to cause erosion on the Yolo Bypass east levee. However, a 50-foot-wide, 2.5-foot-deep area of rock revetment would be incorporated on the eastern edge of Tule Pond with 1.5:1 side slopes (horizontal to vertical) to provide scour protection. The channel revetment would also be incorporated in the areas along the proposed transport channel where the channel could interact

with existing scour channels. The intake channel would be lined with rounded rock revetment to avoid scour, and the inlet and outlet transitions would be concrete.

Impacts of soil erosion are addressed in detail in Chapter 6, *Water Quality*, and Chapter 18, *Air Quality*. Impacts of construction-related sedimentation are addressed in Chapter 6, *Water Quality*.

CEQA Conclusion

Impacts related to soil erosion associated with Alternative 2 would be **less than significant** because the design incorporates erosion control measures such as rock revetment.

12.3.3.3.4 Impact GEO-4: Loss of availability of a known mineral resource that would be of value to the region and the residents of the state

Impacts related to the loss of availability of known mineral resources resulting from the implementation of Alternative 2 would be the same as those discussed for Alternative 1.

CEQA Conclusion

Impacts to mineral resources in the Yolo Bypass associated with Alternative 2 would be **less than significant** because the increased flows through the bypass would be lower than the flood flows mining infrastructure is built to withstand.

12.3.3.3.5 Impact GEO-5: Loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan

Impacts related to the loss of availability of locally-important mineral resource sites resulting from the implementation of Alternative 2 would be the same as those discussed for Alternative 1.

CEQA Conclusion

Impacts to locally important mineral resource sites within the Yolo Bypass associated with Alternative 2 would be **less than significant** because infrastructure associated with the gas fields are built to withstand floods with higher flows than the alternative would allow.

12.3.3.4 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.

12.3.3.4.1 Impact GEO-1: Substantial increase in sediment deposition in Yolo Bypass

Alternative 3 would result in the same amount of additional sediment deposition and removal on an average annual basis as described for Alternative 1. Therefore, impacts to sediment deposition, resulting from the operation of Alternative 3, would be the same as those discussed for Alternative 1.

CEQA Conclusion

Impacts to sediment deposition in the Yolo Bypass from operation of Alternative 3 would be **less than significant** because the increased amount of sediment deposited in the Yolo Bypass would be removed during maintenance activities.

12.3.3.4.2 Impact GEO-2: Induce levee instability at the Yolo Bypass east levee

Impacts related to the destabilization of the exiting levee resulting from the implementation of Alternative 3 would be the same as those discussed for Alternative 2.

CEQA Conclusion

Impacts to the stability of the existing Yolo Bypass east levee as a result of construction under Alternative 3 would be **less than significant** because construction would take place outside the waterside toe of the existing levee.

12.3.3.4.3 Impact GEO-3: Substantially increase soil erosion at the Yolo Bypass east levee

Impacts related to soil erosion resulting from the implementation of Alternative 3 would be the same as those discussed for Alternative 2.

CEQA Conclusion

Impacts related to soil erosion associated with Alternative 3 would be **less than significant** because the design incorporates erosion control measures such as rock revetment.

12.3.3.4.4 Impact GEO-4: Loss of availability of a known mineral resource that would be of value to the region and the residents of the state

Impacts related to the loss of availability of known mineral resources resulting from the implementation of Alternative 3 would be the same as those discussed for Alternative 1.

CEQA Conclusion

Impacts to mineral resources in the Yolo Bypass associated with Alternative 3 would be **less than significant** because the increased flows through the bypass would be lower than the flood flows mining infrastructure is built to withstand.

12.3.3.4.5 Impact GEO-5: Loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan

Impacts related to the loss of availability of locally-important mineral resource sites resulting from the implementation of Alternative 3 would be the same as those discussed for Alternative 1.

CEQA Conclusion

Impacts to locally important mineral resource sites within the Yolo Bypass associated with Alternative 3 would be **less than significant** because infrastructure associated with the gas fields are built to withstand floods with higher flows than the alternative would allow

12.3.3.5 Alternative 4: West Side Gated Notch – Managed Flow

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.

12.3.3.5.1 Impact GEO-1: Substantial increase in sediment deposition in Yolo Bypass

Alternative 4 is estimated to increase the total amount of sediment entering the Yolo Bypass to approximately 701,000 cubic yards on an average annual basis, an increase of 42,000 cubic yards (six percent) compared to existing conditions. Of the 42,000 cubic yards entering the bypass, approximately 12,600 cubic yards (30 percent) are expected to be clays and fine silts that would remain in suspension and wash through the bypass (HDR, Inc. 2017a). Approximately 10,500 cubic yards (25 percent) are expected to settle downstream of Agricultural Road Crossing 1 on agricultural fields and, once dry, would be tilled into the ground during typical agricultural activities. Spread across agricultural fields between Agricultural Road Crossing 1 and I-5, this amount of sediment would not result in a substantial change in ground elevation.

Approximately 18,900 cubic yards would be removed in addition to existing maintenance activities, increasing the annual amount of sediment removal to 315,450 cubic yards from 296,550 cubic yards. From 1986 to 2006, five sediment removal operations were performed on an as-needed basis (1986, 1987, twice in 1991, and 2006). Within that 20-year span, between approximately 530,000 and 1,450,000 cubic yards of soil were removed, per operation, for a total of 4,390,000 cubic yards of soils removed (HDR, Inc. 2017b). The increased sediment deposition from operation of Alternative 4 would require a change from the current frequency of sediment removal actions (as needed) to at least every five years or as needed. Although Alternative 4 would increase the amount and frequency of sediment removal within the bypass, it would remove all deposited sediment upstream of Agricultural Road Crossing 1 and would not result in a substantial increase in sediment deposition.

CEQA Conclusion

Impacts to sediment deposition in the Yolo Bypass resulting from the operation of Alternative 4 would be **less than significant** because the increased sediment deposited in the Yolo Bypass would be removed during maintenance activities.

12.3.3.5.2 Impact GEO-2: Induce levee instability at the Yolo Bypass east levee

Impacts related to the destabilization of the existing levee resulting from the implementation of Alternative 4 would be the same as those discussed for Alternative 2.

CEQA Conclusion

Impacts to the stability of the existing Yolo Bypass east levee as a result of construction under Alternative 4 would be **less than significant** because construction would take place outside the waterside toe of the existing levee.

12.3.3.5.3 Impact GEO-3: Substantially increase soil erosion at the Yolo Bypass east levee

Alternative 4 includes an intake channel, outlet transition, and transport channel identical to those described for Alternative 2. The additional engineered berms featured at the northern and southern water control structures in Alternative 4 would be rock-lined on both the land and waterside slopes to provide scour protection. The bypass channels in these areas would be earthen channels, and some soil erosion could occur. However, Alternative 4 was designed to avoid excessive soil erosion by incorporating rock-lined channels and berms, concrete transitions, and rock revetments.

Impacts of soil erosion are also addressed in detail in Chapter 6, *Water Quality*, and Chapter 18, *Air Quality*. Impacts of construction-related sedimentation are addressed in Chapter 6, *Water Quality*.

CEQA Conclusion

Impacts related to soil erosion associated with Alternative 4 would be **less than significant** because the design incorporates erosion control measures such as engineered berms and rock revetment.

12.3.3.5.4 Impact GEO-4: Loss of availability of a known mineral resource that would be of value to the region and the residents of the state

Similar to Alternative 1, Alternative 4 would increase flows through the Yolo Bypass by up to 3,000 cfs. Impacts related to the loss of availability of known mineral resources resulting from the implementation of Alternative 4 would be similar to those discussed for Alternative 1.

CEQA Conclusion

Impacts to mineral resources in the Yolo Bypass associated with Alternative 4 would be **less than significant** because the increased flows through the bypass would be lower than the flood flows mining infrastructure is built to withstand.

12.3.3.5.5 Impact GEO-5: Loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan

The 2030 Countywide General Plan (2009) identifies gas fields located within the Yolo Bypass. Changes in flows through the bypass associated with Alternative 4 would not affect the natural gas fields and would not result in the loss of availability of this resource.

CEQA Conclusion

Impacts to locally important mineral resource sites within the Yolo Bypass associated with Alternative 4 would be **less than significant** because infrastructure associated with the gas fields are built to withstand floods with higher flows than the alternative would allow.

12.3.3.6 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.

12.3.3.6.1 Impact GEO-1: Substantial increase in sediment deposition in Yolo Bypass

Similar to Alternative 4, Alternative 5 would require an additional 18,900 cubic yards of sediment be removed from the Yolo Bypass during maintenance activities every five years or as needed. Impacts to sediment deposition resulting from the operation of Alternative 5 would be the same as those discussed for Alternative 4.

CEQA Conclusion

Impacts to sediment deposition in the Yolo Bypass resulting from the operation of Alternative 5 would be **less than significant** because the increased sediment deposited in the Yolo Bypass would be removed during maintenance activities.

12.3.3.6.2 Impact GEO-2: Induce levee instability at the Yolo Bypass east levee

Impacts related to the destabilization of the exiting levee resulting from the implementation of Alternative 5 would be the same as those discussed for Alternative 2.

CEQA Conclusion

Impacts to the stability of existing Yolo Bypass east levee as a result of construction under Alternative 5 would be **less than significant** because construction would take place outside the waterside toe of the existing levee.

12.3.3.6.3 Impact GEO-3: Substantially increase soil erosion at the Yolo Bypass east levee

The new excavated transport channels under Alternative 5 would be west of the Yolo Bypass east levee. The angle at which water would flow through the channels near the Yolo Bypass east levee would not cause scouring at the levee. Construction and operation of Alternative 5 would not introduce potential soil erosion at the Yolo Bypass east levee. The transport channels would be rock-lined, angular rocks would be placed along the bank slopes of the intake channel, and rounded rocks would be placed on the intake channel bottom to avoid scour.

Impacts of soil erosion are also addressed in detail in Chapter 6, *Water Quality*, and Chapter 18, *Air Quality*. Impacts of construction-related sedimentation are addressed in Chapter 6, *Water Quality*.

CEQA Conclusion

There would be **no impacts** related to soil erosion at the Yolo Bypass east levee associated with Alternative 5 because the channels would approach the levee at an angle that would not result in scouring at the levee.

12.3.3.6.4 Impact GEO-4: Loss of availability of a known mineral resource that would be of value to the region and the residents of the state

Similar to Alternative 1, Alternative 5 would increase flows through the Yolo Bypass by up to 3,400 cfs. Impacts related to the loss of availability of known mineral resources resulting from the implementation of Alternative 5 would be similar to those discussed for Alternative 1.

CEQA Conclusion

Impacts to mineral resources in the Yolo Bypass associated with Alternative 5 would be **less than significant** because the increased flows through the bypass would be lower than the flood flows mining infrastructure is built to withstand.

12.3.3.6.5 Impact GEO-5: Loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan

The 2030 Countywide General Plan (2009) identifies gas fields located within the Yolo Bypass. Changes in flows through the bypass associated with Alternative 5 would not affect the natural gas fields and would not result in the loss of availability of this resource.

CEQA Conclusion

Impacts to locally important mineral resource sites within the Yolo Bypass associated with Alternative 5 would be **less than significant** because infrastructure associated with the gas fields are built to withstand floods with higher flows than the alternative would allow.

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

The Alternative 5 program level of improvements to the Tule Canal Floodplain would have no impact on levee instability or soil erosion at the Yolo Bypass east levee because the improvements are not near the levee.

Impact GEO-1: Substantial increase in sediment deposition in Yolo Bypass

The program level improvements to the Tule Canal Floodplain would include the construction of a series of secondary channels that connect to the Tule Canal. The channels would have a 30-foot bottom width with 3:1 side slopes (horizontal to vertical). A fish bypass channel would be constructed around the weir in the Tule Canal. These channels would require an additional amount of sediment be removed from the Yolo Bypass during maintenance activities. The amount of additional sediment to be removed in this area is not anticipated to increase sediment removal in the Yolo Bypass outside of historical ranges.

CEQA Conclusion

Impacts to sediment deposition in the Yolo Bypass resulting from operation of program level improvements to the Tule Canal Floodplain would be **less than significant** because the increased sediment is expected to remain within historical ranges of sediment removal in the Yolo Bypass.

12.3.3.7 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.

12.3.3.7.1 Impact GEO-1: Substantial increase in sediment deposition in Yolo Bypass

Alternative 6 is estimated to increase the total amount of sediment entering the Yolo Bypass to approximately 827,000 cubic yards on an average annual basis, an increase of 168,000 cubic yards (25 percent) compared to existing conditions. Of the 168,000 cubic yards entering the bypass, approximately 50,400 cubic yards (30 percent) are expected to be clays and fine silts that would remain in suspension and wash through the bypass (HDR, Inc. 2017a). Approximately 42,000 cubic yards (25 percent) are expected to settle downstream of Agricultural Road Crossing 1 on agricultural fields and, once dry, would be tilled into the ground during typical agricultural activities. Spread across agricultural fields between Agricultural Road Crossing 1 and I-5, this amount of sediment would not result in a substantial change in ground elevation.

Approximately 75,600 cubic yards would be removed in addition to existing maintenance activities, increasing the annual amount of sediment removal to 372,150 cubic yards from

296,550 cubic yards. From 1986 to 2006, five sediment removal operations were performed on an as-needed basis (1986, 1987, twice in 1991, and 2006). Within that 20-year span, between approximately 530,000 and 1,450,000 cubic yards of soil were removed, per operation, for a total of 4,390,000 cubic yards of soils removed (HDR, Inc. 2017b). The increased sediment deposition from operation of Alternative 6 would require a change from the current frequency of sediment removal actions (as needed) to at least every five years and as needed. Although Alternative 6 would increase the amount and frequency of sediment removal within the bypass, it would remove all sediment deposited between Fremont Weir and Agricultural Road Crossing 1. This alternative would add sediment to the agricultural fields in the bypass.

CEQA Conclusion

Impacts to sediment deposition in the Yolo Bypass resulting from the operation of Alternative 6 would be **less than significant** because the increased sediment deposited in the Yolo Bypass would be removed during maintenance activities.

12.3.3.7.2 Impact GEO-2: Induce levee instability at the Yolo Bypass east levee

Impacts related to the destabilization of the exiting levee resulting from the implementation of Alternative 6 would be the same as those discussed for Alternative 2.

CEQA Conclusion

Impacts to the stability of the existing Yolo Bypass east levee as a result of construction under Alternative 6 would be **less than significant** because construction would take place outside the waterside toe of the existing levee.

12.3.3.7.3 Impact GEO-3: Substantially increase soil erosion at the Yolo Bypass east levee

Impacts related to soil erosion resulting from the implementation of Alternative 6 would be the same as those discussed for Alternative 2.

CEQA Conclusion

Impacts related to soil erosion associated with Alternative 6 would be **less than significant** because the design incorporates erosion control measures such as rock revetment.

12.3.3.7.4 Impact GEO-4: Loss of availability of a known mineral resource that would be of value to the region and the residents of the state

Alternative 6 would increase flows through the Yolo Bypass by up to 12,000 cfs. There are known oil and gas wells in the Project area, the majority of which (98.6 percent) are idled or plugged and abandoned. Active wells and idled wells that have the potential to be reactivated account for 4.7 percent of oil and gas wells in the bypass. Wells and buried pipelines associated with nearby natural gas fields are designed and built to withstand flood conditions. Increased flows under Alternative 6 would be lower than the design flood flows and would not result in the loss of availability of mineral resources and would not affect the natural gas fields.

CEQA Conclusion

Impacts to mineral resources in the Yolo Bypass associated with Alternative 6 would be **less than significant** because the increased flows through the bypass would be lower than the flood flows mining infrastructure is built to withstand.

12.3.3.7.5 Impact GEO-5: Loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan

The 2030 Countywide General Plan (2009) identifies gas fields located within the Yolo Bypass. Changes in flows through the bypass associated with Alternative 6 would not affect the natural gas fields and would not result in the loss of availability of this resource.

CEQA Conclusion

Impacts to locally important mineral resource sites within the Yolo Bypass associated with Alternative 6 would be **less than significant** because infrastructure associated with the gas fields are built to withstand floods with higher flows than the alternative would allow.

12.3.4 Summary of Impacts

Table 12-1 provides a summary of the identified impacts to geology and soils for construction and operation of the Project.

Table 12-1. Summary of Impacts and Mitigation Measures – Geology and Soils

Impact	Alternative	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Impact GEO-1: Substantial increase in sediment deposition in Yolo Bypass	No Action	NI	---	NI
	All Action Alternatives	LTS	---	LTS
Impact GEO-2: Induce levee instability at the Yolo Bypass east levee	No Action	NI	---	NI
	1, 2, 3, 4, 5 (Project), 6	LTS	---	LTS
	5 (Program)	NI	---	NI
Impact GEO-3: Substantially increase soil erosion at the Yolo Bypass east levee	No Action	NI	---	NI
	1, 5 (Project), 5 (Program)	NI	---	NI
	2, 3, 4, 6	LTS	---	LTS
Impact GEO-4: Loss of availability of a known mineral resource that would be of value to the region and the residents of the state	No Action	NI	---	NI

Impact	Alternative	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
	All Action Alternatives	LTS	---	LTS
Impact GEO-5: Loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan	No Action	NI	---	NI
	All Action Alternatives	LTS	---	LTS

Key: LTS = less than significant; NI = no impact

12.4 Cumulative Impacts Analysis

This section describes the cumulative impacts analysis for Geology and Soils. Section 3.3 presents an overview of the cumulative impacts analysis, including the methodology, and the projects, plans, and programs considered in the cumulative impacts analysis.

12.4.1 Methodology

This evaluation of cumulative impacts for land use 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 includes the area in which Project actions would occur affecting geology and soils, which is the northern portion of 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.

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

Projects that would construct, remove, modify, or relocate levees and weirs in the Project area have the potential to impact geology and soils in combination with the Project alternatives. These projects are listed below:

- The American River Common Features General Reevaluation Report would involve extensive excavation activities that could impact topsoil and cause erosion in the Sacramento Bypass near the east side of Yolo Bypass.
- The Delta Plan would improve water supply reliability.
- The Lower Elkhorn Basin Levee Setback Project would remove portions of existing levees and improve or relocate associated infrastructure.
- The North Bay Aqueduct Alternative Intake Project would improve water supply reliability.
- The Sacramento River Basin-Wide Feasibility Study would include options to improve the bypass system that includes potential expansion of Yolo Bypass and Fremont Weir, which could consist of a combination of levee setbacks, weir expansions, and new bypass channels.

- *The Sacramento River General Reevaluation Report* considers widening bypasses and constructing setback levees.
- The Shasta Lake Water Resources Investigation would improve water supply reliability.

12.4.2 Cumulative Impacts

The Project alternatives would have a less than significant impact to geology and soils with the incorporation of control structures and best management practices that are included within the project description. The cumulative projects would require construction and excavation, which could impact the soils and result in increased erosion in the area or affect levee stability. However, the cumulative projects would be expected to implement proper mitigation measures, when necessary, to prevent significant cumulative impacts and reduce impacts to less than significant with mitigation measures.

The Delta Plan, North Bay Aqueduct Alternative Intake Project, and Shasta Lake Water Resources Investigation would improve water supply reliability, which should result in beneficial impacts by providing sufficient water that would reduce the amount of fallowed lands and erosion potential.

Therefore, the Project alternative's contribution to the cumulative effects associated with geology and soils **would not result in a cumulative considerable impact** because the effects would not likely result in a substantial increase to sedimentation in the Yolo Bypass, induce levee instability, or increase soil erosion.

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